TS

NOT MEASUREMENT SENSITIVE

DOE-STD-1068-94
June 1994

DOE STANDARD

GUIDELINE TO GOOD PRACTICES FOR MAINTENANCE HISTORY AT DOE NUCLEAR FACILITIES

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

AREA MNTY

FOREWORD

The purpose of the *Guideline to Good Practices for Maintenance History at DOE Nuclear Facilities* is to provide contractor maintenance organizations with information that may be used for the development and implementation of comprehensive, readily retrievable, information regarding item maintenance and critical parameters essential to effective maintenance planning, safe and reliable first-effort workmanship, trending, problem analysis, and knowledge-based management decisions. This guide should be used to verify adequacy of and/or modify existing or develop new Maintenance History Programs. This document is intended to be an example guideline for the implementation of DOE Order 4330.4A, *Maintenance Management Program,* Chapter II, Element 16, *Maintenance History.* 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 developing Maintenance History Programs that are applicable to their facility.

CONTENTS

1. INTRODUCTION

1.1 Purpose

This guide is intended to assist facility maintenance management in defining the development, documentation, and implementation of the maintenance history program. It is expected that each DOE facility may use different approaches or methods than those defined in this guide. Explanation of the intent of this guide is provided in the Discussion section, and the specific guidelines that follow reflect generally accepted industry practices. In some cases, example situations accompany these guidelines. These examples have been provided only as an aid in clear understanding of the guidelines and should not be construed as the only method for meeting the intent of the guidelines. Therefore, deviation from any particular guideline would not, in itself, indicate a problem. If substantive differences exist between the intent of the Guideline and actual practice, management should evaluate current practice to determine the need to include/exclude proposed features. A change to maintenance practice would be appropriate if a performance weakness was determined to exist. Development, documentation, and implementation of other features which further enhance these guidelines for specific applications, is encouraged.

Additional information pertinent to the implementation of this guideline may be found in the following Guidelines:

1) DOE-STD-1050-93 *"Guidelines to Good Practices for Planning, Scheduling, and Coordinating of Maintenance Activities for DOE Nuclear Facilities"*

2) DOE-STD-1029-92 *"Writer's Guide for Technical Procedures"*

3) DOE-STD-1004-92 *"Root Cause Analysis Guidance Document"*

4) DOE-STD-1052-93 *"Guidelines to Good Practices for Types of Maintenance at DOE Nuclear Facilities"*

5) DOE-STD-1053-93 *"Guidelines to Good Practices for Control of Maintenance Activities at DOE Nuclear Facilities"*

Appendix C is provided for use by facility trainers who provide training regarding this element.

1.2 Background

The information in this guide was developed from commercial and DOE sources. Each facility should select those details that are applicable, add any unlisted knowledge or experience that are applicable, and develop and implement facility-specific maintenance management programs. Facilities that have existing maintenance history programs should review this guide to identify details that may enhance their existing programs.

1.3 Application

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

2. DEFINITIONS

2.1 **Acronyms used in this standard.** The acronyms used in this standard are defined as follows:

a. ALARA - As Low As Reasonably Achievable

b. MEL - Master Equipment List

c. MJR - Maintenance Job Request

d. SSC - Structures, Systems, and Components

2.2 **Engineering Support Personnel.** Engineering Support Personnel should be technically qualified personnel assigned to assess equipment and system performance and to recommend corrective action when necessary.

2.3 **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.

2.4 **Master Equipment List.** A detailed master list of SSC to be included in the maintenance program. The list should include both safety related and non-safety related systems and components. This list may sometimes be referred to as the master equipment data base.

3. MAINTENANCE HISTORY PROGRAM

3.1 DISCUSSION

The objective of a maintenance history program is to document SSC maintenance and performance data as a basis for improving facility reliability. This history should assist in ensuring that root causes of failures are determined and corrected, and used in future work planning. This may be accomplished by a thorough review and analysis of maintenance performed, diagnostic monitoring data and industry experience reports.

This file should be an electronic system maintained centrally with individual groups responsible for collecting data and populating the system to be an effective method for maintenance history control.

The derived database should be readily accessible in a **READ ONLY** mode facility-wide.

An example of a program that addresses these elements has been attached for your consideration.

3.2 SCOPE

An effective maintenance history program should contain the following elements:

- maintenance history file
  - component identification/description
  - maintenance record
  - diagnostic monitoring data
  - vendor correspondence
- provisions for engineering review and analysis

Note: Examples of component identification/descriptions and maintenance records are shown in Appendices A and B respectively.

3.3 RESPONSIBILITIES

Maintenance Manager

The Maintenance Manager, accountable for maintenance of the facility, is responsible for the effectiveness of this program. The Maintenance Manager should ensure that all users clearly understand this program and fully implement its intent.

3.4 GUIDELINES

3.4.1 Maintenance History File Development

The responsible manager should establish a maintenance history file for equipment listed in the Master Equipment List (MEL) for which maintenance provides support or services. If an MEL is not available, the responsible manager and the owner/operator should jointly, selectively and judiciously, define items for prioritized entry into the maintenance history files. Normally, components are grouped by system; however, in cases of like components such as valves, circuit breakers and controllers, it may be more appropriate to group components by type. The maintenance history file for each component should include the following five sections:

3.4.1.1 Component Identification and Description

Engineering Support personnel should ensure the information included in Appendix A (as a minimum) is recorded. Each component is identified by the name and number as listed in the MEL. In the case of like components grouped by type, this may be an index of all individual components and their associated systems. The description includes the manufacturer's name, model, serial number, and priority classification. Additional reference may be made to purchase order number, vendor manuals, drawings, system logic and/or flow diagrams, owner/operator cost center, acquisition data (i.e., purchase information and date accepted), applicable engineering documents, operating requirements/characteristics/history, spare parts list, owner/operator documents, and applicable maintenance procedures. In the event the component is replaced or modified, the original record should be annotated to indicate the change and remain in the file. A new record, referencing the original record, is prepared and placed in the file. Computerizing may assist in the access/use of the file.

3.4.1.2 Maintenance Record

The maintenance record is a chronological record of all significant work performed. All activities related to items selected for history retention should be deliberately and regularly recorded. The maintenance supervisor, or designee, extracts the information from the work package during the initial review of completed work and documents the as-found and as-left conditions. An example is included as Appendix B. Each entry should include the date, Maintenance Job Request number (MJR) and a clear, concise statement describing the deficiency and corrective action, with reference to postmaintenance testing results, as-found and as-left data, parts replaced or repaired, special tools used, craft-resource-hours and man-rem utilized. (Note: Where applicable, portions of this data need not be maintained in the maintenance record, provided it is cross-referenced to and easily retrievable from other record systems.) In the event the component is one of several grouped by type, the component identification is included. Similar entries are made in the event deficiencies are noted and corrective action taken when performing preventive maintenance or surveillance tests. Periodic engineering review of the history file is also recorded. A common format for information entry enhances data entry ease, user familiarity, information retrieval, and repeated application. Computerizing may assist in the access/use of the file.

3.4.1.3 Diagnostic Monitoring Data

This section should contain all performance-related information derived from baseline tests and checkout data, preventive and predictive maintenance, surveillance tests, and Postmaintenance tests. Engineering support personnel should review designated completed test documents and ensure the data is analyzed and recorded. Trending of data (e.g., vibration levels) should be employed whenever feasible to facilitate analysis.

3.4.1.4 Vendor Correspondence

This section should contain any correspondence, inspections, and test results received from the vendor which relate to routine or PM servicing, parts, changes to as-built drawings, etc. Engineering support personnel should review this information and ensure it is filed and properly applied.

3.4.2 Maintenance History Utilization

3.4.2.1 Engineering Reviews

Equipment failures should be analyzed promptly. Abnormal trends noted during diagnostic monitoring should be analyzed and corrective action recommended in a timely manner. In addition, periodic engineering reviews of the maintenance history file should be conducted in accordance with a schedule recommended by the engineering support supervisor and approved by the responsible manager. Component files should be reviewed at least every two years. The purpose of the review is to determine if recurring maintenance problems or other performance trends indicate a need for corrective maintenance. The assigned engineer should determine the probable cause and recommend a course of action. This may result in corrective maintenance, component modification or replacement, a change in the preventive or predictive maintenance schedule, or a change in a procedure. The assigned engineer should track performance after corrective action has been performed to ensure deficiencies have been corrected.

3.4.2.2 Work Planner Review

Work planners should review the maintenance history file on defective components and like components for information on similar deficiencies, performance trends, special tools involved, personnel protection requirements, cautions, warnings, and applicable hazardous aspects, to assist in preparing Maintenance Job Request (MJR) and/or work package repair instructions. The use of interactive data retrieval for like components at other facilities should be considered in this review. They should consult with engineering support on the applicability of any industry experience reports. In addition, engineering support should be advised by work planners of any persistent maintenance problems revealed during their reviews. This may be accomplished by memorandum from the work planner to the engineering support supervisor with a copy to the responsible manager or by direct contact with a follow-up memorandum.

3.4.2.3 Additional Uses of Maintenance History

The record of craft-resource-hours and materials expended to perform maintenance provides useful data for outage, ALARA, and budget planning. Schedules may be developed based on actual craft-resource-hours expended for past tasks that more realistically define the outage end point. More accurate estimates of hazard exposure may also be made based on experienced levels. Maintenance costs may be accurately projected based on actual craft-resource-hours and materials used in performance of maintenance.

APPENDIX A
EXAMPLE COMPONENT IDENTIFICATION AND DESCRIPTION

APPENDIX A

Example Component Identification and Description

SAFETY INJECTION PUMP #1

PEI #SI 19724
Class I
CP
Purchase Order AC-4286316
Vendor Man. Vol. II - Bingham Pump
390162
Flow Diagram AL 480526, Safety Injection

Bingham Pump
Model 4 X 6 X 9-

Serial #14 SA 479
Eng. Drawing E6-

Procedures

MA-4.1924, Safety Injection Pump Disassembly
MA-4.1925, Safety Injection Pump Assembly
MA-4.1926, Safety lnjection Pump Seal Replacement
SP-6.2163, Safety Injection Pump Performance Test - Monthly
PM-5.1372, Safety Injection Pump Inspection - Quarterly
PM-5.3916, Safety Injection Pump Inspection - Annual

NOTE: 8 1/2 " x 11" cards are recommended when manual recording is used.

APPENDIX B
EXAMPLE MAINTENANCE RECORD

APPENDIX B

Maintenance Record

SAFETY INJECTION PUMP #1

06-12-78 M.J.R. 49731 Inboard seal excessive leakage. Removed and inspected seal; excessive wear. Cleaned and inspected shaft. Installed new seal, part #187421. Conducted SP-6.2163; perform SAT. Total craft-resource-hours expended 80.

11-15-79 M.J.R. 51874 Modified first stage impeller retaining nut staking as per Bingham instructions 6-15-79. Internals cleaned and inspected-SAT. Assembled and realigned. Conducted SP-6.2163; perform, SAT. Total craft-resource-hours expended 50.

01-12-80 Reviewed maintenance history file - no problems noted.

NOTE: 8 1/2" x 11" cards are recommended when manual recording is used.

APPENDIX C
MAINTENANCE HISTORY PROGRAM

SAMPLE LESSON PLAN

APPENDIX C

MAINTENANCE HISTORY PROGRAM

LESSON PLAN

1. The instructor should be familiar with the following background information:

   a. A maintenance history program supplies vital information to support root cause analysis and the preventive maintenance requirements for facility equipment and systems. This program receives its information from completed corrective maintenance actions, logbook and record keeping systems, and predictive maintenance analysis.

   b. This program should clearly define:

      - the site process systems and equipment to be included,
      - information collection requirements,
      - data recording requirements, and
      - a system for data distribution and use.

2. To teach this lesson, the following training housekeeping items are required:

   a. Location for the training,

   b. Approximately 30 minute time period for the training,

   c. Notification of selected employees, and

   d. A copy of the facility's procedure or policy for a maintenance history program.

3. This lesson has the following trainee enabling objective:

   Define the function of a maintenance history program.

4. A maintenance history program is the data Source for information to make changes to equipment maintenance and ultimately its performance. This program receives its information from completed corrective maintenance actions, logbook and record keeping systems, and predictive maintenance analysis. Some criteria for a maintenance history program includes the following:

   a. The program should clearly define and identify the systems and equipment that require documentation and retention of historical data. This assignment should be based on a graded-approach. Also, equipment requiring repetitive maintenance should be included in the history program.

   b. Data collected should Include:

      - details of work performed,
      - special equipment and tools used,
      - procedures or drawings needed,
      - spare parts installed,
      - personnel safety and radiation protection requirements, and
      - other designated useful information.

   c. Planners, coordinators, field supervisors, and craftspersons should use maintenance history regularly as a planning tool. Some uses of maintenance history data are as follows:

      - support data needs for equipment failure analysis,
      - input for assessments of maintenance improvement programs,
      - data support for adjustments to the preventive maintenance program,
      - planning for postmaintenance testing,
      - for budget preparation, and
      - to enhance equipment life extension programs.

5. Discuss with the trainees the maintenance history program.

CONCLUDING MATERIAL

Review Activity:

DOE
FM
DP
EH
EM
ER
NE
NS
RW

Field Offices
AL
CH
ID
NV
OR
RL
SR
OAK
RF

Area Offices
Amarillo
Brookhaven
Fernald
Kansas City
Kirtlant
Princeton

Facilities
ANL
KC AlliedSignal
NBL
LBL
LANL
LLNL
ORAU
PANTEX M&H
PNL
PPPL
RF-EG&G
SNL
NV REECo.
NV EG&G
OR OSTI
WHC
ID-EG&G
RF
SLAC
WSRC

Preparing Activity:

DOE-EH-63

Project Number:

MNTY-0014