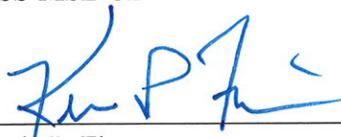


CRITERION 101

O&M CRITERION WRITER'S GUIDE

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RECORD OF REVISIONS

Revision No.	Date	Description
0	08/27/98	Initial Issue
1	03/01/00	This revision reflects the conversion from a WordPerfect document into a Microsoft Word document and additional clarification of how to develop criteria.
2	03/06/01	This revision includes <ul style="list-style-type: none"> • The addition of a Table of Contents, • The use of Basis Statements in Sections 6, 7, and 9, • References to “Lessons Learned” in Section 6, “Requirements,” • Revision to Section 9, “Required Documents,” and • Further clarification in the use of references.
3	01/09/02	Incorporation of comment and rewording requested by the Maintenance Subcommittee.
	04/03/02	Changes to Section 4.0 to address O& M Criterion written by groups other than MSS-MSE
	07/12/02	Editorial Change to Section 4.3.2
4	6/25/03	Change to reflect Division Reorganization, new group of MSS-MSE, and positions. Change all reference to DOE O 4330.4B with the replacement DOE Order - DOE O 433.1. Minor editorial formatting changes for uniformity. Addition of Authority Having Jurisdiction in Section 4.0 Responsibilities.
5	4/30/07	This revision incorporates organizational changes, reference updates, and document revision reference updates.

CRITERION 101

O&M CRITERION WRITER'S GUIDE

This document is designed to provide a standard document format and style guide for use in developing the Operations and Maintenance (O&M) Criterion for Structures, Systems, and Components (SSCs) as required by IMP 951-1,, *LANL Conduct of Maintenance Manual* (Ref. 10.X)

NOTE: Reference numbers imbedded in the document shall correspond with the reference number in Section 10.

The format and examples of the type of technical content that shall be adhered to by all organizations in the development of assigned Criterion is defined below.

Guidance on how to develop each section of the Criterion is provided with examples provided within each section after the guidance. Examples appear just as they would in an actual Criterion (i.e., font, paragraph numbering, style, etc.).

WRITER'S GUIDANCE BEGINS ON NEXT PAGE

RECORD OF REVISIONS

Revision numbering begins with 0 (Original document) and then proceeds numerically (e.g., 1, 2, etc.) for each revision.

The revision date shall be recorded in the “Date column.”

Under “Description” include range of dates for the entry, if applicable. For additional revisions, include pertinent information describing why the document was revised.

Example - Record of Revisions

Revision No.	Date	Description
0	03/07/00	Initial Issue – Incorporates a review of ORPS & NRC lessons learned from 1/1/95 to 2/1/2000.
1	11/14/00	Added requirement 7.2.4 and reviewed Lessons Learned from 2/00 to 10/00 for additional relevant information.

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Figures

When generating a list of figures in a document, number them sequentially within a section (e.g., Figure 6-1, Figure 6-2, etc. for figures in Section 6) and place the title at the bottom of the figure.

Example – List of Figures:

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Tables

When generating a list of tables in a document, number them sequentially within a section (e.g., Table 6-1, Table 6-2, etc. for tables in Section 6, and place the title at the top of the table.

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This page **shall be deleted** if there are no figures and/or tables in the O&M Criterion.

CRITERION XXX**(THE CRITERION NUMBER WILL ALWAYS BE A THREE DIGIT NUMBER)****TITLE****(CENTER THE TITLE OF THE CRITERION)****1.0 PURPOSE**

This section should clearly and concisely state the purpose of the criteria and why it has been issued. Additional information to clarify any special aspects regarding the specific need for the document and its implementation at Los Alamos National Laboratory (LANL) may be included.

In all cases, include the following statement:

This document addresses the requirements of IMP 951-1 *LANL Conduct of Maintenance Manual*.(Ref.10.X)

Implementation of this Criterion satisfies the requirements of DOE Order 430.1B *Real Property Asset Management*, (Ref 10.X) Attachment 2 "Contractor Requirements Document," Paragraph 2, Sections A through C, which in part requires LANL to "...maintain physical assets in a condition suitable for their intended purpose," and employ "preventive, predictive, and corrective maintenance to ensure physical asset availability for planned use and/or proper disposition." Compliance with DOE Order 430.1B is required by the LANL Contract.

Example - Purpose:

The purpose of this Criterion is to establish the minimum requirements and best practices for operation and maintenance of Electrical Motors ranging from 5 Hp. to 200 Hp. at LANL.

This document addresses the requirements of IMP 951-1 *LANL Conduct of Maintenance Manual*. (Ref. 10.X)

Implementation of this Criterion satisfies the requirements of DOE Order 433.1B *Real Property Asset Management*, (Ref. 10.X) Attachment 2 "Contractor Requirements Document," Paragraph 2, Sections A through C, which in part requires LANL to "...maintain physical assets in a condition suitable for their intended purpose," and employ "preventive, predictive, and corrective maintenance to ensure physical asset availability for planned use and/or proper disposition." Compliance with DOE Order 430.1B is required by the LANL Contract.

2.0 SCOPE

Provide a concise description of the types of activities, facilities, systems, or equipment to which this document applies. Where applicable, state in this section what size and type of equipment, facility, and applicability to real property and/or programmatic Structures, Systems, and Components (SSCs) that are within the scope of this Criterion. To ensure clarity, the author may also specify SSCs that fall outside the scope of this Criterion.

The author must set the boundaries of the document. Review related criterion scope sections to determine if they may include parts of a system that would fall under the criterion currently being developed. For example, filters, motors, and refrigeration systems do not need to be covered in the Air Handling System criterion; however, it is helpful to refer the reader to them. When in doubt as to where something is to be covered, contact the criterion author or the MSS-MSE Group Leader for clarification.

Example - Scope:

The scope of this Criterion includes the routine inspection, testing and preventive and predictive maintenance of Electrical Motors with horsepower ratings from 2 Hp to 200 Hp, single phase and three-phase power source, all frame types, at all nuclear and non-nuclear LANL facilities. Lubrication is not addressed; see Criterion 427, *Lubrication*. This Criterion does not address corrective maintenance actions required to repair or replace equipment.

3.0 ACRONYMS AND DEFINITIONS

3.1 Acronyms

Alphabetically list all acronyms used in the body of the Criterion or state that “Acronyms are defined in their first use.”

Example – Acronym List:

AHJ	Authority Having Jurisdiction
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
CFR	Code of Federal Regulations
ISD	Implementation Support Document
LPS	Lightning Protection System
MM	Maintenance Manager
O&M	Operations and Maintenance

3.2 Definitions

Define any terms, in alphabetical order, that are used in the criterion that may not be obvious to the reader or may be subject to interpretation. For terms that are not unique to the Criterion, but need to be restated, reference the original source of the definition in detail.

Example – List of Definitions:

Air Terminal. A strike termination device that is essentially a point receptor for attachment of flashes to the lightning protection system and is listed for the purpose. Typical air terminals are formed of a tube or solid rod. Air terminals are some times called lightning rods. Definition per NFPA 780. (Ref. 10.X)

Insulation Resistance Test (meggering). A test for measuring the electrical resistance between two conductors separated by an insulating material. (McGraw-Hill Dictionary of Scientific and Technical Terms 5th Edition).

4.0 RESPONSIBILITIES

Clearly define the responsibilities associated with implementing and maintaining the subject Criterion alphabetically. Include responsibilities for MSS-MSE, the SME organization (if different from MSS-MSE), the Maintenance Manager, Group Leaders, and others as applicable.

When the Criterion is authored by MSS-MSE or an SME, include the following statement of responsibility:

MSS-MSE is responsible for the technical content of this Criterion, monitoring the applicability and the implementation status of this Criterion, and either assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating their concerns to the director(s).

Basis: ISD 951-1, *LANL Conduct of Maintenance Manual*, Section 2, Roles, Responsibilities, Authorities, and Accountability. (Ref. 10.X)

MSS-MSE shall provide technical assistance to support implementation of this Criterion.

Criteria authored by organizations other than MSS-MSE shall include the following statement of responsibility:

MSS-MSE is responsible for the administrative content of this Criterion, monitoring the applicability and the implementation status of this Criterion, and either assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating their concerns to the director(s).

Basis: ISD 951-1, *LANL Conduct of Maintenance Manual*, Section 2, Roles, Responsibilities, Authorities, and Accountability. (Ref. 10.X)

MSS-MSE shall provide technical assistance to support implementation of this Criterion.

Criteria could include the specific Authority Having Jurisdiction (AHJ) position and shall include the following statement defining the AHJ:

The AHJ is responsible for providing a decision on a specific technical question regarding this criterion.

Example – Responsibilities List:

4.1 MSS- Maintenance Support and Engineering (MSE)

MSS-MSE is responsible for the technical content of this Criterion and monitoring the applicability and the implementation status of this Criteria and either assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating their concerns to the director(s).

Basis: ISD 951-1, *LANL Conduct of Maintenance Manual*, Section 2, Roles, Responsibilities, Authorities, and Accountability. (Ref. 10.X)

MSS-MSE shall provide technical assistance to support implementation of this Criterion.

4.2 Maintenance Manager

The Maintenance Manager (MM) is responsible for the overall maintenance of facilities. The MM is operationally responsible to ensure that functionality of the systems and equipment is maintained and achieve optimum availability from the Real Property of Installed Equipment (RP&IE) associated within assigned facilities.

The MM also acts as a deployed arm of Maintenance and Site Services Division (MSS) monitoring and contributing to the management of institutional maintenance issues and in overseeing subcontracted and/or in-house facility maintenance services.

Basis: IMP 313.2, *Roles, Responsibilities, Authorities, and Accountability*. (Ref. 10.X)

4.3 Authority Having Jurisdiction (AHJ) – Point of Contact for (State Chapter) of the LANL Engineering Manual

The AHJ is responsible for providing a decision on a specific technical question regarding the systems or equipment relevant to this criterion.

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Precautions

List any unique precautions that may be required to ensure the safety of personnel, the environment, or equipment unique to the Criterion being discussed. If an existing LANL document, (i.e., AP, IP, IMP, or ISD), specifically addresses the hardware-related safety concerns (i.e., not general program information) for the process under discussion, reference it in this section (refer the reader to the document, do not restate its content).

It is important to note that the intent of this section is not to restate all applicable precautions (the existing LANL work control and safe work practice programs are intended to identify all applicable hazards). Only list those unique precautions requiring special attention in this section.

Example - Precaution:

Precautions

This section is not intended to identify all applicable precautions necessary for implementation of this Criterion. A compilation of all applicable precautions shall be contained in the implementing procedure(s) or work control authorization documents. The following precautions are intended only to assist the author of a procedure or work control document in the identification of hazards and precautions that may not be immediately obvious.

NOTE: The above paragraph should appear in all O&M Criterion.

Example - Precaution:

Ensure electric motor units are electrically grounded and electrical installation wiring and controls are used consistent with NEC and NFPA electrical code requirements. (NEC Article 430 and 250)

5.2 Limitations

Identify any unique limitations associated with this Criterion. Note that limitations in applicability should be placed in Section 2.0, Scope, not in this section.

Example - Limitation:

LIMITATIONS

The intent of this Criterion is to identify the minimum requirements and recommendations for SSC operation and maintenance across the Laboratory. Each user is responsible for the identification and implementation of additional facility specific requirements and recommendations based on their authorization basis and unique equipment and conditions, (e.g., equipment history, manufacturer warranties, operating environment, vendor O&M requirements and guidance, etc.).

Nuclear facilities and moderate to high hazard non-nuclear facilities will typically have additional facility-specific requirements beyond those presented in this Criterion. Nuclear facilities should implement the requirements of DOE Order 433.1 (Ref. 10.X) as the minimum programmatic requirements for a maintenance program. Additional requirements and recommendations for SSC operation and maintenance may be necessary to fully comply with the current DOE Order or the Code of Federal Regulations (CFR) identified above.

Nuclear facilities and certain high hazard facilities (e.g. high explosive operations) may have additional facility specific requirements beyond those presented in this Criterion which are contained in the Safety Analysis Report (SAR), Technical Safety Requirements (TSR), or facility safety plans, as applicable.

NOTE: The above three paragraphs should appear in ALL O&M Criterion.

6.0 REQUIREMENTS

Clearly state what minimum requirements the Criterion users have to meet. In this section concisely state what minimum O&M related activities are required for the subject equipment / system. Required activities must be driven by either:

1. **DOE Orders, codes or standards committed to in the LANL Contract.** Perform a thorough search of applicable documents committed to in the LANL Contract to identify those O&M requirements that the Laboratory must meet to satisfy the Contract. A search of these documents is required in the development of each Criterion. Each Criterion shall clearly define or describe the specific requirements for the equipment or process covered.
2. **Formal commitments made to the DOE or other regulatory agencies.** Identify and review any additional formal commitment made to the DOE or other regulatory agencies. These commitments may be found in communications between LANL organizations and DOE, DNFSB, EPA, the State of

New Mexico, and others. Requirements that are adopted as a result of commitments made to the DOE, or other regulatory bodies, as a result of such items as inspections, audits, or accident investigations shall be listed.

- 3. Operating experience, the DOE/LANL Lessons Learned program, and/or good engineering practices.** Operating experience, Lessons Learned, and engineering judgment should also be researched for additional requirements that the institution deems appropriate. Lessons Learned reports should be researched back 5 years from the date that the Criterion is being developed or revised. Lessons Learned data is available through the DOE Occurrence Reporting Program and its data system, the Occurrence Reporting and Processing Systems (ORPS) located at the following web address: www.eh.doe.gov/web/ocaf/orps/orps.html. A copy of ORPS reports researched by the Criterion author shall be provided in the project file (to be maintained by MSS-MSE). Professional operating experience, engineering judgment, manufacturer's recommendations and requirements, and system/equipment historical analysis form a basis for a requirement when the implementation of the requirement is proven to enhance safety, increase longevity of the SSC, insure availability for intended service or positively impact cost of maintenance and/or operations. The author must be capable of defending the requirement and the basis. Analysis results, a statement of the operating experience basis and research documentation shall be provided and kept in the project file.

In development of the Criterion, internal Laboratory requirements should be referred to but not restated. However, the requirements may be restated when taken from DOE Orders, codes, standards, Lessons Learned information, LANL communications, etc. that are not readily available to the user. Where this is not possible, a summary or paraphrase of the requirement may be provided.

A "basis" statement shall be provided after each requirement listed. The basis statement shall clearly list the source document, where applicable (see IMP 951-1, *LANL Conduct of Maintenance Manual* for other commitments including reference number, revision, section and/or page number) (Ref. 10.X) and if appropriate, the driver for the document. If the basis is the author's judgment, manufacturer requirements, or operational experience, a justification shall be provided. In no case shall the phrase "engineering judgment" be used as a stand-alone basis. The author shall include (succinctly, in less than one paragraph, preferably in a sentence or two) a defensible justification describing why the subject requirement is necessary. Bear in mind the contractual requirements to sustain the SSCs for intended and planned use when formulating the basis statements. Section 6.1 shall always be "Operations Requirements" and Section 6.2 shall always be "Maintenance Requirements." When there are no requirements identified in a given subsection, simply state "No requirements beyond those stated in section 5.2, Limitations."

NOTE: In all cases, include the following statement immediately after the Section 6.0 heading:

Minimum requirements that Criterion users shall follow are specified in this section. Requested variances to these requirements shall be prepared and submitted to MSS-MSE in accordance with IMP 951-1, *LANL Conduct of Maintenance Manual* for review and approval. The Criterion users are responsible for analysis of operational performance and SSC replacement or refurbishment based on this analysis. Laws, codes, contractual requirements, engineering judgment, safety matters, and operations and maintenance experience drive the requirements contained in this section

Example - Requirements:**REQUIREMENTS**

Minimum requirements that Criterion users shall follow are specified in this section. Requested variances to these requirements shall be prepared and submitted to MSS-MSE in accordance with IMP 951-1, *LANL Conduct of Maintenance Manual*, for review and approval. The Criterion users are responsible for analysis of operational performance and SSC replacement or refurbishment based on this analysis. Laws, codes, contractual requirements, engineering judgment, safety matters, and operations and maintenance experience drive the requirements contained in this section.

6.1 Operations Requirements

List all operations-related requirements that shall be followed. Examples of potential requirements include special qualification or certification requirements for operators. The author is strongly encouraged to grade requirements based on Management Level (ML) (Ref. ISD 341-1.2, *Engineering Processes Manual*). (Ref. 10.X) The author may divide these requirements into subsections, as appropriate.

Example – Operations Requirements:**Operations Requirements**

Inspect the floor area directly under the door and on the sides for tripping hazards that may create hazards to personnel. Inspect the areas affected by the operation of the door for obstructions that may interfere with normal operation of the door. These inspections should be performed every time the door is opened or closed.

NOTE: Documentation supporting execution of this requirement may be required for ML-1 and ML-2 door systems or as defined by the facility Authorization Basis (AB). As a minimum, personnel that operate roll-up / overhead doors shall be able to demonstrate knowledge of this requirement.

Basis: These inspections are required to assure personnel safety and are based, in part, on DOE Lessons Learned ALO-LA-FIRNGHELAB-1995-0002 (Ref. 10.X). Wear of obsolete floor guides and other surrounding structures may become damaged and cause personnel injuries. Obstructions that may interfere with the normal operation of the door may cause personnel injury or damage to the door. This inspection should be performed every time the door is opened or closed.

Point-to-point testing of all zones of a Fire Alarm Control Panel shall be performed as post-maintenance verification of the operability of the system

Basis: NFPA 72-7-3.21(1) (Ref. 10.X). Compliance with NFPA code is required per the LANL Contract. ¹¹

6.2 Maintenance Requirements

List all maintenance-related requirements that shall be followed. Examples of potential requirements include the following:

- Special qualification or certification requirements for personnel doing preventive maintenance activities.
- Preventive maintenance activities by frequency or type (including inspections, lubrications, routine part replacements, calibrations, functional tests, predictive maintenance, and surveillance's).

The author is strongly encouraged to grade requirements based on the Management Level (ML). The author may divide these requirements into subsections as deemed appropriate. These subsections can be organized by maintenance frequency or equipment / component type, or any combination of the two. It is acceptable to organize this section to level 5 subsections, if necessary. When itemizing requirements, use an alphabetical list rather than bullets. A basis statement shall be used for each numbered section and address any lettered lists within the section. Each item on a lettered list does not require a separate basis statement if the basis for all the elements on the list is the same. Basis statements can be combined to address several items on the list. The use of tables in this section is encouraged.

Example – Maintenance Requirements:

Maintenance Requirements

Semi-Annual Intervals

Visually inspect critical welds between the curtain or panel support shaft and end-plates for damage or cracking.

Basis: This inspection is required to assure personnel safety and is based on DOE Lessons Learned ALO-LS-LANL-PHYSCOMPLX-1997-0003 (Ref. 10.X). Damaged welds can lead to failure and allow the door to fall uncontrollably. Several DOE locations have experienced near-miss accidents that could have been prevented by performing this inspection.

Inspect labels on the door control switches. Verify that the labels provide clear guidance for the operation of the door and cannot be confused with other equipment in close proximity to the operating door such as a dock leveler.

Basis: This inspection is required to ensure personnel safety and is based on Lessons Learned 1998-LA-LANL-ESH7-0009 (Ref. 10.5) and vendor instruction, e.g., Overhead Door Company; Recommended Preventive Maintenance – Rolling Doors 1994 (Ref. 10.X).

Example – Maintenance Requirements:

Freeze protection systems shall be inspected and verified to be fully operational and placed in service not later than 15 October of each year.

Basis: Operating experience at LANL has shown that early cold snaps are frequent and often result in significant facility and system damage as a result of inoperable freeze protection.

Example – Maintenance Requirements:

Check the sensitivity of each smoke detector within 1 year of installation and every 2 years thereafter in accordance with manufacturer's instructions. Use only manufacturer approved equipment to conduct tests.

Basis: NFPA 72-7-2.2 (Ref. 10.X). Compliance with this NFPA code is required per the LANL contract.

7.0 RECOMMENDATIONS AND GOOD PRACTICES

Clearly state in this section what the in-scope Criterion user should consider in the development of the O&M program. State concisely what O&M related activities are recommended for the subject equipment / system. Recommended activities shall be driven by either:

1. **Industry standards and practices.** Review generally accepted industry standards and guidelines to identify best practices in operations and maintenance for the subject SSCs.
2. **Industry codes and standards.** Review accepted industry codes to identify code recommendations for operations and maintenance for the subject SSCs.
3. **Manufacturer's recommendations.** The primary guide to maintenance and operational requirements can be obtained from the manufacturer of the structure, system, or component. These manufacturer recommendations should be used when the failure to perform the recommended actions could void the manufacturer's warranty or it is demonstrated that failure to perform the maintenance / operations actions could cause the SSC to fail to meet the requirement to be "available for intended use."
4. **Operating experience, the DOE/LANL Lessons Learned program, and/or engineering judgment.** Operating experience, Lessons Learned, and engineering judgment should also be researched and applied for additional recommendations. Lessons Learned reports should be researched back 5 years from the date that the Criterion is being developed or revised. Lessons Learned data is available through the DOE Occurrence Reporting Program and its data system, the Occurrence Reporting and Processing Systems (ORPS) located at the following web address:

www.eh.doe.gov/web/oeaf/orps/orps.html. A copy of all ORPS reports researched by the Criterion author shall be provided and kept in the project file (to be maintained by MSS-MSE).

A “basis” statement shall be provided after each recommendation listed. The basis statement shall clearly list the source document (including reference number, revision, section and/or page number) and if appropriate, the driver for the document. If the basis is the author’s judgment, manufacturer recommendations, or operational experience, a justification shall be provided. In no case shall the phrase “engineering judgment” be used as a stand-alone basis, the author shall include (succinctly, in less than one paragraph) a defensible justification describing why the subject recommendation has been made. Manufacturer recommendations form the basis for LANL recommendations when the failure to perform the recommended actions will void the manufacturer’s warranty or it is demonstrated that failure to perform the maintenance / operations actions will cause the SSC to fail to meet the requirement to be “available for intended use.”

Section 7.1 shall be “Operations Recommendations” and Section 7.2 shall be “Maintenance Recommendations.” When there are no recommendations identified in a given subsection, simply state “No recommendations beyond those stated in Section 5.2, Limitations.”

Example – Recommendations and Good Practices:

7.0 RECOMMENDATIONS AND GOOD PRACTICES

The information provided in this section is recommended based on acceptable industry practices and should be implemented by each user based on the unique application and operating history of the subject systems / equipment.

NOTE: The above paragraph should appear in ALL O&M Criterion.

Example – Operations Recommendations:

7.1 Operations Recommendations

Motors are designed to operate at or below any maximum surface temperature stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a hazardous area, this excessive temperature may cause ignition of hazardous materials. Operating motors at any of the following conditions can cause nameplate temperatures to be exceeded:

- A. Motor load exceeding service factor value
- B. Ambient temperatures above nameplate value
- C. Voltages above or below nameplate value
- D. Unbalanced voltages
- E. Loss of proper ventilation
- F. Variable frequency operation
- G. Altitude above 3000 ft.
- H. Severe duty cycles – repeated starts
- I. Motor stalls, motor reversing, or single phase operation

Basis: Recommendations provided by DOE Motor Challenge Program (Ref. 10.X).

Example – Maintenance Recommendations:

7.2 Maintenance Recommendations

Careful and regular maintenance and inspections are required to detect and clear any faults as early as possible before major damage can develop. Only general inspection intervals for trouble-free operation can be recommended because of the widely differing operating conditions. The inspection intervals shall therefore be matched to the prevailing circumstances (dirt, deposits, frequent starts, loading, temperature, etc.). Special information provided by motor manufactures must also be followed. The following Maintenance Recommended Frequency Matrix is provided as a general guide.

Table 7-1 Recommendations Frequency Matrix			
Chart Legend	I = Inspect, T = Test, M = Monitor, P = Perform		
	Qtr (3mo)	6 mo	1yr
COMPONENT - MOTOR			
<i>Monitor of Operating Conditions</i>			
Power			T
Power Factor			T
<i>Monitor Thermal, Vibration, Acoustics</i>			
Thermographic/Temperature Assessments			M
Vibration Monitoring			M
Acoustics			M
<i>Electrical Motors in Storage</i>			
Lubrication			P
Start/Run (when available)	P		
Shaft Rotations	P		

Basis: See basis statement in Section 7.1.

8.0 GUIDANCE

This section provides guidance on how to implement the requirements and recommendations delineated in Sections 6.0 and 7.0 above. The intent here is to provide guidance to the Criterion user for the development and implementation of the program and to prevent each FOD/user from starting over each time for acceptable program development and implementation.

Where possible, the guidance should track to the section numbers for each respective Requirement or Recommendation. For example, guidance on how to implement Requirement 6.2 should be provided in Section 8.2. Where no guidance is provided for a specific section or statement, simply state: “No implementing guidance is available.”

As a minimum (and if available), reference implementing LANL operations/maintenance procedures or job standards by number and title that have been reviewed and approved by MSS-MSE that meet the expectations of the Criterion. In the majority of cases, MSS-MSE has lead responsibility for these implementing procedures. For each reference to an existing LANL procedure, include the following pre-fix statement:

“Provided it has been reviewed and approved by MSS-MSE...”

Identify and discuss any preferred methods or techniques that should be used in implementing the requirements and recommendations. Where applicable, list additional technical reports, white papers, Lessons-Learned, Energy Facility Contractors Group (EFCOG) presentations, etc. that would be helpful to the user.

Example – Operations Guidance:

8.1 Operations Guidance

Provided it has been reviewed and approved by MSS-MSE, an acceptable program for crane operator qualification may be found in MST procedure MST-123, "Crane Operator Qualification and Certification."

Example – Maintenance Guidance:

8.2 Maintenance Guidance

A discussion of water chemistry issues unique to northern New Mexico and how to best develop and apply chemical addition is provided in Attachment A, "Water Chemistry Issues Unique to Northern New Mexico."

Example – Maintenance Guidance:

KSL PMI 40-40-001, *Air Conditioning and Refrigeration Systems* provides guidance for chiller maintenance programs.

9.0 REQUIRED DOCUMENTATION

Clearly define SSC-specific documentation that is required to comply with; DOE Orders, codes, or standards committed to in the LANL Contract; Formal commitments made to the DOE; other regulatory agencies; defensible operating experience; the DOE/LANL Lessons Learned program; and/or defensible engineering judgment. The author shall provide samples of the required documentation as an Appendix to the subject criteria when specific formats are required.

Identify any required documentation of data, the types of required documentation, content, format necessary to maintain auditable records for all maintenance, repairs, tests, and inspections and the basis for taking the data. If none is required, simply state "None required."

A "basis" statement shall be provided after each requirement listed. The basis statement shall clearly list the source document, where applicable (see IMP 951-1, *LANL Conduct of Maintenance Manual*, for other commitments, including reference number, revision, section

and/or page number) and if appropriate, the driver for the document. If the basis is the author’s judgment, manufacturer requirements, or operational experience, a justification shall be provided. In no case shall the phrase “engineering judgment” be used as a stand-alone basis, the author shall include (succinctly, in less than one paragraph, preferably in a sentence or two) a defensible justification describing why the subject requirement is necessary. Maintenance history shall be maintained for all maintenance activities performed on structures, systems or components addressed by this document as required by AP-MNT-010, *Maintenance History* (Ref 10.X). The procedure states, in Section 2.1:

“A maintenance history and trending program will be maintained to document data, provide historical information (maintenance planning), and support maintenance and performance trending of SSCs.”

Example – Required Documentation:

REQUIRED DOCUMENTATION

Maintenance history shall be maintained for electric motors to include, as a minimum, the parameters listed in the following table:

Table 9-1 Documentation Parameters

MAINTENANCE HISTORY DOCUMENTATION PARAMETERS				
PARAMETER	ML 1	ML 2	ML 3	ML 4
Maintenance Activities				
Repair / Adjustments	X	X	X	X
Motor Replacement	X	X	X	X
Lubrication Evolutions	X	X	X	
Equipment Problems				
Failure Dates	X	X	X	
Failure Root Cause	X	X	X	
Inspection Results				
Inboard Bearing Temperature	X	X		
Outboard Bearing Temperature	X	X		
Vibration Analysis Data	X	X		
Leg Voltage	X			
Start-Up Current per Leg	X			

Basis: Documentation of the parameters listed in Table 9-1 above satisfies the requirements of AP-MNT-010, *Maintenance History*. (Ref. 10.X)

10.0 REFERENCES

List all documents that are directly noted in the body of the Criterion. Do not include a blanket listing of additional references that were not directly referenced in the body of the Criterion. Include dates and/or revision numbers in references.

Example – Reference List:

REFERENCES

The following references, and associated revisions, were used in the development of this document.

- 10.1 IMP 951-1, *LANL Conduct of Maintenance Manual*.
- 10.2 DOE O 430.1B, *Real Property Asset Management*.
- 10.3 DOE Order 433.1, *Maintenance Management Program for DOE Nuclear Facilities*.
- 10.4 OSHA 1910.212, *Occupational Safety & Health Administration* “General Requirements for all machines,” subpart title, “Machinery and Machine Guarding.”
- 10.5 AP-MNT-010, *Maintenance History*.

11.0 APPENDICES

List any additional appendices in this section that are referenced in the body of the Criterion. Appendices may be used to include such items as recommended data sheet formats/forms, special instructions, excerpts of requirements/codes/laws, recommended maintenance program, or any other supplemental information, which will aid in the implementation of the Criterion.

Example – Appendix List:

- Appendix A, Reliance Proper Motor Lubrication White Paper – B5021
- Appendix B, Reliance RPM AC Finned Frame Inverter Duty Motor Data Sheet

Example – Appendix A:**APPENDIX A****RELIANCE PROPER MOTOR LUBRICATION WHITE PAPER – B-5021****White Paper:****AC Motors****Proper Motor Lubrication**

|Open Bearing | Sealed Bearing | Shielded Bearing | Lubrication Techniques | Over-greasing |

The service life of most motors is dependent on a little bit of good grease at the right times. This report discusses the pros and cons of different types of bearings, under-or-over-lubrication problems, and proper lubrication techniques.

Most motor failures are related to bearing failures. However, most bearing failures are not the result of bearing fatigue but improper lubrication. Bearing fatigue life calculations are commonly referred to as L-10 life (previously B-10). These calculations, expressed in thousands of hours of bearing life, give a good indication if a specific bearing can handle a specific load; but they cannot and should not be used to predict bearing life. Why? Because it all comes back to taking care of that bearing with good lubrication practice.

Before we can discuss good lubrication practices we need to understand the basic types of bearings that motor manufacturers generally use, along with their advantages and disadvantages.

[Intermediate pages deleted for this guide example]