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DOE STANDARD

WRITER'S GUIDE FOR TECHNICAL PROCEDURES

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

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DISCLAIMER

Writer's Guide for Technical Procedures

Page / Section	Change
p. 1 / Introduction / third paragraph	The reference to DOE Order 5480.5, *Safety of Nuclear Facilities*, was removed.
p. 58 / Development References	The reference to DOE Order 5480.5, *Safety of Nuclear Facilities*, was removed.
p. 58 / Development References	The reference to NUREG/CR-1369, *Procedures Evaluation Checklist for Maintenance, Test, and Calibration Procedures,* was updated to NUREG-CR-1369-Rev.1.
p. 58 / Development References	The reference to NUREG/CR-2005, *Checklist for Evaluating Emergency Operating Procedures Used in Nuclear Power Plants,* was updated to NUREG/CR-2005-Rev.1.
p. 58 / Development References	The volume number and volume title to reference NUREG/CR-3177, *Methods for Review and Evaluation of Emergency Procedures Guidelines,* were added.
p. C-4	The definition for "task" was updated.
p. C-4	The definition for "task analysis" was updated.
p. C-5	The definition for "technical safety requirements (TSR)" was updated.
Concluding Material	The Preparing Activity was changed from EG&G, ID to EH-31.

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Revision Log

Revision Number	Date Approved	Pages Affected	Description of Revision
0	December 1992	All	Initial Issue
See Change Notice No. 1, December 1998			

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Foreword

This *Writer's Guide for Technical Procedures* replaces Revision 0 of DOE/NE SP-0001T, DOE Standard (For Trial Use), *Writer's Guide for Technical Procedures*, issued in September 1991. The substantive changes between Revision 0 and this document involve format and language.

This document has been formatted as a handbook rather than as a procedure. That is, the way in which this writer's guide is formatted is no longer intended to be an example of procedure formatting (as Revision 0 was). Examples are now set off more clearly from the text, lettered lists have been replaced by bulleted lists, and more font sizes and styles have been used for separation and delineation.

Editorial changes were made to clarify and simplify the language used to present the guidance in this document. Also changed were some minor corrections and consistency issues identified during the review and comment period on Revision 0. Finally, a sample procedure is included (as Appendix B) in this document to assist users in implementing the guidance into their procedures.

The following members of the DOE Procedures Standards Committee contributed to the development of this document.

Robert M. Waters, DOE, NE-74
Maggie H. Sturdivant, DOE, NS-10

Susan G. Hill, INEL, EG&G Idaho
James C. Byers, INEL, EG&G Idaho
Wendy J. Reece, INEL, EG&G Idaho
Henry A. Romero, INEL, EG&G Idaho

Valerie E. Barnes, Battelle HARC
Douglas R. Wieringa, Battelle HARC
Christopher J. Moore, Battelle HARC

Karen J. Krasner, Battelle PNL
Daniel T. Donohoo, Battelle PNL

Robert W. Holloran, DocuStructure Corp. (ONS)

Dennis L. Dole, EG&G Rocky Flats
Terry Mountain, independent consultant, (EG&G Rocky Flats)
Robert McKay, Tenera Corp. (EG&G Rocky Flats)

Janice E. Baker, LANL
Hillard H. Howard, LANL

Jeffrey S. Paris, MMES
Joyce A. Sylvester, MMES
Frank J. Kocsis, MMES Paducah
John McCormick, MMES Portsmouth

Daniel L. Plung, WSRC
Kevin J. Schmidt, WSRC
Thomas E. Walsh, WSRC

Daryl Grider, Halliburton NUS Environmental Corp.

Preface

This ***Writer's Guide for Technical Procedures*** is one of a series of documents currently being developed by the U.S. Department of Energy (DOE) to define broad requirements for procedure program management and to provide guidance for the preparation of procedures used at DOE facilities. This preface describes the intent and overall approach of the DOE's procedures program and presents a brief overview of how this writer's guide fits into the series of procedures guidance documents currently under development.

Background: The Role of Procedures in Managing Facility Operations

A primary objective throughout the DOE complex is that operations be conducted in a safe, deliberate, and controlled manner. In addition to training or day-to-day supervision, providing sound procedures and requiring workers to use them are among the most formal, direct, and effective methods available to facility managers to ensure that their operations meet DOE's objective. Procedures provide managers with a critical management tool to communicate detailed expectations for how individual workers are to perform specific tasks.

To be effective management tools, however, the procedures that workers use must present the best knowledge available of how to integrate the policies, principles, rules, parameters, processes, controls, products, culture, physical facilities, equipment, material, and people necessary to operate a facility safely. In addition, procedures must be technically and operationally accurate, up-to-date, and easy to follow, or workers will lack confidence in them and may not use them. Ensuring that facility procedures meet these criteria is a complex job.

The best knowledge to be incorporated in procedures must be available to procedure writers in the form of basis documentation. At the most general level, senior management basis documents define the facility's senior managers' goals and expectations regarding the conduct of operations at the facility. Senior management basis documents provide the overall framework, in the form of policies and charters, within which facility operations occur. Policies specify the senior managers' commitment to meeting the company's contractual and regulatory obligations, and define their philosophy of operation. Because they are intended to apply broadly to all site activities, policies generally do not specify the details or mechanics of accomplishing the work. Charters establish an organizational structure and define roles, responsibilities, and authorities for accomplishing the work of the company's contract with DOE. Flowing down from the directions and requirements established by the senior management documentation, three types of lower-level basis documentation are required for procedure development:

Background: The Role of Procedures in Managing Facility Operations (continued)

- The technical programs basis documents define the particular safety aspects and safety implications of the facility's processes. Various hazards analyses and the outcomes of probabilistic risk assessments are first synthesized in a primary safety document—the Safety Analysis Report (SAR)—which details the technical and administrative elements of the operation and defines safety requirements, risks, and postulated accidents. The safety parameters reflected in the SAR are then translated into Technical Safety Requirements (TSRs) that describe the specific operating limits necessary to provide a reasonable safety margin for operations. Additional documents are used to maintain the efficacy and currency of the SAR: Test Authorizations provide direction for temporary modifications, such as when conducting brief experimental runs to test process adjustments. Unreviewed Safety Questions assess the implications of any modification in the design, equipment, or operating ranges of the system to ensure that the modifications do not change the magnitude or type of safety issues the SAR originally considered.

- The management control programs basis documents define all of the management programs and controls needed to support and maintain the operation. These documents define the programs that will accomplish the facility's mission. They address the facility's administrative programs (e.g., quality assurance, document and records management, property management); the operational programs (e.g., corrective and preventative maintenance requirements); technical support operations (e.g., facility safety, radiological controls); and facility design and engineering controls (e.g., configuration management). This collection of documents may also include certain additional management baseline information, such as an annual operating plan, the operational budget, and integrated schedules for accomplishing the work scope.

- The design programs basis documents include the design criteria; calculations and analyses (e.g., seismic calculations) that represent the engineering and construction criteria used; the vendor materials that demonstrate the quality and suitability of equipment; and the engineering standards, drawings, and specifications that were used in the actual procurement, construction, testing, and turnover phases of the facility's lifecycle.

These management and programmatic bases documents, if available, provide much of the information to be used in developing a facility's procedures. However, in many DOE facilities, basis documentation is out-of-date, incomplete, or has not yet been developed. In some facilities, procedure writers are being set the impossible task of preparing sound procedures without basis documentation or are required to develop it themselves before they begin writing procedures.

Background: The Role of Procedures in Managing Facility Operations (continued)

Even in facilities where the bases documents are accurate and available, this information must be organized and applied appropriately in developing a procedure for a specific process (a recurring work activity with a measurable product). Further, the resulting procedure must be accurate and easy to follow. Meeting these objectives requires the implementation of procedures programs that include, among others, the following program elements:

- The cooperation of management, technical, and administrative personnel in ensuring that sufficient staff time, information, and other resources are available to those individuals responsible for the procedures program.
- Properly trained procedure writers, reviewers, and users.
- Writer's guides for defining the format and writing styles to be used to ensure that procedures are easy to follow.
- Formal processes for verifying and validating the procedures before use to ensure that they are accurate and easy to follow.

Further, procedures must be updated as required by operational activities: upgrades or modifications to equipment or systems may trigger procedural changes; adjustments in training requirements or certification levels may require reassessment of procedures; and changes in the safety requirements or management philosophy may also result in review of procedures to ensure that the procedures reflect the current configurations, philosophy, and safety criteria. Additionally, procedure revisions also result from growing operational sophistication: continued use of a procedure or the system or equipment it addresses may identify a better or more appropriate method for completing the task. Any change to the bases for facility operations will be likely to require procedure revisions.

Establishing and managing an on-going procedures program requires the active participation of personnel at all levels in the facility:

- The Facility/General Manager's responsibility is to have a disciplined procedure system integrated with and supported by the overall management control system.
- The Operations/Technical Manager's responsibility is to have procedures to address the facility's complete scope of work.

Background: The Role of Procedures in Managing Facility Operations (continued)

- The Technical Reviewer's responsibility is to ensure that procedures reflect the true and complete scope of the applicable technical, management control, and design bases the procedure is designed to implement.

- The Procedure Manager's responsibility is to have a controlled production system that ensures procedures are correct, usable, and available when needed.

- The Procedure Writer's responsibility is to develop procedures that provide specific instructions for task performance and to use the facility's writer's guide to present those instructions in an easy-to-follow manner.

- The Operating Staff's responsibility is to use procedures appropriately and to understand their significance in maintaining a disciplined, safe operation.

The development and on-going management of sound procedures, then, rests upon the availability of a large array of different types of information and the integrated efforts of facility personnel. If the basis information has not been documented, is inaccurate, incomplete, or otherwise unavailable to the procedure writer, or if facility personnel do not actively support the procedure program, procedures will be inaccurate, incomplete or so hard to follow that workers will avoid using them. If procedures are inaccurate, incomplete, or not used, they cannot fulfill their primary function of assuring that work processes are occurring in a safe, deliberate, and controlled manner.

Procedures and the Safety Envelope

The overall safe operation of the facility depends upon the structured interrelationship among DOE requirements and guidance, the bases documentation (senior management, technical, management control, and design), and the facility's procedures—generally referred to as its safety envelope. In other words, a facility's procedures define how requirements, management philosophies and strategies, and technical knowledge will be integrated and applied to performing work in the facility. Figure 1 illustrates a facility's safety envelope, and shows how requirements, guidance, and technical and managerial constraints flow down through a facility's basis documentation and are incorporated in the facility's operations.

Procedures and the Safety Envelope (continued)

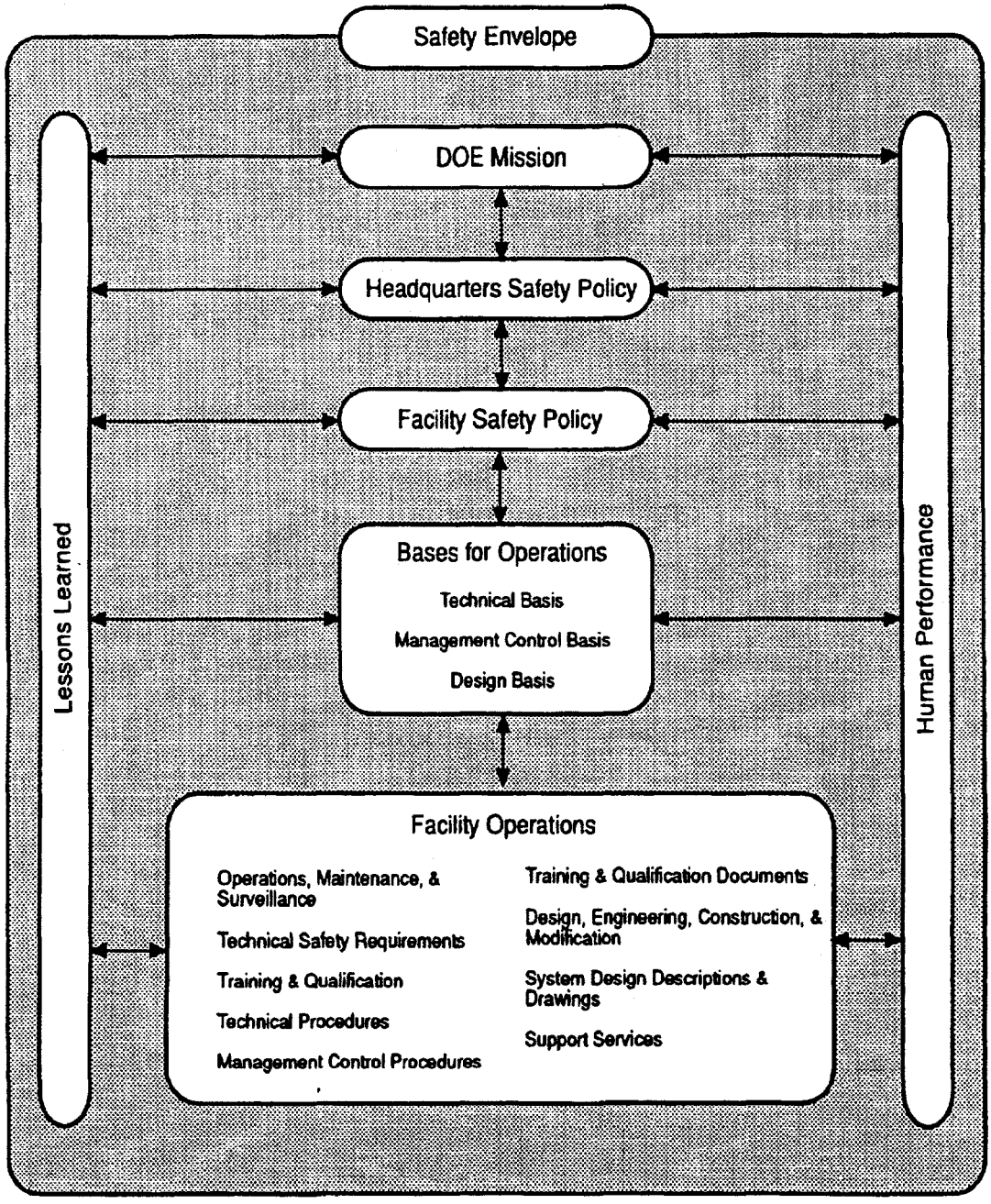

Figure 1: Safety Envelope Diagram

Types of Procedures

Because procedures must address how all operations and processes are to be performed, from the administrative to the technical, several types of procedures must be part of a facility's safety envelope:

- Management control procedures define the communication and coordination activities necessary to carry out the facility's technical programs, management control programs, and design control programs. These procedures describe the processes to be followed to ensure that all of the various programs' functions are effectively integrated and that the programs' requirements are applied appropriately throughout the facility's lifetime.

- Technical procedures prescribe precisely how to accomplish the various technical tasks associated with starting up, testing, operating, and maintaining the facility's equipment and systems. These procedures specify fixed tasks and define activities in a way that ensures operations are safe, efficient, and practiced within the appropriate margins of safety.

- Emergency and alarm response procedures define the action steps to take when an abnormal condition exists. Emergency procedures address conditions that require immediate and absolute attention to mitigate problems, reestablish safety boundaries, and bring operations and equipment back within established operating parameters. Alarm response procedures address the actions to be performed in response to annunciators and other types of facility displays that indicate an off-normal condition.

Each of these procedure types is slightly different owing to the intended purpose and use of the procedures; the considerations in effect at the time of use; the level of detail required to allow the task to be accomplished; the typical user of the procedure; and the degree to which compliance with the procedure must be documented.

The DOE Procedures Program

Because the development of sound procedures and on-going procedure management are complex and new activities for some DOE facilities, and because of the key role that procedures play in ensuring safe, deliberate, and controlled operations, the DOE has initiated a program to define requirements for procedure system management and to provide guidance in certain areas that have not previously been addressed in detail within the DOE literature. As part of this program, a series of DOE procedures documents is currently under development. The intent of these documents is to provide a knowledgeable and reasonable approach to all aspects of procedure management that will ensure the availability and use of sound procedures at DOE facilities.

The DOE Procedures Program (continued)

The procedure guidance documents are in various stages of preparation and review. Some, such as this *Writer's Guide for Technical Procedures*, are already available to DOE personnel as a standard. Documents currently under development include:

- Principles for Excellence in Procedure Writing: This document presents the fundamental principles associated with writing sound procedures. The principles provide a basis for understanding how to develop and evaluate procedure formats and writing style. Therefore, the Principles serve as a means for each facility to confirm the adequacy and appropriateness of the writer's guides developed for the facility's procedure writers.

- Writer's Guides: Three separate writer's guides are being developed, one for each of the three major procedure types: technical procedures, emergency and alarm response procedures, and management control procedures. An appendix to the *Writer's Guide for Technical Procedures* and the *Writer's Guide Emergency and Alarm Response Procedures* will cover the use of graphics in procedures. The guides are model writer's guides, rather than requirements documents, and provide examples of writer's guides that meet DOE requirements. Each of the guides provides a basic explanation of the technical, management control, and design bases for that procedure type, and then provides detailed sections on content and format.

- Principles for Excellence in Procedures Programs: This document presents the fundamental principles associated with managing an on-going procedures program. It defines the purposes procedures serve in facility operations as well as the program elements and processes required for an effective procedures program.

- Manager's Guides: Four separate manager's guides are being developed. The Guides will cover four important functions: developing procedure bases; technical review of procedures; validation and verification of procedures; and, procedure implementation and control. The Guides will provide managers with explanations of the requirements and processes associated with successful completion of these functions.

As is shown in Figure 2, the above documents provide for both product enhancement (better procedures) and system enhancement (better procedures programs). As experience in applying these documents is gained throughout the DOE complex, the documents will be revised on the basis of lessons learned. Additional guidance documents also may be published as the need arises.

The DOE Procedures Program (continued)

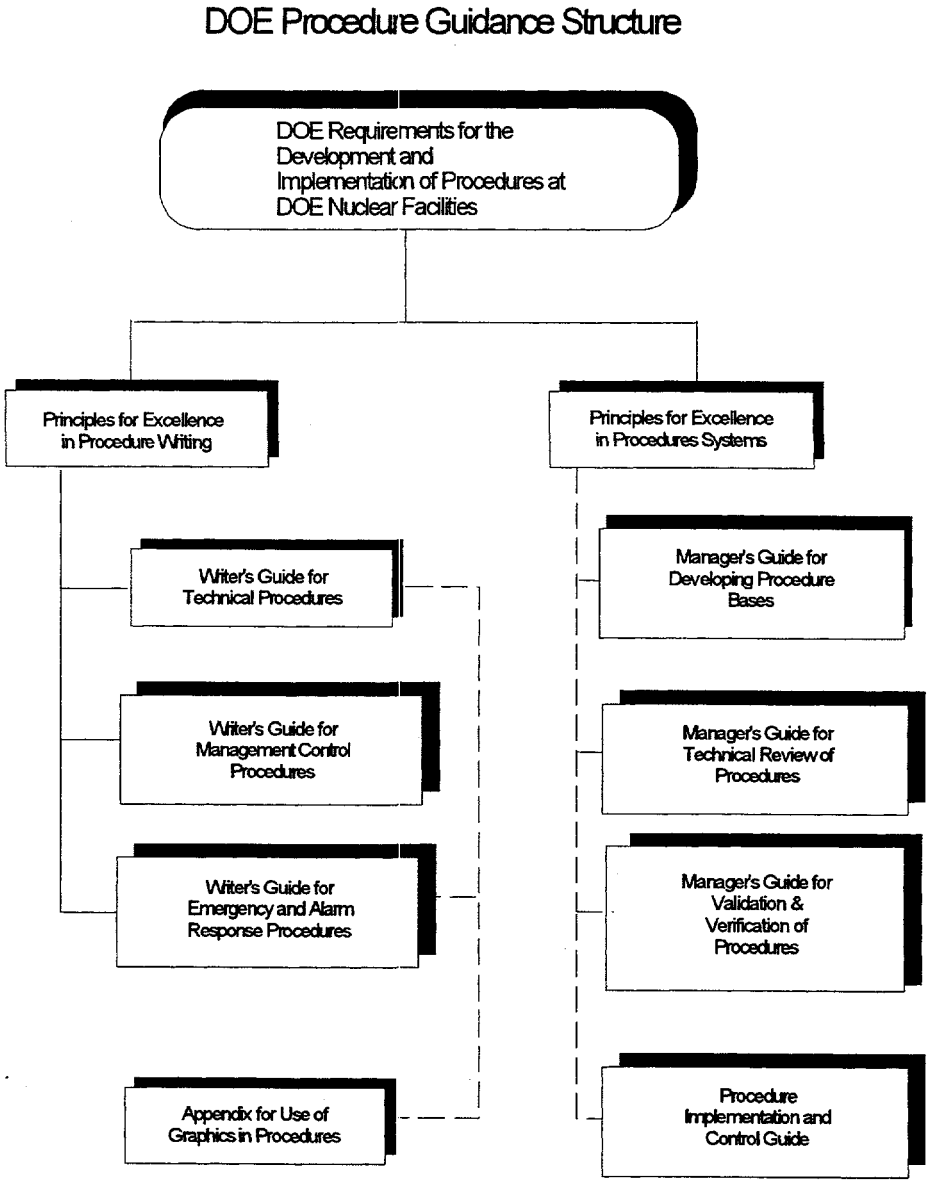

Figure 2: Proposed Documents for DOE Procedure Guidance

1 INTRODUCTION

A primary objective of operations conducted in the U.S. Department of Energy (DOE) complex is safety. Procedures are a critical element of maintaining a safety envelope to ensure safe facility operation.

This DOE *Writer's Guide for Technical Procedures* addresses the content, format, and style of technical procedures that prescribe production, operation of equipment and facilities, and maintenance activities. The DOE *Writer's Guide for Management Control Procedures* and DOE *Writer's Guide for Emergency and Alarm Response Procedures* are being developed to assist writers in developing nontechnical procedures.

DOE is providing this guide to assist writers across the DOE complex in producing accurate, complete, and usable procedures that promote safe and efficient operations that comply with DOE orders, including DOE Order 5480.19, *Conduct of Operations for DOE Facilities*, and 5480.6, *Safety of Department of Energy-Owned Nuclear Reactors*.

Successful procedures assist users by presenting actions clearly, concisely, and in the proper sequence. This guide provides a method for writers to ensure the following key questions are addressed and that procedures contribute to maintaining safe operations:

- What technical and administrative requirements are to be met?
- Who is the user and what is the user's level of experience and training?
- How does this document relate to other procedures for this equipment and facility?
- What materials, equipment, and facilities are to be used?
- What tasks are to be accomplished?
- Why, when, where, and how are the tasks to be accomplished?

1.1 Organization of this Guide

This guide for writing technical procedures is presented in five sections:

- Section 1 provides an introduction to the writer's guide and the process involved in writing technical procedures
- Section 2 presents information about establishing the procedure basis for the procedure content
- Section 3 discusses procedure content and format
- Section 4 deals with writing and structuring action steps
- Section 5 cites references used to develop this guide.

Appendixes provide additional information in worksheets, a glossary, a list of acronyms and abbreviations, and a verb list.

1.2 Purpose of this Guide

This writer's guide establishes the recommended process for developing technical procedures that are accurate, complete, clear and consistent. It provides guidance for

- Developing a procedure basis
- Planning, organizing, and structuring
- Developing content and establishing format
- Writing action steps.

The examples in this guide cannot cover every situation. The guidance presented should be applied as appropriate when writing procedures.

1.3 Scope of this Guide

This guide assists writers, reviewers, administrators, subject matter experts, support personnel, and users involved in developing and writing technical procedures that assist production, operation of equipment and facilities, and maintenance activities. Technical procedures include:

- Normal operating procedures (NOPs)
- Planned nonroutine operations procedures (off-normal operating)
- Surveillance and test procedures
- Maintenance procedures
- Analytical procedures.

Until the writer's guides for management control procedures and emergency and alarm response procedures are issued, selectively apply the techniques presented in this guide to those procedure types.

1.4 Involvement of Operational Organizations in Procedure Development

Procedures are written for facility operational personnel; therefore, operators are an important source of information when developing procedures. Personnel from the operational organization should be involved in the process from the initial decision to write a procedure through the review, verification, and validation of the procedure.

Facility operators can provide valuable insight into the job being performed, information about past operating experience, and data for developing the procedure basis of the procedure. Their involvement in the process can include participating in walkthroughs

and walkdowns and identifying behavioral obstacles, cautions, and valuable nonstandard source documentation beyond safety analysis reports (SARs), probabilistic risk assessments (PRAs), technical safety requirements (TSRs), vendor manuals, and old procedures.

2 ESTABLISHING THE BASES FOR PROCEDURES

Because procedures are a critical element of maintaining a safety envelope, they must be based on the same facility design bases, design verification and functional test results, safety analyses, and operating limits and surveillance requirements used to establish the safety envelope. There are at least three pertinent bases to consider for the development of the technical procedure, the management control basis, technical basis, and design basis.

The technical basis of a technical procedure is a compilation of information such as the Safety Analysis Report, Technical Safety Requirements, operational "lessons learned", facility configuration, and conditions of performance. The technical basis documentation is needed to describe the technical parameters and boundaries within which the process is performed.

The management control basis of a technical procedure contains information such as management controls on the process, facility administrative requirements, and relevant management plans and programs.

The design basis of a technical procedure includes the design criteria, vendors, and engineering standards drawings and specifications that were used in the design and construction of the facility.

The process of establishing the bases involves activities used to research and plan the content of a procedure. The bases of a procedure must be defined before the actual writing can begin. The procedure writer develops procedure bases by either updating the bases of a current procedure or creating bases for a new procedure. The bases provide a researched compilation and analysis of the engineering and design, safety, operations, regulatory, vendor, and administrative information necessary to develop a comprehensive and usable procedure. They are based on the facility as-built drawings, lessons learned, test information, administrative and management controls, and other relevant information.

The bases are working documents and are part of the Procedure History File (PHF). The PHF is compilation of all pertinent information used to develop the procedure and any subsequent revisions. The bases are used to analyze the requirements that must be included in a procedure or revision. The contents of the bases may be revised during procedure preparation to ensure that the final product contains accurate and relevant information.

All the bases combined are referred to as the procedural basis. The procedural basis is used for:

- Writing the procedure
- Simplifying the review process

- Developing later revisions
- Resolving audit findings
- Providing useful fault analysis information.

Follow six basic steps to assemble the procedure basis information: (1) develop a research and planning process; (2) identify the procedure requirements; (3) determine the facility configuration and analyze the process; (4) develop the process and activities; (5) assemble procedure basis documentation; and, (6) prepare a procedure revision history.

2.1 Research and Planning Process

Procedures are written and used for work that could result in abnormal facility conditions, degraded equipment reliability, or personnel or equipment hazards. Procedures are also needed for complex nonsafety-related work, and for work that is performed infrequently.

[1] Identify the procedure to be written.

[2] Plan the research process.

[3] Record the research and planning process to document the basis of the procedure. Be sure to record the methods, calculations, and user feedback obtained during procedure development that might not exist elsewhere.

[4] Identify the appropriate operations organizations and plan for their personnel to help develop the procedure.

As stated in Section 1, operations personnel provide valuable insight when writing a procedure. Operations personnel can greatly improve procedure basis documentation for technical processes, conditions of performance, process analysis, and user feedback.

2.2 Procedure Requirements

Writers must understand the bases for procedures before they begin to write. Completing the following steps will help writers understand these bases (the worksheets in Appendix A can be used to record information).

[1] Research the regulatory and administrative requirements affecting the procedure. This research includes assembling and reviewing documents containing direct requirements and commitments that apply to the procedure.

[2] Determine the technical requirements that apply to the procedure by examining the following:

- DOE rules, orders, and standards.
- Safety analysis report and technical safety requirements (formerly technical specifications or operational safety requirements).

- Approved vendor information.
- Other procedures that describe similar functions, including procedures from outside organizations if necessary.
- Technical literature such as textbooks.
- Engineering documents such as engineering drawings or analysis reports.
- Records of the basis for and development of methods and calculations.
- Analyses of the process.
- User feedback reports.
- Relevant event reports, root cause analyses, and lessons-learned documents.
- Results of design verification, qualification tests, and functional tests.
- Other relevant information that should be reviewed and incorporated into the procedure basis such as letters of commitment and contracts.

[3] Document the information used to determine procedure requirements. This documentation may include a list of procedures used or referred to during the research (the worksheets in Appendix A provide a sample of how information may be documented).

2.3 Facility Configuration

To ensure the technical adequacy and accuracy of process and equipment information in the procedure, perform a detailed check (walkthrough).

[1] Study technical safety requirements, the safety analysis report, or other documents to understand the process. Refer to appropriate drawings before and during walkthroughs.

[2] Perform an appropriate assessment (using walkdowns, simulations, modeling, or desk-top reviews) to note

- Equipment configuration
- Nameplate information
- Environmental or location factors that may influence procedure performance or increase the safety risk to the user, such as radiation or chemical hazards, equipment locations requiring ladders, special lighting, scaffolding, or rigging.

[3] If practical, observe the activity being performed (or a simulation of the performance) and similar activities. Observing an activity can identify activity

sequences and techniques used that might not be apparent by reading the existing procedure.

[4] Research potential hazards and problems in performing the activities.

- Interview procedure users familiar with similar activities.
- Learn about past problems with the existing procedure.
- Obtain suggestions for improving methods from operators and training personnel.
- Review procedure use histories or other documents that record previous performance (for example, maintenance histories for maintenance procedures).

[5] Determine how frequently the procedure is used.

[6] Consider the consequences if the procedure is not performed correctly.

[7] Identify the administrative processes that affect the procedure process. Administrative processes include required verifications, inspections, and notifications. Be specific. For example, "Observe all safety rules" or "refer to the facility's safety manual Section 10" does not add specific work instructions; the procedure user may not do the research required to identify specific instructions.

2.4 Process Analysis

After completing the research and planning process, determining the procedure requirements, and reviewing the facility configuration, perform an analysis of the activities that make up the process. A process analysis identifies the requirements of the activity and the functions that must be accomplished to meet the process objectives. While performing a process analysis, consider the rationale behind the activities, activity frequency and complexity, the consequences of an error, and the relationship of training to successful performance of the activity. The activities are translated into action steps in the performance sections of the procedure. Analyze the process while developing the process and activities of a procedure (see "Develop the Process and Activities" in this section).

[1] Determine the following as applicable:

- The principal users of the procedure and other participants in the process, including support functions such as health physics and laboratory services
- The level of detail to be used in writing the procedure based on user training and qualifications (see "Appropriate Level of Detail" in Section 3).

[2] Review available process information such as task analyses.

[3] Review a similar procedure to help establish the appropriate level of detail.

An important part of the process analysis is to identify where extra caution is needed. The analysis identifies and helps mitigate the potential for abnormal events by writing procedures sensitive to aspects of the process that could cause errors. The analysis identifies design defects and assists procedure developers in providing warnings and cautions at appropriate places within the procedure to help the procedure user to recognize and prevent mishaps or mitigate the effects if mishaps occur. The analysis should be documented as part of the procedure basis.

2.5 Develop the Process and Activities

A procedure provides a process (method) to accomplish a specific task. Use information gathered in the process analysis to define the process, define the activities that make up the process, and organize the activities into related sections. These sections will become the subsections and action steps within the procedure.

[1] Identify each activity within each process.

[a] Assess the technical requirements to accomplish the activity, such as

- System/component configuration
- Interfaces with other procedures and with other organizations
- Limitations
- Potential hazards and problems
- Expected system responses.

[b] Assess applicable administrative requirements such as verifications, inspections, and notifications (a form such as the Administrative Requirements Worksheet shown in Appendix A can may be used to record the requirements for each activity).

[2] Place the activities identified in sequence in their order of performance. Outlines, tables, and flow charts are useful for viewing the sequence and hierarchy of the activities required to complete the process.

[3] Review the activities and combine common activities. Activities can be combined as long as they do not increase the complexity of the procedure or interrupt the correct sequence of actions.

[4] Develop a clear, concise statement of purpose for performing the procedure.

[5] List other documents, forms, and definitions of important terms that will be used to support the procedure being developed.

[6] Develop procedure headings as applicable (see Section 3, "Procedure Organization" and "Headings").

[7] Identify the portions of the process to be addressed in each of the following procedure sections:

- Prerequisite actions
- Performance sections
- Post-performance activity.

[8] Include activities that respond to limitations and potentially hazardous conditions. These activities were identified in the process analysis.

2.6 Assemble the Results of the Research into the Procedure Basis

Procedure basis documentation for a procedure documents all research results from activities previously discussed.

[1] Assemble the research documents in a logical manner that is easy for reviewers and procedure writers to access. Documentation may include appropriate listings of documents, copies of resource material, data sheets, checklists or worksheets (example worksheets are provided in Appendix A).

[2] Attach records of the research that were not included on the worksheets that support the procedure basis, such as observations, literature searches, methods development, and calculations.

[3] Complete the procedure basis documentation by placing purpose and scope statements in front of the worksheets and other information.

EXAMPLE 2-1. Overview statement for a procedure basis.

1.1 Purpose

This collection of information provides the procedure basis for SP-EG-1-K, GM Diesel Generator No Load Test.

1.2 Scope

This procedure basis includes documentation of the research used to evaluate the conditions and constraints relevant to performing SP-EG-1-K, GM Diesel Generator No Load Test.

2.7 Prepare a Revision History

The revision history provides a history of the procedure and specifies its effective date. Although the revision history may be initiated at this point in developing a procedure, it cannot be completed until the procedure is approved.

[1] Include the following information in the revision history:

- Revision level
- Effective date
- Affected pages
- Revision description.

EXAMPLE 2-2. Revision description.

Revision 2 was done to reflect the equipment changes made to the chilled water supply system.

[2] Provide a specific statement of the reason for the revision. Generalizations, such as general revision, do not provide meaningful information.

[3] List the procedure(s) that the new procedure replaces or requirements that the procedure implements.

[4] If the number of the procedure changes, cite the old number in the revision history to provide appropriate history and cross referencing.

[5] Add the approval date to the description of the revision for use in tracking periodic reviews.

[6] Include any temporary changes implemented since the last revision.

[7] Maintain and update the procedure basis documentation to ensure that a complete history of the procedure is available each time the procedure is revised.

3 CONTENT AND FORMAT

3.1 General Content and Format Guidelines

This section discusses the technical subject matter content and organization of a procedure. It also defines the format of procedure pages, headers, and other elements.

All types of procedures are not within the scope of this writer's guide. While sections within this writer's guide may apply to other than technical procedures, writers should exercise discretion when applying the guidance presented. For help with procedures exclusively formatted with graphics, or those portions of procedures which combine graphics and text, the *DOE Guide for Use of Graphics in Procedures* will, when completed, be attached as an appendix to this document.

3.1.1 Appropriate Level of Detail

Writing at the appropriate level of detail is the key to successful communication with procedure users. For ease of use and to reduce distraction and confusion, only include information in the procedure that relates directly to completing the task.

[1] Write procedures to a level of detail consistent with the qualifications and training of the expected users. Job task analyses and training records provide information useful in assessing the level of detail requirements. When in doubt, write to the lowest common denominator.

[2] Provide a level of detail that takes into account the following variables:

- Qualification level of the user. As qualification level increases, level of detail can decrease on tasks that are simple or are frequently performed.
- Complexity of the task. As task complexity increases, level of detail can increase.
- Frequency of task performance. As task frequency increases, the level of detail can decrease.
- Degree of standardization desired. Level of detail varies directly with the degree of standardization desired. The more standardized the performance, the more detailed the procedure.

[3] Determine whether the amount and kind of information provided are adequate for intended users by answering the following questions:

- Can the procedure be performed in the sequence it is written?
- Can the user locate and identify all equipment referred to in the procedure?

- Can the user explain in detail how to perform general instructions?
- Can the user perform the procedure without obtaining additional information from persons or procedures not specified by the procedure?
- Can the user perform the procedure without obtaining direct assistance from persons not specified by the procedure?

[4] Ensure that the decision making required in the procedure is consistent with the user's qualifications and level of authority. This approach permits tasks to be performed with minimum supervision.

[5] Exclude information that is useful only to reviewers or other persons not involved in performing the procedure.

3.1.2 Consistency

One of the most important principles in writing effective technical procedures is to maintain consistency in procedure style, format, and organization, both within and among procedures. Inconsistencies can result in users attributing differences in meaning to spurious differences in presentation. Consistency allows users to move through documents without having to waste effort interpreting the style of presentation for each section they encounter. This facilitates comprehension and allows users to concentrate on the actual performance of the instructions. When employing the guidelines discussed in this document, maintain consistency!

3.1.3 Writing Style and Language

Narrative prose and paragraph style are inappropriate for writing procedures. Users of procedures will likely be working under difficult, sometimes very stressful conditions, and thus procedures should be written so that users can grasp the intended meaning quickly and easily.

[1] Communicate instructions using simple and concise language, although not at the expense of comprehensibility.

[2] Use action statements to communicate procedure instructions to users.

[3] Maintain consistency in language (words, definitions) and format among instrument labelling, procedures, and training.

[4] Avoid using synonymous terminology merely for the sake of introducing variation. Use words and phrases consistently throughout procedures.

[5] Write instructions clearly. The users should not have to infer the meaning.

[6] Select vocabulary carefully. Use simple, common vocabulary that accurately reflects intended meaning and which is common and familiar in the context of the training users receive. Use technical terms when they are the most common and familiar terms to the users.

[7] Adhere to grammatical conventions and to the punctuation rules of standard American English.

[8] Rewrite sentences, if necessary, to avoid excessive punctuation.

[9] Avoid ambiguous words, e.g., "the right valve" should be rephrased as "the right-hand valve" and augmented by the specific valve name or number.

[10] Avoid vague adjectives (words modifying nouns) and adverbs (words modifying verbs) which are subject to interpretation. Specify quantities whenever possible (e.g., "Drain the tank at 10 gallons/minute" is preferable to "Drain the tank slowly.").

[11] Limit the use of abbreviations and acronyms.

[12] Develop a restrictive list of abbreviations and acronyms and use only those words on this list. Users should be familiar with these acronyms and abbreviations without having to refer to the list.

[13] Ensure that each abbreviation and acronym is uniquely associated with a single specific term. Do not use the same abbreviation or acronym for two different meanings.

[14] Avoid using abbreviations ending in a period so as not to suggest the end of the sentence.

3.1.4 Numerical Information

[1] Maintain consistency in using Arabic numbers (e.g., 0, 1, 2) and spelled-out numbers (e.g., zero, one, two).

[2] Use spelled-out numbers when one number without a specified unit of measure is followed directly by one with a unit of measure.

EXAMPLE 3-1. - Use of spelled-out numbers with a unit of measure.

Use: "Energize one 4.16 kV bus."
Do not use: "Energize 1 4.16 kV bus."

[3] Use spelled-out numbers when a number, typically a single digit number, is emphasized.

EXAMPLE 3-2. - Use of spelled-out numbers with emphasis.

"Use **one** of the following." is preferable to "Use **1** of the following."

[4] Otherwise, use Arabic numbers to present numerical information, as in "Decrease tank level by 10 inches."

3.1.5 Instrumentation/Component Information

[1] Refer to instruments and components using both the equipment name and number. The equipment name can be the verbatim equipment label, a paraphrased equipment label or some other name, depending upon which is the most familiar to users. Ideally, there should only be one name in use for any given piece of equipment. Set the numeric identifier apart from the equipment name (e.g., by placing it in braces after the common usage name as in: "Open both Vessel Vent valves {GH-32-1 and GH-32-2}.").

[2] Do not require users to interpret ambiguous descriptors, such as "approximately" and "slowly" when referring to instrument information.

[3] Specify numbers in procedures at the same precision and the same units of measure that they are presented on instrument panel displays.

[4] Express consecutive acceptable values as a range of values rather than in terms of tolerance bands. Tolerance bands require additional mental calculation on the part of the users, increasing the probability of error.

EXAMPLE 3-3. - Use of spelled-out numbers with emphasis.

Use: "if the temp is 75° to 85° F..."
or: "if the temp is 80° F (acceptable range of 75° to 85°)"
Do not use: "if the temp is 80°F ± 5°F..."

3.1.6 Typeface

The readability of type is affected by its font (typeface, point size, and weight), and case (capitalized versus uncapitalized).

[1] Select typeface font and size so that it is readable under the worst conditions anticipated. Ensure that the type size is large enough for users to read at anticipated distances and lighting conditions.

[2] Use a mixture of both upper and lower case in text. Only use capital letters for emphasis of single words or phrases, not for an entire block of text.

3.1.7 Page Headers and Page Numbering

Each page of the procedure should include a main page header that fits at the top of the page and clearly distinguishes a specific identity for each procedure. The identity of a procedure should include a unique number and the unit (building or system) to which it applies.

[1] Place the page header at the top of every procedure page.

[2] Ensure margins are adequate on all sides so that information is not lost during duplication. Surrounding the text area with a box is one method to ensure information is not lost.

[3] Include the following in the front page header:

- Procedure title
- Procedure number
- Revision number
- Revision date.

[4] Include sufficient information on successive pages to identify the procedure to which the page belongs (for example, procedure number and revision).

[5] Number pages consecutively. Begin with the coversheet (which is page 1) and continue to the end.

[6] Establish the location of the page number and consistently maintain the location for all procedures. Designate the page number as "Page __ of __," (for example, "Page 5 of 23"). Label the main page header in appendix pages with the parent procedure revision number and revision date.

[7] Maintain the page numbering sequence and use an internal appendix page number as shown in the following example.

EXAMPLE 3-4. Internal page numbering for an appendix.

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APPENDIX A -- Check Sheet/Data Sheet
(Page 1 of 1)

[8] Ensure the header information clearly communicates the specific use and applicability of the procedure; the number, in conjunction with the title, must state the unit (building or facility) to which the procedure relates.

3.1.8 Procedure Titles

[1] Write procedure titles that are concise, clear, and descriptive of the system, equipment, process, or activity.

[2] Write procedure titles that are short and descriptive enough to permit the user to easily identify the procedure and activity to which the procedure applies.

[3] Write unique procedure titles to assist the user in identifying the correct procedure.

EXAMPLE 3-5. Procedure title.

Reservoir Plug Welding

3.1.9 Headings

Headings break the text of the procedure into sections by grouping related action steps. Section headings help users locate information in the procedure, break up long series of actions into manageable chunks, and track their progress through the procedure, especially when branching to other sections.

[1] Give each major activity in the main body of the procedure a unique and descriptive heading.

[2] Limit the number of heading levels to three (for example, 1, 1.1, and 1.1.1). Excessive levels result in complex section numbers.

[3] Identify first-, second-, and third-level headings by a decimal numbering system.

[4] Begin first-, second-, and third-level headings at the left margin of the text block.

[5] Identify first-level headings with all capital letters and bold type.

[6] Identify second- and third-level headings with initial capital letters of important words and bold type.

[7] If second-level headings organize activities, start the headings with the "ing" form of action verbs and complete the headings with the objects of the action verbs (for example, **Starting Cooling Water Pumps**).

[8] If the third-level headings under a second-level heading are being used to organize action steps, start the headings with action verbs and complete the headings with the objects of the action verbs (for example, **Start the Cooling Water Pump**).

[9] Otherwise, use topics for second- and third-level headings (for example, **Cooling Water Pumps**).

[10] Use a list to organize material other than action steps under headings and action steps.

[11] Designate listed items with indented upper-case letters.

EXAMPLE 3.6 - Headings.

1 FIRST LEVEL HEADING

1.1 Second-Level Heading

1.1.1 Third-Level Heading

[1] First-level action step

[2] First-level action step with two second-level action steps

[a] Second-level action step
[b] Second-level action step

[12] If it is necessary to continue a section on subsequent pages, repeat the heading on subsequent pages with an indication that the page is a continuation.

EXAMPLE 3-7. Section heading and indication of section continuation.

3.2 Special Tools, Equipment, Parts and Supplies (continued)

3.1.10 Action Step Numbering

Action steps reduce a task or activity to a discrete set of instructions. Action step numbering identifies individual action steps and their sequence.

[1] Make action steps readily distinguishable by the user.

[2] Limit the number of action step levels to two.

[3] Identify first-level action steps with bold typeface bracketed numbers.

[4] Identify second-level action steps with bold typeface bracketed lower-case letters.

EXAMPLE 3-8. First-level action step with two second-level action steps.

---

[3] Prepare compressed gas cylinders.

[a] Select compressed gas cylinders with current in-service dated gas certification.

[b] Verify that each cylinder regulator will maintain 35 psig (30 to 40).

3.2 Procedure Organization

A technical procedure is organized to provide the procedure user with all the needed information to accomplish an activity. It includes the following elements:

- Coversheet
- Revision status
- Table of Contents
- Introduction
- Precautions and limitations
- Prerequisite actions
- Acceptance criteria
- Performance
- Post-performance activity
- Source requirements
- Appendixes.

Not all procedures require each of these elements. For example, not every procedure needs an appendix. If the procedure does not need an element, do not include it. The contents and format for each of these procedure elements are discussed in the following sections of this guide.

3.2.1 Coversheet

The coversheet provides a means for the user to verify that the procedure is appropriate for the task at hand.

[1] Provide a simple descriptive title that identifies the system, equipment, process, or activity described in the procedure.

[2] Include other information, as needed, to differentiate the procedure from other procedures (for example, specific conditions or activities that the procedure controls). Example 3-9 contains a sample coversheet.

EXAMPLE 3-9. Coversheet

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Reservoir Plug Welding

Building 618

PERFORMANCE SECTIONS:

[4] RESERVOIR CHECK-IN AND ACTUATOR REMOVAL

[5] WELD PREPARATION

[6] PLUG WELDING

[7] DECONTAMINATION OF RESERVOIRS

[8] RESERVOIR STORAGE

Approved By:_____

3.2.2 Revision Status

It is essential that users follow the most current version of a procedure. Document control systems typically ensure the most recent versions are available. Ensure the latest revision is used by including the revision number on each page of the procedure.

Draw the user's attention to changes (additions, corrections, or deletions) made in the procedure. A clear, simple means of marking these changes is required. One suggested method is to mark the changes with vertical lines in the margin. Only the marks for the most recent revision should appear in the revision.

3.2.3 Table of Contents

The table of contents helps users locate the portions of the procedure they need for a specific operation and is useful for locating appendixes. A table of contents is recommended.

[1] List the procedure section and subsection headings and the titles of appendixes exactly as they appear in the procedure.

[2] List third-level subsection headings in the table of contents when required by the length and complexity of the procedure (listing third-level headings is optional).

[3] Identify at the right margin of the Table of Contents, the number of the page on which the heading or title first appears.

[4] Format the table of contents consistently (Example 3-10 contains a sample table of contents).

EXAMPLE 3-10. Table of contents showing layout and format.

TABLE OF CONTENTS

3.3 Introduction

The introduction should address the purpose, scope, and applicability of the procedure.

[1] Provide a clear description in the purpose of the goal to be achieved by performing the procedure. Avoid purpose statements that repeat the procedure title and headings of the table of contents.

EXAMPLE 3-11. A typical purpose statement.

1.1 Purpose

This procedure provides instructions for reservoir plug welding and storage of plug welded reservoirs.

---

[2] Describe the activities the procedure covers in a statement of scope. If necessary, the scope may also address the limitations of the procedure (what the procedure does not cover). Example 3-12 contains an outline of a scope for a technical procedure.

EXAMPLE 3-12. Outline of a scope for a technical procedure.

1.2 Scope

This procedure addresses the actions necessary to plug weld reservoirs, to decontaminate them, and to store them. It does not include receipt and unpackaging of reservoirs, nor does it address rework of improperly welded reservoirs.

---

[3] Specify the conditions that require procedure use in the applicability statement. For example, in a surveillance test procedure the applicability statement might be that the test has been requested by a manager.

3.4 Precautions and Limitations

Failure to include precautions and limitations within the procedure can cause a severe injury to, or the death of, the procedure user and/or serious damage to equipment.

The precautions and limitations section delineates precautions that affect the entire procedure or that occur at more than one point in the procedure.

[1] Write precautions and limitations to inform users of hazardous conditions and their potential effects. Precautions (a) alert procedure users to actions and conditions that represent potential hazards to personnel or possible damage to equipment or (b) establish abnormal conditions. Limitations define boundaries that are not to be exceeded.

[2] Do not present user actions in the precautions and limitations section.

[3] Avoid generic precautions that are part of a job description or inherent in the task.

[4] Present hazardous conditions that exist during the entire procedure or occur at more than one point in the procedure.

[5] If action is required by users to respond to the precaution or limitation, provide action steps at the appropriate location in the procedure and use a conditional action step to define the conditions that require an action. (See Section 4 for information on writing action steps.)

[6] Address the following in precautions and limitations as appropriate.

[a] Identify and address potential exposure of personnel or the environment to

- Radiation or contamination
- High temperature or high pressure fluids
- Hazardous substances
- Electrical shocks
- Excessive noise levels
- Confined space hazards
- Falls
- Moving equipment or parts of equipment
- Fire hazards.

[b] Identify and address the protection of equipment and material from

- Inadvertent, incorrect, or omitted actions that may cause facility shutdown

- Inadvertent, incorrect, or omitted actions that may result in limiting conditions for operation as defined in the technical safety requirements
- Limitations identified in approved vendor information
- Limitations identified in applicable design documents
- Unusual alarms affecting facility availability that may occur or are expected to occur as a result of performing the procedure
- Mechanical or electrical bypasses (lifted leads, inhibits, jumpers, and fuse removals) used in performing the procedure
- Electrical and mechanical interlocks involved in performing the procedure
- Actions resulting in emergency response or automatic incident response
- Undesirable consequences of violating each precaution or limitation statement.

EXAMPLE 3-13. Precaution statements.

2 PRECAUTIONS AND LIMITATIONS

2.1 Vapor pressure thermometer capillary tubing can be damaged if rolled up less than 8 inches in diameter.

2.2 The instrument terminals may carry hazardous electrical currents. You may receive severe or fatal electric shock if you touch these terminals without protection.

EXAMPLE 3-14. Limitation statement

2 PRECAUTIONS AND LIMITATIONS

2.1 The unavailability of the standby motor generator during power operations may exceed a technical safety requirements limiting condition of operation.

Hazardous conditions that apply to individual action steps are written as warnings or cautions; they are placed just before and on the same page as the affected action step. (See Section 4, "Action Steps with Warnings, Cautions, and Notes," for information on writing warnings and cautions.)

3.5 Prerequisite Actions

The prerequisite actions section identifies actions that must be completed by the user and requirements that must be met and signed off before the user continues with the procedure.

[1] Include the following subsections in the prerequisite actions section as applicable:

- Planning and coordination
- Performance documents
- Special tools, equipment, parts, and supplies
- Field preparations
- Approvals and notifications.

[2] Vary the sequence of procedure subsections as appropriate; the sequence of subsections should be determined by the sequence of the actions to be performed. For example, an approval might be needed before a field preparation.

[3] Arrange action steps in an order ensuring that all required permissions and notifications are obtained before any facility equipment is manipulated.

[4] If the procedure is generic, include only those prerequisite actions that apply to all uses of the procedure. Application-specific prerequisite actions, including data sheets, are contained in separate procedures. Administrative prerequisites for maintenance may be included in work-initiating procedures. For example, a generic procedure to change out a pump seal would include only those prerequisites applicable to the seal change out. The prerequisites for taking the specific pump out of service are contained within the specific pump procedure.

[5] Include provisions for recording data, signoffs, and remarks discussed in the following subsections as needed.

3.5.1 Planning and Coordination

The planning and coordination section includes information on activities that must be undertaken to plan and coordinate the performance of the procedure. These actions may include, but are not limited to, the following:

[1] If training or qualifications specific to the procedure are required, list personnel requirements.

[2] Include instructions for a pre-job planning meeting with the participants as appropriate. For example, a pre-job meeting may include coordinating activities at several locations, planning detailed measurements to be taken by several persons, or other aspects of performing a complex procedure.

[3] Provide administrative requirements (such as the statement "Verify the procedure to be used is a copy of the current revision") to ensure the user has the latest revision.

[4] Provide action steps to ensure needed information is obtained and recorded. These action steps may involve:

- Identifying the principal personnel involved by functional responsibility (see Section 4, "Writing Basic Action Steps," and "Actions Steps Containing Verifications, Checks, Notifications, and Data Recording").
- Recording the facility condition at the start and end of the procedures and the date and time the procedure is started.
- Justifying and identifying portions of the procedure that are used.

[5] Address any special system conditions and hold orders required to perform the work.

3.5.2 Performance Documents

[1] Direct the user to obtain all other documents required to perform the procedure, such as drawings, approved vendor manuals, and other procedures that may be referenced in the base procedure. Listing these references in the prerequisite actions subsection ensures that the documents are available at the job site when needed. Where feasible, however, include such material in the base procedure to lessen the number of references the user must refer to.

3.5.3 Special Tools and Equipment, Parts, and Supplies

[1] List special tools, measuring and test equipment, parts, and supplies required to perform the procedure. Strict attention to the completeness and correctness of this

section is extremely important. For example, failure to specify a necessary item could result in costly equipment downtime or using a substitute for a specialized tool could damage equipment. It may be appropriate to provide some of this information in tables. Lists of material may be more appropriately placed in an appendix than in this subsection.

[2] Identify certified or qualified parts and equipment needed for the activities.

[3] Provide guidelines for selecting and assembling special tools, measuring and test equipment, parts, and supplies.

[4] Provide separate action steps for the different categories such as parts, supplies, or measuring and test equipment.

[5] Specify alternative tools and equipment if applicable.

EXAMPLE 3-15. Table identifying required parts.

[3] Obtain the following parts:

Description	Part Number	TIIC No.	Quantity	Class
Gasket	3	XX-XX-XX	1	EQ
Piston	5	YY-YY-YY	1	EQ
Nut	6	ZZ-ZZ-ZZ	2	NA

[6] Identify specific equipment necessary to perform a procedure.

[7] Avoid using the statement "or equivalent" when specifying equipment.

[8] Do not specify ordinary craft tools such as standard pliers and wrenches.

[9] If the procedure has a generic application, do not include instrument-specific information such as serial number or calibration date. This information is included in application-specific procedures.

[10] Provide clear specifications for verifying the adequacy of test equipment. Specifications include ranges, accuracies, and compliance with calibration standards.

[11] Ensure that range and accuracy of measuring equipment are consistent with the expected values to be measured.

[12] Determine when data concerning test equipment (for example, serial numbers or calibration dates) must be recorded. Provide space in the procedure or in an appendix to record the data before the user encounters action steps which use the test equipment for critical measurements.

[13] Specify verification and performance checks or special controls required before the equipment is used. If the performance check is done just before use, include the check in the body of the procedure rather than in the prerequisite actions section.

EXAMPLE 3-16. Measuring and test equipment identification.

[3] Obtain two stopwatches (calibrated and approved by Quality Assurance Lab), and complete Table 4-2.

TABLE 4-2

M&TE No.	Expiration Date	Performer Initials
		____
		____

3.5.4 Field Preparations

[1] Provide instructions for preparatory field activities that must be completed before continuing with the procedure. Examples of these activities are listed below.

- Lock-out/tag out of equipment

EXAMPLE 3-17. Tag out action step.

[4] Verify that the GM Diesel unit to be inspected has been tagged out. ___

- Unlocking valves or rooms
- Recording the as-found condition of the structure, system, or component
- Verifying if systems and components are in use before removal from service (for example, redundant safety system or indicator lights)
- Confirming the correct system or equipment configuration
- Establishing system or equipment alignment and power supply
- Identifying actions to cope with potential hazards such as fire, radioactive spills, or exposure to radiation
- Installing portable communications equipment and preparing special test equipment
- Identifying needed support services such as craft personnel to remove a relay cover.
- Verifying availability of performance documents before continuing with the procedure.
- Providing specifications and tolerances that determine whether the results of the prerequisite action steps are acceptable
- Obtaining required permits such as radiation work, electrical work, or confined space work permits. Ensure appropriate signoffs and approvals are obtained.

EXAMPLE 3-18. Field preparations.

---

[4] Verify that the halon fire protection system is in service for each GM Diesel room. ___

[5] Ensure that the following tests have been completed on the GM Diesel to be tested:

A. SP-EG-100 series. ___
B. SP-EG-1. ___

3.5.5 Approvals and Notifications

The approvals and notifications section identifies approvals and notifications that must occur before the actions in the procedure begin. Approvals and notifications related to specific action steps in the procedure are placed adjacent to the affected action step.

[1] Provide instructions to ensure that all necessary approvals are obtained and all required notifications are made before initiating the procedure. Approvals and notifications may involve responsible individuals such as:

- Shift manager
- Central control room operator of the affected units
- Responsible system or equipment engineer
- Support, quality control, regulatory, and audit personnel
- Health physics and chemistry technicians.

EXAMPLE 3-19. Approval to begin a procedure.

3.3 Approvals

[1] Consult with, and obtain permission from, your supervisor before beginning performing this procedure

_____
Supervisor Initials

---

[2] If a work package encompassing activities performed in a procedure does not include instructions to obtain permits before performing the activity, provide instructions for obtaining the required permits (for example, radiation work or confined space entry permits).

[3] Provide for notifications if they are required in the event of a delay.

EXAMPLE 3-20. Notifications in case of delay.

[2] IF the test is delayed until a later shift,
THEN obtain approvals to begin or continue the test from the following individuals:

Position	Signature	Date	Time
Shift Manager			
Central Control Room Operator			
Shift Technical Engineer			

3.5.6 Terms, Definitions, Acronyms, and Abbreviations

Avoid using a separate section devoted to terms, definitions, and acronyms in technical procedures. Users should be adequately trained and familiar with the terms used in the procedure. Facility-specific glossaries of terms, definitions, acronyms, and abbreviations should be maintained to ensure consistent use of these elements and consistent interpretation by the user. If the writer decides a term needs amplification in a specific procedure, the amplification should appear in a note preceding the affected action step or be incorporated in the action step.

3.5.7 Responsibilities

In technical procedures, responsibilities are implicit in the action statements (see Section 4 of this guide for information about writing action statements). Only action steps that involve personnel in addition to the user need specify the person responsible for a specific action. Therefore, because the procedure has a limited number of users, a separate responsibilities section is not warranted.

3.6 Performance Sections

The performance sections contain the action steps that prescribe the principal tasks and subtasks of the procedure.

[1] Organize activities in the order that they will be performed.

[2] Divide the performance sections into subsections that logically group related activities as established in the procedure basis outline.

[3] Use headings for each subsection that reflect the activity rather than a generic title (for example, "Removing the Actuator," rather than "Actuator").

[4] Write the specific action steps within the performance sections in accordance with Section 4 of this guide.

3.7 Post-performance Activity

The post-performance activity section stipulates actions needed to close out the activity including testing, restoration, and compiling results.

3.7.1 Testing

[1] If operability of equipment has been affected while performing a procedure and operability has to be verified before returning the equipment to service, include action steps that specify these tests.

3.7.2 Restoration

[1] Provide action steps to specify and record the return of all affected structures, systems, or equipment to the desired configuration.

[2] Include instructions for

- Required restoration adjustments, storage, or maintenance of laboratory and process equipment
- The return of tools and equipment
- The proper disposal or storage of consumables such as test samples or chemicals not used in the process.

[3] Provide space for recording the notification of appropriate personnel that the system has been returned to service.

[4] Include provisions for close out of any permits (such as confined entry permits) that were required to perform the procedure.

[5] Provide for verification of appropriate restoration action steps.

3.7.3 Results

[1] Provide instructions to summarize the results of the procedure including

- Listings of facility conditions
- Date and time of test start and test completion
- Participants
- Reasons for the test

[2] Provide instructions to state whether

- Problems or delays were encountered
- Corrective action(s) were performed
- Authorization signatures were obtained.

[3] Provide instructions to state whether acceptance criteria were satisfied, a nonconformance report was initiated, and/or a limited condition for operation was exceeded.

[4] Provide an action step to review the entire procedure for completion and to review and approve test results.

3.8 Records

Records generated by a procedure are maintained to document the tasks completed by performing the procedure. Administrative controls establish requirements for, and control of, records. Post-task analyses of the procedure require that the conditions of performance and the personnel involved are clearly recorded so lessons can be learned if adverse consequences occur.

[1] Identify the records generated as a result of performing the procedure in the performance section (for example, forms, data sheets, checklists, and documentation of as-found conditions).

[2] Classify the records generated as appropriate to facility records control and indicate the appropriate filing or transmittal of the records.

[3] If no records are generated, state this in the procedure.

3.9 Source Requirements

Source requirements are requirements implemented by the procedure. There should be a cross-reference between these requirements and the parts of the procedure which implement them. Source requirements are identified in this way to alert users who are making an expedited procedure change.

[1] Identify within the procedure the parts of the procedure which implement a source requirement.

[2] List the DOE rules and orders, technical safety requirements, safety analysis reports, and other requirements and commitments directly implemented by the procedure (for example, industry codes and standards). Source requirements are identified when the basis for the procedure is established.

[3] Do not include broad, programmatic documents unless there is a specific purpose for the reference.

[4] Identify the specific requirements (and their locations) within the source requirements documents of the requirements that are implemented by the procedure.

[5] Ensure that the authorized versions of the source requirement documents are listed. For example, the codes and standards in effect when the facility was designed, not the most recent versions, normally apply unless a modification, commitment, or technical safety requirement change invokes a more current version.

[6] Do not include documents listed as performance documents.

[7] If there is more than one type of source requirement document, use subheadings to list them. For example,

- DOE rules and orders
- Technical safety requirements and safety analysis reports
- Industry codes and standards.

3.10 Appendixes

Provide appendixes when the material and function of the procedure require them. Appendixes are part of the procedure; number pages to show they are a continuation of the main body of the procedures. In addition, number appendixes independently to ensure all pages are available if the appendix is detached from the main body of the procedure.

Examples of items that may be placed in an appendix are forms, tables, figures, graphs, and some checklists that are too large to incorporate in the sequence of action steps.

[1] Reference appendixes within the text of the procedure.

[2] Include in appendixes information more conveniently located outside the main body of a procedure. Example 3-21 illustrates a suggested format for a valve alignment checklist.

EXAMPLE 3-21. Valve alignment checklist.

SHIELD HX CW				SP-SHS-1-K Rev. 0 Page 19 of 23
APPENDIX D SHIELD SYSTEM HX COOLING WATER SUPPLY & VALVE ALIGNMENT CHECKLIST (Page 1 of 2)				
Component Noun Name	Description (Location)	Valve Number	Required Position	Initials
Bypass effluent to HX		CWS-V-272D	OPEN	— IV
Flow pressure tap		CWS-V-1513	OPEN	—

[3] Avoid using vendor information as appendixes.

[a] Integrate approved vendor information into procedures, when possible, rather than referencing the information.

[b] Refer to administrative requirements for processing and using vendor information.

4 WRITING ACTION STEPS

The basic element of an action step is an imperative sentence—a command to perform a specific action. An action step answers the question "what is to be done?" Additional elements, such as cautions and condition statements, add precision to instructions.

4.1 Writing Basic Action Steps

EXAMPLE 4-1. Basic action step.

Action Verb	Direct Object	Supportive Information
Label	the actuator disposal can	with Identification Tag Form 45

NOTE **In many requirements documents, required actions are expressed by using "shall" in declarative sentences (for example, "The manager shall approve the completed work order" for "Approved storage shall be provided for classified documents"). The words "will", "should," and "must" are similarly used. In procedures governed by the guidelines in this writer's guide, this type of sentence is not used to express required actions. Imperative sentences (commands) are used instead, as illustrated throughout this guide.**

[1] Start the basic action step with a singular present tense action verb such as open. Appendix E of this guide includes a list of suggested action verbs.

[2] Describe the direct object of the verb.

[a] Identify equipment precisely as it is in the facility.

[b] If the equipment is not labeled within the facility, use equipment nomenclature precisely as it appears in the procedure basis documentation.

[c] Avoid using acronyms and abbreviations when writing action steps, particularly for short, simple words and terms. If an acronym or abbreviation is used, it must (a) be easily understood by the users and (b) have a standardized and unique meaning for the users.

[d] Use only acronyms and abbreviations that are included in an approved, site-specific list.

[3] Complete the basic action step with supportive information about the action verb and the direct object. Supportive information includes further description of the object and the recipient of the object. Acceptance criteria, referencing, and branching are other types of supportive information that are described later in this section.

[4] Identify each action step and action substep with a special identifier (as established in Section 3, "Action Step Numbering") to distinguish the action steps from each other and from topical headings and explanations.

EXAMPLE 4-2. First-level action step with two second-level action steps.

---

[3] Prepare compressed gas cylinders as follows:

[a] Select compressed gas cylinders with current in-service dated gas certification. ____

[b] Verify that each cylinder regulator will maintain 35 psig (30 to 40 psig). ____

---

[5] Write action steps using words that are easily understandable by the users. Where a word is used that requires a definition, include the definition as (a) part of that action step or (b) as a note that immediately precedes the action step.

[6] Restructure the actions as needed to avoid using action sub-substeps. Break one section into two or more sections to simplify the action step structure if necessary.

[7] Place three or more objects of the verb in a separate table or listing with appropriate checkoff boxes or signoff blanks.

[8] Consider combining multiple verbs with the same object in a single action statement.

EXAMPLE 4-3. Three action verbs combined in a single action statement.

---

[12] Sign, date, and transmit completed form to Records Management. ____

---

[9] If someone other than the primary procedure user is responsible for performing an action step, identify the person to perform the task directly above the affected action step.

EXAMPLE 4-4. Identification of performer of action step.

---

[2] Torque head bolts with torque wrench set at 90 foot-pounds. ____

QA Inspector

[3] Verify that head bolts are torqued to 90-foot pounds. ____

---

[10] Use emphasis techniques (for example, **bold**, *italics*, or underlining) to highlight important information, with the following constraints: (a) do not use all capital letters for blocks of text, (b) do not capitalize the first letter of any words unless they are formal, proper nouns in accordance with standard American English usage or they are the first word of a sentence, and (c) avoid the overuse of multiple emphasis techniques.

[11] Specify numbers in the procedures at the same precision than can be read from the instruments.

[12] Avoid requiring users to make conversions from one unit of measure to another whenever possible. Provide an aid for the user if conversions are essential. Do not require mental calculations.

[13] Use consistent vocabulary, syntax, and punctuation

[a] Include articles (a, an, the) when referring to a general item; omit the article when referring to specific items (for example, "Open the door," "Open door DW-9").

[b] Use punctuation in accordance with standard American English.

[c] Present action steps, including associated action substeps and lists, with a minimum of interruption (for example, page breaks).

[d] Follow standard grammatical principles.

[e] Use words consistently within and among procedures.

[f] Use short, simple words.

[g] Avoid ambiguous or vague adverbs.

[14] Use main action steps to allow users to quickly comprehend the purpose of the action step. Use action substeps to provide specific details for performance. Both main action steps and action substeps use the same basic action step form.

[15] Avoid formatting an action step so that it continues onto the next page.

[16] Present numerical information in Arabic numbers (as opposed to Roman numerals). Use spelled-out numbers only when one number without a specified unit of measure is followed directly by one with a unit of measure or when a number, typically a single digit number, is emphasized.

4.2 Conditional Action Steps

Conditional action steps are used when a decision is based upon the occurrence of a condition or a combination of conditions. The use of conditional action steps is extremely important in technical procedures as they structure the decisions required by the operator. Conditional action steps use the following logic terms:

- IF or WHEN to present the condition to the user
- THEN to present the action
- OR or AND to present more complex conditions
- NOT to negate the condition

Other words (for example, "except", "unless", "but", "only") should never be used to present conditional information.

[1] Describe the condition first and then the action to be taken if that condition applies.

EXAMPLE 4-5. Proper sequence for conditional statements.

---

[6] IF the plug piece is not clean,
THEN wipe the cone base off with an alcohol moistened cotton swab. ☐

---

[2] Emphasize conditional terms in procedures. By convention, conditional terms are usually capitalized and underlined. The emphasis techniques used for conditional terms should be applied uniquely to conditional terms. Additionally, white space

can be used to add emphasis in conditional statements, for instance, by starting each new conditional term on a new line.

[3] If two conditions are required and both of these conditions must be met, then place the conditional term AND between the conditions. Begin a new line when presenting the second condition and begin a new line with THEN and the action.

[4] If two conditions are involved and one or both of these conditions must be met before the action is taken, place the conditional term OR in underlined capital letters between the conditions. Begin a new line when presenting the second condition and begin a new line with THEN and the action.

[5] If three or more conditions are described, consider using a decision table or a listing format.

EXAMPLE 4-6. Use of a listing format for three or more conditions.

[6] IF all of the following conditions exist,

A. Condition 1

B. Condition 2

C. Condition 3

THEN open CWS-HMOV-290, ECW pump discharge valve. _____

[6] Avoid using AND and OR in the same conditional statement as the resulting logic can be ambiguous and difficult to understand.

EXAMPLE 4-7. Avoid using AND and OR in the same statement.

Do not use: [8] IF condition A OR condition B AND condition C,
THEN open valve D.

Use: [8] IF condition A OR condition B,
AND condition C,
THEN open valve D.

[7] Use only AND and OR to join conditions that include both a subject and a predicate. If two subjects apply to the same predicate (for example, 'IF temperature and pressure are stable, ...") or one subject takes two predicates (for example, "IF level is stable or falling, ...") use the unemphasized conjunctions "and" or "or" rather than the special emphasized logic terms.

EXAMPLE 4-8. Two subjects with one predicate.

---

[5] WHEN cooling water pump and pump discharge pressure have stabilized, THEN close CWS-V-3351-1 bypass isolation valve. ____

---

[8] For a negative condition, use the conditional term NOT. Avoid using NOT if a single word can be used and the condition can be stated in a positive manner. For example, "IF the valve is open, ..." is preferable to "IF the valve is NOT closed, ..."

4.3 Nonsequential Action Steps

Procedure users should perform the action steps in the order they are written unless they are specifically directed to perform action steps in another order. When the objectives of the action steps will be met regardless of the sequence they are performed, then

[1] Sequence the action steps according to usability criteria, such as according to equipment or control board layout, to reduce opportunities for error.

[2] Identify in a consistent fashion that a series of action steps can be performed nonsequentially. Place a note before the sequence of action steps that can be performed nonsequentially, as shown in Example 4-9.

EXAMPLE 4-9. Note announcing nonsequential action steps.

NOTE *The activities in Action Steps **[1]** through **[7]** may be performed in any order.*

---

[3] Provide a checkoff box or signoff line for every action in a series of nonsequential action steps to ensure that action steps are not omitted.

4.4 Equally Acceptable Alternative Action Steps

Equally acceptable alternative action steps are used when it is beneficial for users to be provided with more than one option. It is important to ensure that only one alternative is performed.

[1] Present alternative actions as items in a list within a single action step.

[2] Use the word one in lower case underlined to introduce the list of alternatives (for example, "Perform one of the following actions").

[3] Provide a checkoff line for every action as a series of alternative action steps to ensure that action steps are not omitted and that redundant actions are not performed.

[4] Specify that users only check off those action steps actually performed.

EXAMPLE 4-10. Two equally acceptable action steps.

[1] Perform one of the following actions: Check action taken

- Set Switch S-7 to "ON" ____
- Set Switch S-9 to "ON" ____

4.5 Time-dependent Action Steps

Some action steps contain actions that impose time requirements on the user by specifying the duration of actions or actions that must be completed within a specific period of time.

[1] Place a note before the action steps to be timed in order to alert the user.

[2] Begin the action steps with instructions for the user to record critical time information and provide the user with a place to record this information. Typically this information will be the time that "starts the clock," and the time by which some action step or action must be completed.

[3] Include guidance to identify the actions to take in the event that the time-dependent action step cannot be performed within the specified time.

EXAMPLE 4-11. Time-dependent action steps.

NOTE *The following action step starts a time-limited sequence. Action steps [2] through [5] are to be performed within 20 minutes.*

[1] Calculate the time by which action step **[5]** is to be completed by the following steps:

[a] Record the time that action step **[2]** is to be started. _____

[b] Add 20 minutes. + 20 minutes

[c] Record the time that action step **[5]** is to be completed. _____
Complete by

[2] Place the Incident Action switch to TEST. ____

[3] Verify the amber *ALARM TEST* light on the AIA graphic panel is LIT. ____
IV

[4] Place the *Incident Action* switch to OFF. ____

[5] Push the *RESET* pushbutton on the AIA logic tester and record the time. _____

[6] IF the time recorded in action step **[5]** is later the time recorded in action step **[1] [c]**, THEN REPEAT action steps **[1]** through **[5]**.

[4] A note advising of time-dependent actions and instructions to record the time information are not required when the time requirement is an inherent part of the action step and misunderstanding is unlikely.

EXAMPLE 4-12. Time-dependent action step.

[1] Push *Generator Start* pushbutton, and verify that the Generator started within 12 seconds.

_____ _____ ____
Time to Start Initial IV

4.6 Concurrent Action Steps

Concurrent action steps contain actions that must be performed at the same time. For example, parameters may have to be monitored or checked while the user accomplishes another action, or two performers in different locations may have to execute actions simultaneously.

[1] If concurrent action steps are to be performed by one person, place those actions in one action step that describes precisely the relationship between the action steps.

[2] If concurrent action steps are to be performed by more than one person, place a note before the first concurrent action step, as appropriate, identifying

- Concurrent action steps
- Personnel needed to perform each concurrent action step
- Locations where the action steps are performed
- Means of communication between locations.

4.7 Continuous Action Steps

Continuous action steps are conditional action steps where the conditions they describe must be monitored throughout a procedure or a portion of a procedure. For example, a user may need to monitor a gauge and take a specific action if the gauge, at any point during the procedure, indicates a reading above or below a specific level.

[1] Place continuous action steps in the procedure at the point at which they first apply. Repeat the action steps periodically, as appropriate, on the facing pages of the procedure or in the body of the procedure.

[2] Format continuous action steps as conditional action steps and state the portion of the procedure during which they are applicable, as shown in Example 4–13.

EXAMPLE 4-13. Continuous action step.

---

[7] IF at any time while performing Action steps [9] through [17] condition X exists, THEN take action Y.

---

[3] Notify the user when continuous action steps are to be discontinued.

4.8 Repeated Action Steps

Repeated action steps are simple action steps that must be performed more than once during the execution of a procedure.

[1] If an action step must be repeated an indefinite number of times to achieve an objective, specify that the action step is to be repeated until the expected results are achieved. Only a single signoff line is provided for this action step regardless of the number of times the action step is performed.

EXAMPLE 4-14. Repeated action step.

[8] Vary input signal until switch SW-1-7 trips. ___

[2] If it is important to know the number of times the sequence is repeated, provide placekeeping (see Section 4, "Placekeeping").

[3] If an action must be performed repeatedly at timed intervals, place instructions in the procedure and provide suitable space to record the times that the action step is performed.

[4] If an action step is to be performed periodically throughout a procedure or a portion of a procedure (but not at specific timed intervals), place reminders as action steps in the body of the procedure.

[5] If a large group of repetitive actions is required and becomes cumbersome, address the actions in action steps that reference a table, a list, or an appendix (an example of a large group of repetitive actions is a series of valve alignments).

[6] Notify the performer when repeated action steps are to be discontinued.

4.9 Action Steps Containing Verifications, Checks, Notifications, and Data Recording

Verification action steps assure that a specific activity has occurred or that a stated condition exists. Manipulation by the user may be required. Check action steps call for a comparison with stated requirements; and no manipulation by the user occurs. Notification action steps require reporting when given criteria are met. Data recording action steps assure that desired data are recorded.

[1] Provide appropriate space or tables for entering data (either in the procedure or in data sheets).

[2] If the condition to be verified or checked is not found, provide the appropriate actions to take.

[3] Include labeled lines in action steps as necessary for users to record required information.

EXAMPLE 4-15. Format for data recording of individual action step showing sign off by initials.

---

[10] Record cooling water flow to Cylinder 12 Cooling Jacket.

_____ _____ _____

Required GPM Actual GPM Initials and date

---

[4] Specify required independent verification and inspection action steps (the number of independent verification and inspection action steps increase as the consequences of performance error increase).

[5] Include directions for notifying other personnel as discrete action steps. Actions requiring notifications of others often include

- System alignments to be performed.
- Systems to be removed from or returned to service.
- Alarms and alarm setpoints that may annunciate as a result of performing the procedure.
- Equipment actuations that are expected to occur during performance of the procedure.
- Actions with electrical or mechanical interlocks involved (e.g. interlocks to be honored or overridden).
- The effects of precautions and limitations on the operating conditions, noting which equipment will be inoperative and which lights, alarms, or annunciators will react.

- Changes or special conditions established by the procedure that could affect or appear to affect other equipment or systems. For example, performing the procedure could involve mechanical or electrical bypass (lifted leads, inhibits, jumpers, and fuse removals) or other functional restrictions.

- Methods and instructions for communication among multiple persons required to perform an action.

- Inspection for degradation of qualified equipment (for example, environmentally qualified or seismically qualified equipment).

[6] Identify parameters and acceptable ranges needed to perform the procedure.

[a] Use the same units of measure in the procedure that users will read from the facility instrumentation.

[b] If there is an acceptable range for a parameter, include the acceptable range rather than a point value.

4.10 Action Steps with Warnings, Cautions, and Notes

Warnings alert users to potential hazards to personnel. Cautions alert users to potential hazards to products or equipment. Notes call attention to important supplemental information.

4.10.1 Warnings and Cautions

Warnings and cautions attract attention to information that is essential to safe performance; they usually consist of the conditions, design limitations, practices, and procedures to be complied with to avoid loss of life, personal injury, health hazards, or damage to equipment. An industry study of significant events attributed one-fourth of all human performance events to a failure to provide proper warnings and cautions.

[1] Review potential hazards with facility technical specialists to determine warnings or cautions that need to be included.

[2] Determine those parts of the procedure where the addition of information is necessary.

[3] Review each action step and list the potential hazards in warning or caution format.

[4] Position warnings and cautions so they are complete on one page and appear immediately before and on the same page as the action step(s) to which they apply

[5] Place warnings ahead of cautions whenever more than one type is used at the same point in a procedure.

[6] Do not include action steps in warnings and cautions.

[7] Write warnings and cautions as short, concise statements. Write warnings and cautions as statements rather than as commands to distinguish them from action steps (for example, "Touching this wire will electrocute you!"). Do not embed an action step in a warning format (for example, do not rewrite the instruction "Shut the valve," as "The valve should be shut").

[8] Ensure that cautions and warnings provide (a) a description of the hazardous condition, (b) the consequences of failing to heed the warning or caution, and (c) critical time considerations.

[9] Present the text of warnings and cautions using appropriate techniques to ensure visual identification. (Do not use all capital letters to distinguish warnings and cautions because they are hard for users to read.)

[10] Include only one topic in each warning or caution.

[11] Number each warning or caution when more than one exists (see Example 4-16).

[12] If the danger is present during the entire procedure, place the warning or caution in the precautions and limitations section.

[13] Repeat the information in precautions as separate cautions or warnings within the body of the procedure as it applies to individual action steps.

[14] Avoid overusing warnings and cautions.

EXAMPLE 4-16. Numbered cautions.

CAUTION 1

Operating the generator system at speeds less than 700 rpm for longer than 10 minutes with the exciter regulator in operation may cause damage to the exciter regulator field.

CAUTION 2

In the event of a power failure, emergency equipment will start and overload the diesel if the diesel is isolated on the emergency bus during testing.

4.10.2 Notes

Notes call attention to important supplemental information. The information can be a reminder of preparatory information needed to perform the activities of a procedure or action step.

[1] Use notes to present information that assists the user in making decisions or improving task performance.

[2] Position notes so they are complete on one page and appear immediately before and on the same page as the action step(s) to which they apply.

[3] Place warnings and cautions ahead of notes whenever more than one type is used at the same point in a procedure.

[4] Do not include action steps in notes. Embedded actions should be removed from the note and written as action steps.

EXAMPLE 4-18. Note presentation.

- Wrong form: contains a hidden command

  NOTE *A timed duration starts when fluid collection begins. Time is measured and fluid is collected from the end of the test hose (at the floor drain) into a graduated cylinder.*

- Correct form: rewritten to remove embedded action step

  NOTE *A timed duration starts when fluid collection begins in Action step [12] below.*

[12] Collect fluid from the end of the test hose (at the floor drain) into a graduated cylinder.

---

[5] Number the notes if more than one note is entered at the same location in a section or subsection.

EXAMPLE 4-17. Numbered notes.

NOTE 1 *The following action step closes generator breaker G-1 and starts diesel DL-I.*

NOTE 2 *The following action step requires a time measurement starting at the initiation signal.*

[6] Write notes as short, concise statements. Write notes as statements rather than as commands to distinguish them from action steps (for example, "The following action step starts a timed duration.").

[7] Use appropriate emphasis techniques (for example, *italics*) to distinguish notes from cautions or warnings.

[8] Include only one topic in each note.

[9] Avoid overusing notes.

4.11 Action Steps Directing Users Elsewhere—Branching and Referencing

To perform a task, sometimes users must branch or reference another procedure, section, or appendix. Branching routes the procedure user to other action steps or sections within the procedure or to other procedures, and the user does not return to the original position. Referencing routes the procedure user to other action steps or sections within the procedure or to other procedures and then back to the original position in the base procedure.

Referencing and branching increase the potential for error with attendant safety and administrative consequences. Therefore, branching and referencing are highly discouraged. Use referencing and branching only when it is necessary to direct the user to information that is vital to the performance of the activity and it is not appropriate to incorporate that information into the base procedure.

[1] Evaluate the following criteria to determine if referencing or branching is appropriate. If the answer to all of the following is "NO", then referencing or branching may be appropriate.

- Can action steps be readily incorporated rather than referenced?
- Will branching and referencing decrease user comprehension and ease of use?

- Will users be directed to small, isolated sections, rather than whole procedures or appendixes?

- Will branching and referencing cause users to bypass prerequisites that affect the section to which they are being directed.

- Will branching and referencing cause users to bypass precautions and limitations that affect the section to which they are being directed.

[2] If referencing or branching is appropriate, then use the following methods for referencing and branching:

[a] Make it clear to the users that they are being directed to other material. Do not expect them to know implicitly that other material is being referenced.

[b] Fully specify the location the user is to go when cross-referencing. If the user is being sent to another procedure, identify the procedure number, title, and section of the procedure. If the user is being sent to another location in the base procedure, identify the specific location in the procedure.

[c] Use a consistent format for presenting cross-references. Emphasize key words consistently so that users can identify a cross-referenced action step. Use a term such as GO TO presented in all capital letters to indicate departure from the base procedure.

[d] If referencing, use the term RETURN TO presented in all capital letters to indicate the reentry point into the base procedure.

[e] If referencing, use the terms GO TO and RETURN TO in the same action step.

[f] Ensure that a reference or branch directs the user to all material needed as a prerequisite to the identified material. For example, ensure that in executing a reference or branch, the user does not bypass an applicable caution or prerequisite action step.

Data sheets are used exclusively for recording information, not prescribing how action steps are to be completed. Therefore, the referencing and branching techniques of this section are not applicable to data sheets.

4.12 Action Steps with Acceptance Criteria

Acceptance criteria provide a basis for determining the success or failure of an activity. Acceptance criteria may be qualitative (specify a given event that does or does not occur) or quantitative (specify a value or value range).

[1] Determine where specific acceptance criteria are to be presented in the procedure. Either or both of the following methods can be used.

[a] State the location of acceptance criteria, whether located at individual action steps (used when criteria are satisfied at the time of performance) or located in data sheets or other procedures. When acceptance criteria are located in other procedures, link procedures using referencing techniques if the information cannot be included in the procedure.

[b] Provide a summary of the acceptance criteria in a table or a list as an appendix.

EXAMPLE 4-19. Statement regarding the location of acceptance criteria

---

Summary of Acceptance Criteria

Specific quantitative or qualitative requirements that are intended to be verified by this procedure are noted in the action step(s) where the verifying action is performed and recorded.

---

[2] Include instructions for notifications to be made or actions to be taken immediately by the user, in the event that specified acceptance criteria are not met.

[a] Place these instructions or actions in the body of the procedure.

[b] Ensure that these actions are consistent with administrative instructions.

[3] Include subsequent notifications and actions, such as those to be taken by reviewers, with the acceptance criteria.

EXAMPLE 4-20. Notification of failure to meet acceptance criteria.

---

[14] IF specific acceptance criteria stated in action steps [15] through [19] are not met, THEN notify the shift manager as soon as practical after observing the nonconformance.

---

[4] Use acceptance criteria that consist of nominal values and, if available from the procedure basis, allowable ranges.

4.13 Action Steps with Placekeeping and Sign Offs

4.13.1 Placekeeping

Placekeeping helps users to keep track of their progress in a procedure and reduces the probability of omitting or duplicating action steps. The placekeeping mechanism typically consists of checkoff boxes.

[1] If initials or signatures are not required, provide a placekeeping checkoff box near the right margin of the page or the right side of a table.

EXAMPLE 4-21. Check off box for placekeeping at the action step.

---

[8] Turn the transformer test switch to the TEST position. ☐

---

[2] If placekeeping must be performed on a separate checklist, arrange the placekeeping items in the order the actions are to be performed and reference the associated action steps in the procedure on the checklist.

4.13.2 Sign Offs

Written responses for action steps that require independent verification, inspection, data recording, or documentation of completion can also be placekeeping devices. The use of signatures, initials, check marks, and "N/A" should be defined in site-specific administrative procedures. A signoff action step includes one or more of the following elements:

- A blank line for verification, notification, or inspection signatures or initials
- A blank line for sign off by a person other than the user
- Blanks for recording data and the initials or signatures of persons recording the data.

[1] If procedures require that action steps be signed off, provide space for the sign off of the action step.

[2] Provide a space for the date and/or time of a signoff where such information is determined to be useful.

[3] Position a blank signature or initial line (for entering initials that identify the persons signing off the action step) immediately following the affected action step, or on a separate data sheet or checklist, if necessary.

[4] If the signoff is located in one procedure and the action to be signed off is located in a referenced procedure, indicate in the base procedure action step that documentation occurs in the **referenced procedure signoff space.**

EXAMPLE 4-22. Verification by the user showing sign off by initials.

---

[14] Verify ISV Pump A discharge valve (ISV-A-D2) CLOSED. ____

---

[5] Use the following methods to differentiate between sign offs required of the user and those required of other personnel.

[a] If the action step is to be signed off by someone other than the principal user, place the title or function of the responsible person under the blank line.

[b] If the action step is to be signed off by the user, place no identifying title or function under the blank line.

[6] Do not combine two closely related actions each requiring a sign off into a single action step. Make two separate action steps with individual sign offs.

[7] If an independent witness or other second sign off is needed, provide an additional space for initials and identify that an IV (independent verification) sign off or other specified signature is required.

EXAMPLE 4-23. Independent verification or second sign off of same action step showing sign off by initials.

---

[13] Verify safety system pneumatic valve (ISV-P-2) CLOSED. ____ ____
IV

---

[8] Identify action steps requiring a hold point (action steps that require inspection of the actions performed). Inspections of the results of a action step before initiating

successive action steps are normally designated as hold points. Hold points may involve quality assurance, health physics, engineering, or other inspectors.

EXAMPLE 4-24. Action and hold point verification sign off in the same action step.

Hold Point:

[3] Torque head bolts with torque wrench set at 90 foot-pounds.

_____
QA Inspector

[9] Include places for entering initials or signatures to identify persons recording data when presenting action steps in tables.

EXAMPLE 4-25. Sign off of a series of data points.

Parameter	Tolerance	As Found	As Left	Initials
Pressure	290 psig (285 to 295)			__ __ IV
Temperature	350°F (345 to 355)			__ __ IV
Level	20 ft (19.5 to 20.5)			__ __ IV

4.13.3 Sign Off or Check Off of Conditional Action Steps

In some instances, performing an action depends on a condition or combination of conditions. Conditional action steps are introduced by the words IF or WHEN and are followed by an action.

[1] Provide a space for the user to mark conditional action steps where a sign-off or check-off is desired. Typical entries indicating the appropriate action was taken

are "N/A" if the condition does not occur or a check mark or initial if the condition does occur. Direct the user what to place in the space.

EXAMPLE 4-26. Conditional action step with a sign off.

---

[4] IF outside temperature is less than or equal to 39°F
AND heated air is required,
THEN place coils in service.

Enter N/A or Initials

---

5 DEVELOPMENT REFERENCES

1. U.S. Department of Energy, DOE Order 5480.6, *Safety of Department of Energy-Owned Nuclear Reactors.*

2. U.S. Department of Energy, DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities.*

3. U.S. Nuclear Regulatory Commission, NUREG-0899, *Guidelines for the Preparation of Emergency Operating Procedures*, August 1982.

4. U.S. Nuclear Regulatory Commission, NUREG/CR-1368, *Development of a Checklist for Evaluating Maintenance, Test, and Calibration Procedures Used in Nuclear Power Plants*, May 1980.

5. U.S. Nuclear Regulatory Commission, NUREG/CR-1369-Rev. 1, *Procedures Evaluation Checklist for Maintenance, Test, and Calibration Procedures*, September 1982.

6. U.S. Nuclear Regulatory Commission, NUREG/CR-1875, *Evaluation of Emergency Operating Procedures for Nuclear Power Plants*, April 1981.

7. U.S. Nuclear Regulatory Commission, NUREG/CR-1999, *Human Engineering Guidelines for Use in Preparing Emergency Operating Procedures for Nuclear Power Plants*, April 1981.

8. U.S. Nuclear Regulatory Commission, NUREG/CR-2005-Rev. 1, *Checklist for Evaluating Emergency Operating Procedures Used in Nuclear Power Plants*, April 1983.

9. U.S. Nuclear Regulatory Commission, NUREG/CR-3177, *Methods for Review and Evaluation of Emergency Procedure Guidelines, Volume 1: Methodologies*, March 1983.

10. U.S. Nuclear Regulatory Commission, NUREG/CR-3177, *Methods for Review and Evaluation of Emergency Procedure Guidelines, Volume 2: Applications to Westinghouse Plants*, March 1983.

11. U.S. Nuclear Regulatory Commission, NUREG/CR-3177, *Methods for Review and Evaluation of Emergency Procedure Guidelines, Volume 3: Applications to General Electric Plants*, September 1983.

Appendix A: Worksheets

	Procedure Basis **Administrative Requirements Worksheet**	**Proc. No.**
	Title	**Revision** **Page of**

Function	Requirement Source	Responsible Position Organization	Addressed in Section/Subsection
Verifications			
Notifications			
Inspections			
Permits or Approvals			

Appendix A

	Procedure Basis Feedback Worksheet	**Proc. No.**
	Title	**Revision**
		Page of

Writer Observation or User Comment	Information Source	Addressed in Section/Subsection

Appendix A

	Procedure Basis Activity Worksheet	Proc. No.
	Title	Revision Page of

Instruction Sect./Subject No. _____ Activity No. _____	
Activity Description	
Participant Position Titles	Special Training/Qualification Requirements
Technical Requirements (Equipment ID, setpoints, operating values and ranges, common mode failure, cautions, warnings, limitations)	
Level of Detail Considerations (Knowledge and Skill Level, Complexity, Frequency, Consequences, Standardization)	
Interfaces (Other personnel or Instructions)	

Appendix A

	Procedure Basis **Program Support Requirements Worksheet**	**Proc. No.** **Revision**
	Title	**Page of**

Description of Support Activity	Responsible Position/Organization	Addressed in Section/Subsection

Appendix A

	Procedure Basis **Acceptance Criteria Worksheet**	**Proc. No.** **Revision** **Page of**
	Title	

Criteria	Affected Activities	Addressed in Section/Subsection

Appendix A

	Procedure Basis Records Worksheet	**Proc. No.** **Revision** **Page of**
	Title	

Record*	Recommended or Required Retention	QA	Non-QA

*Group in packages, if appropriate

Appendix B: Example of a Technical Procedure

This appendix contains an example of a technical procedure, "Reservoir Plug Welding", which has been structured and formatted according to this guide. The example demonstrates much of the guidance put forward in this writer's guide and supplements the examples given in the text. The procedure was adapted from an actual procedure in use at a DOE facility. The main purpose in adapting this procedure was to illustrate the structure and formatting guidance, not to demonstrate a technically perfect procedure. The adapters did not have access to the procedural basis and so could not verify the technical assumptions implicit in the adaptation.

Parts of the example procedure have been omitted as they provided no additional exemplary material. These omitted sections have been identified in the body of the procedure.

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SOP-618-4

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Approved October 22, 1991
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Reservoir Plug Welding

Building 618

PERFORMANCE SECTIONS:

[4] RESERVOIR CHECK-IN AND ACTUATOR REMOVAL

[5] WELD PREPARATION

[6] PLUG WELDING

[7] DECONTAMINATION OF RESERVOIRS

[8] RESERVOIR STORAGE

Approved By:_____

Appendix B

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1 INTRODUCTION

1.1 Purpose

This procedure provides instructions for reservoir plug welding and storage of plug welded reservoirs.

1.2 Scope

This procedure addresses the actions necessary to plug weld reservoirs, to decontaminate them, and to store them. It does not include receipt and unpackaging of reservoirs, nor does it address rework of improperly welded reservoirs.

1.3 Applicability

This procedure is applicable to reservoir Types 1A and 1A with **rings.**

2 PRECAUTIONS AND LIMITATIONS

A. Dropped reservoirs can cause personal injury if safety shoes are not worn.

B. This procedure can cause eye injury if safety goggles are not worn.

C. Filled reservoirs present a radiological hazard. Do not bring filled reservoirs into Building 618.

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2 PRECAUTIONS AND LIMITATIONS (continued)

D. Handling unplugged reservoirs presents a chemical release hazard. Do not handle unplugged reservoirs outside of hoods.

3 PREREQUISITE ACTIONS

3.1 Performance Documents

[1] Obtain SOP-618-23, "Performing a Test Weld", which may be needed for performance. ☐

3.2 Special Tools, Equipment, Parts and Supplies

[1] Identify, according to the following table, and obtain the appropriate weld fixtures that will be needed for this batch of reservoirs before proceeding:

Type Reservoir	Electrode Sleeve	Pedestal Fixture Number	Number	
1A	D145795G	4.8.1	D144784-D	☐
1A w/ rings	D144993A w/ 0.5" copper spacer	4.8.2	D145784-D	☐

[2] Obtain conical reservoir plug pieces (Part No. 14678). ☐

[3] Obtain a 0.275 inch electrode. ☐

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3.3 Approvals

[1] Consult with, and obtain permission from, your supervisor before beginning performing this procedure

_____
Supervisor Initials

4 RESERVOIR CHECK-IN AND ACTUATOR REMOVAL

NOTE: *SOP-618-3, "Receiving Reservoirs", is used for receiving and unpackaging reservoirs.*

4.1 Checking in the Received and Unpackaged Reservoirs

[1] Complete Check Sheet/Data Sheet (Appendix A) for each received and unpackaged reservoir in the hood. ☐

- **[a]** Record the serial number of the reservoirs ☐
- **[b]** Record the reservoir type ☐
- **[c]** Verify that reservoir is unloaded and mark verification on check sheet ☐
- **[d]** Verify that reservoirs are acceptable to bury by ensuring that the status is "NRR" or "NWR" in the computer system. ☐

Supervisor:

[2] Verify that the serial number(s) on the Check Sheet/Data Sheet (Appendix A) match the reservoir(s) which have been unloaded. ☐

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4.1 Checking in the Received and Unpackaged Reservoirs (continued)

[3] IF any foreign material is around the fill stem area,
THEN remove the foreign material with alcohol and rag and/or grid paper. ☐

4.2 Removing the Actuator

NOTE: *A pair of vise grips, a pair of pliers, or a wrench is used to remove the actuator.*

[1] IF the reservoir is equipped with an actuator,
THEN remove the actuator by the following steps. ☐

[a] Close the hood door. ☐

[b] IF the actuator cover can be moved freely,
THEN remove the actuator cover. ☐

[c] IF the cover is galled to actuator,
THEN leave the cap on the actuator
AND GO TO Step [1] [e] (in this Section 4.2, Removing the Actuator). ☐

[d] Install the shorting plug. ☐

[e] Position the reservoir on its side on the metal hood floor, so that the actuator and pit port(s) are pointing away from you. ☐

[f] Remove the actuator with pliers or wrench. ☐

[g] Place the actuator (with shorting plug, if installed) in aluminum foil and place it into the actuator disposal can. ☐

[h] Label the actuator disposal can with appropriate identification tags (Identification Tag Form 45). ☐

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4.2 Removing the Actuator (continued)

[2] Continue removing the actuators following Section 4.2, Removing the Actuators, step [1], until all the reservoirs, with actuators, in the current batch have been done. ☐

[3] WHEN actuator removal from the current batch of reservoirs is completed, THEN seal the actuator disposal can with its top ☐

[4] Seal the actuator disposal can in a plastic bag for removal from hood. ☐

Health Physicist:

[5] Check the bagged actuator disposal can. ☐

[a] Verify that off-gassing and contamination are within limits (1500d/m and $1x10^{-5}$ microcuries/cc of air). ☐

[b] Mark verification on bag label, initial, and date. ☐

[6] IF the Health Physicist identifies that off-gassing or contamination exceed prescribed limits,
THEN STOP this procedure
AND contact supervisor immediately. ☐

[7] WHEN the Health Physicist has cleared the package for off-gassing and contamination,
THEN transfer the sealed can with the actuator(s) to Building 618 Squib room. ☐

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5 WELD PREPARATION

NOTE *Vise grips, pliers, a file punch and a hammer are used to remove and/or open fill tube remnant.*

5.1 Preparing Reservoirs that have Stems that CAN be removed with Pliers

[1] Place the reservoir in the reservoir holding device. ☐

[2] Clamp the vise grips as close as possible to the base of the fill stem remnant. ☐

[3] Twist off the fill stem remnant. ☐

[4] IF the fill stem remnant cannot be removed by twisting with the vise grips, THEN GO TO Section 5.2, Preparing Reservoirs with a Stem that CANNOT be removed with Pliers. ☐

[5] Open up the fill hole for plug insertion by placing the punch in the fill hole and punching an indentation around the fill hole. ☐

[6] Remove the reservoir from the reservoir holding device. ☐

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5.2 Preparing Reservoirs with a Stem that CANNOT be removed with Pliers

[1] IF the reservoir has a wafer or stem that cannot be removed with pliers, THEN perform the following steps: ☐

(A lengthy series of steps has been omitted here. The omitted steps provide no further exemplary guidance for producing a procedure)

6 PLUG WELDING

[1] Ensure that these parts are available for use:

A. one 0.275 inch electrode ☐

B. reservoir plug pieces (Part No. 14678), and ☐

C. an appropriate weld fixture (identified in Section 3.2) ☐

[2] Start up welder. ☐

[3] IF welding plugs for the first time this week,
OR an electrodes has just been changed
OR a fixture has just been changed,
THEN GO TO SOP-618-23, performing a test weld
AND RETURN TO this procedure, Section 6, PLUG WELDING step **[4]** ☐

[4] Move the reservoir to the plug welding station. ☐

[5] Obtain a clean conical plug piece (Part No. 14678). ☐

Appendix B

6 PLUG WELDING (continued)

[6] IF the plug piece is not clean,
THEN wipe the cone base off with an alcohol moistened cotton swab. ☐

[7] Visually verify that both the welder base plate and fixture surface are free of foreign materials. ☐

[8] Visually verify the plug and the weld area on the reservoir are clean. ☐

[9] IF the plug and weld area are not clean,
THEN clean with a cotton swab moistened with alcohol
AND purge area with dry nitrogen. ☐

NOTE *Section 3.2 of this procedure contains information on fixture numbers.*

[10] Install the reservoir in the appropriate fixture. ☐

[11] Apply <300 lb_f to the welder by backing the nitrogen regulator out until the heise gage reads zero. ☐

[12] Adjust the motion transducer to 0.4000 (acceptable range of 0.3995 - 0.4005) on the motion readout. ☐

[13] Apply 1000 lb_f (acceptable range of 9950 lb_f - 1050 lb_f) by opening the nitrogen pressure valve to the welder piston rams. ☐

Appendix B

6 PLUG WELDING (continued)

[14] Adjust the transducer bracket until the motion readout indicates 0.4000 (acceptable range of 0.3995 - 0.4005). ☐

[15] Verify "Flow Normal" indicator light on the control panel is on. ☐

NOTE *The low flow switch to the welder is pre-set to 0.75 gpm.*

[16] IF "Flow Normal" indicator light is not on,
THEN rotate the water filters to attempt to correct the flow conditions, ☐
AND verify that "Flow Normal" indicator light is on. ☐

[17] IF "Flow Normal" light is still not on,
THEN STOP this procedure, ☐
AND contact supervisor immediately. ☐

[18] Verify "Pressure Normal" indicator light on the control panel is on. ☐

[19] IF the "Pressure Normal" indicator light is not on,
THEN adjust the pressure switch located on the side of the welder head to a slightly lower setting ☐
AND verify the "Pressure Normal" indicator light is on. ☐

[20] IF "Pressure Normal" light is still not on,
THEN STOP this procedure, ☐
AND contact supervisor immediately. ☐

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6 PLUG WELDING (continued)

[21] Verify "Resistance Normal" indicator light on the control panel is on. ☐

[22] IF the "Resistance Normal" indicator light is not on,
THEN check that the fixturing and items around the weld are not inhibiting current flow by insulating the fixture from the welder head or base. ☐
AND verify the Resistance Normal indicator light is on. ☐

[23] IF "Resistance Normal" light is still not on,
THEN STOP this procedure, ☐
AND contact supervisor immediately. ☐

NOTE *A low pitched buzz will indicate the weld occurred.*

[24] Switch the key operated weld selector switch on the control panel to WELD for 5 seconds, and then return the switch to OFF. ☐

[25] Record the post weld force, duffer current, and cycles on the Check Sheet/Data Sheet. ☐

Appendix B

6 PLUG WELDING (continued)

NOTE *The nominal values and the acceptable ranges are presented in the table in step **[26]**.*

[26] Verify readings are within the limits specified:

Parameter	No Tube	Step Stub Weld	
Current, amps	5000 (4500-5500)	4000 (3500-4500)	☐
Force, lb_f	1000 (950-1050)	1000 (950-1050)	☐
Cycles, Hz	25 (20-30)	25 (20-30)	☐

[a] IF the recorded readings are within the limits, THEN mark "YES" in the "Within Limits" column of the Check Sheet/Data Sheet ☐

[b] IF the recorded readings are not within the limits, THEN mark "NO" in the "Within Limits" column of the Check Sheet/Data Sheet ☐

[27] Switch station selector OFF. ☐

[28] Push emergency stop button to retract piston. ☐

[29] Remove reservoir from welder. ☐

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6 PLUG WELDING (continued)

NOTE *Weld should have uniform runout of weld flash and no evidence of cracking in weld runout. Plug should be visually perpendicular to the reservoir.*

[30] Visually inspect weld for acceptability.

[a] IF the weld appears acceptable,
THEN mark "YES" in the "Visual Inspection Acceptable" column of the Check Sheet/Data Sheet ☐

[b] IF the weld appears unacceptable,
THEN mark "NO" in the "Visual Inspection Acceptable" column of the Check Sheet/Data Sheet ☐

[31] IF this is the first reservoir of the day,
OR the first reservoir after an electrode change,
OR the first reservoir after a fixture change,
THEN contact Health Physicist to check for off-gassing from plug. ☐

Health Physicist:

[a] Verify the off-gassing rate from the reservoir plug is less than 1.0×10^{-5} microcuries per cc of air. ☐

[b] IF the Health Physicist identifies that a reservoir exceeds the off-gassing rate limit,
THEN STOP this procedure, ☐
AND Contact supervisor immediately. ☐

Appendix B

6 PLUG WELDING (continued)

[32] Continue plug welding, following Section 6, Plug Welding, steps[4] through [33], of this procedure until all the reservoirs in the current batch have been welded. ☐

[33] IF seal welding is completed for the day, THEN shutdown welder. ☐

7 DECONTAMINATION OF RESERVOIRS

(A lengthy series of steps has been omitted here. The omitted steps provide no further exemplary guidance for producing a procedure)

8 RESERVOIR STORAGE

(A lengthy series of steps has been omitted here. The omitted steps provide no further exemplary guidance for producing a procedure)

9 POST PERFORMANCE ACTIVITY

NOTE *This completed procedure is a record which is retained and dispositioned per the Records Inventory and Dispositioned Schedule.*

[1] Sign and date Check Sheet/Data Sheet. ☐

[2] Forward completed procedure to Building 618 clerk. ☐

APPENDIX A -- Check Sheet/Data Sheet

SERIAL	TYPE	RESERVOIR RECEIPT		WELD PARAMETERS			Within	Visual	DECONTAMINATION		
									Reservoir**	HP	Reservoir
							Limits	Inspection	Decon/Offgas	Inspector's	Stored
NUMBER	RESERVOIR	Unloaded	OK to Bury	Current	Force	Cycles		Acceptable	Within Limits	Initials/Date	In Cabinet

Operator's Initials ____	Operator's Initials ____	Operator's Initials ____
Date ____	Date ____	Date ____
Supervisor ____	Supervisor ____	Supervisor ____
Date ____	Date ____	Date ____

Note
* Record data in for weld parameters.
** Limits are 1500 d/m and $1 * 10^{-5}$ of microcuries/cc of air

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Appendix C: Glossary

acceptance criteria	Criteria that provide a basis for determining whether an activity has succeeded or failed. Acceptance criteria may be qualitative or quantitative.
actions	Specific action steps performed to accomplish a task.
action step	A procedure element that provides instruction for performing a specific action or task.
action substeps	Detailed actions that follow upper-level action steps. Performing all action substeps of an action step results in the action step being performed.
activities	Groups of related tasks performed to accomplish a goal.
appendix	Supplementary material at the end of a procedure. Appendixes include information more conveniently located after the main body of a procedure including forms, tables, figures and graphs.
approvals	Approvals are permission (OKs) from the responsible person(s) that an action or activity may take place. Approvals are usually obtained in written form, by signature or initials.
base procedure	The original procedure from which a user may be branched or referenced.
branching/branches	Branching routes the procedure user to other action steps or sections within the procedure or to other procedures and the user does not return to the original location.
caution	Cautions alert users to conditions, practices, or procedures that must be observed to avoid potential hazards involving products, equipment, and conditions adversely affecting site operations.
check	An action step that directs operators to see if a parameter has assumed a specified value or to see if a specific action has been carried out, and, if it has not, to take the next action specified (for example, notify supervisor).
check off	To check mark a box or line to indicate that the action step has been successfully accomplished.
concurrent action steps	Two or more action steps that are performed at the same time.
conditional action steps	An action step that is contingent upon certain conditions or combinations of conditions. Instructions performed if conditions warrant. Logic terms (for example, IF, AND, and THEN) are used to present conditional action steps.

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conditions of performance	The actual conditions under which the procedural activities are performed, including actual equipment location, lighting, ventilation, protective gear required, and temperature.
content	Subjects, topics, and technical information in a procedure.
contents	A listing of sections, subsections, appendixes that helps in locating those portions of the procedure.
continuous action steps	Action steps that apply for a period of time while the procedure is being executed.
coversheet	The first page of the procedure, which includes, as a minimum, the procedure title and page header.
data point	A discrete item of information. A data point is often quantitative but may be qualitative as well.
data recording	Writing down data points to obtain a written record of particular conditions at a given time. Data may be recorded for QA purposes or for use in further calculations or verifications.
decision tables	A format for presenting algorithms in tables.
equally acceptable action steps	Action steps that specify a number of equally acceptable alternative actions.
facing page	Either side of a two page spread of a procedure.
format	A plan or layout for the organization of pages in a document, including the size, style, typeface, margins, etc.
headings	Words or short phrases that introduce a section.
hold point	Hold points require users to wait until certain conditions exist or specific approvals or notifications have been made before continuing on in the procedure.
independent verification	Verification by someone other than the person who performed the task.

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level of detail	The level of technical detail presented in a procedure. Action steps that are written at a low level of detail include only general instructions and rely heavily on user training. Action steps that are written at a high level of detail precisely specify all actions.
logic term	One of the six words used in conditional action steps to structure the condition and relate it to the action: IF, WHEN, THEN, AND, OR, and NOT.
nonsequential action steps	Action steps that appear where they are first required but that may need to be performed later in the sequence of actions. Nonsequential action steps include continuous action steps, time-dependent action steps and repeated action steps.
note	Notes provide important supplemental information to users. This information is explanation, and contains no action or command.
notification	Notifications inform the appropriate personnel that an action or activity is about to occur or has already occurred.
page header	The page header appears at the top of every page and presents the procedure title, procedure number, revision number, revision date, and page number.
placekeeping	Placekeeping is used to assist the user in knowing what action steps have been accomplished in a procedure. Check off boxes are used to indicate that an action has been accomplished.
procedure	A procedure prescribes a process (a sequence of actions) to be performed to achieve a defined outcome.
referencing/references	Referencing instructions direct the users to temporarily abandon their place in the base procedure in order to perform action steps elsewhere in that procedure or in another procedure. When executing a reference, users always returns to the base procedure action step after performing the referenced action step(s).
repeated action steps	Action steps that are performed repeatedly at various times.

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revision log	The revision log identifies the revision history of the procedure and its effective date.
safety envelope	The safety envelope defines the conditions for which a nuclear facility has been designed, reviewed, evaluated, and determined to be capable of being safely operated. The safety envelope is determined by the facility design bases, design verification and functional test results, safety analyses, operating limits and surveillance requirements, and operating and maintenance procedures.
sign off	A sign off is a set of initials or a signature that indicates that the responsible person has successfully accomplished the action step. Sign offs may also be required of inspectors or other independent verification.
source requirements	Requirements implemented by the procedure.
table	Graphic representation of information where the items are placed in a matrix created by columns and rows.
task	A well-defined unit of work having an identifiable beginning and end which is a measurable component of the duties and responsibilities of a specific job.
task analysis	The systematic process of examining a task to identify skills, knowledge, and/or abilities required for successful task performance.
technical basis	The technical background and information, and the documentation of the background and information, needed as a basis for all technical content of a procedure.
technical procedure	Technical procedures prescribe production, operation of equipment and facilities, and maintenance activities. They do not include administrative nor emergency procedures.

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technical safety requirements (TSR)	Those requirements that define the conditions, safe boundaries, and the management or administrative controls necessary to ensure the safe operation of a nuclear facility and to reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials or from radiation exposures due to inadvertent criticality. Technical Safety Requirements consist of safety limits, operating limits, surveillance requirements, administrative controls, use and application instructions, and the basis thereof.
time-dependent action steps	Action steps that impose time requirements on the user by specifying the duration of an action or actions that must be completed within a specific period of time.
user	The person(s) actually performing the procedure.
verb	The part of speech used to indicate an action or state of being.
verification	Verification involves action steps that direct users to see if a parameter has assumed a specified value or to see if a specific action has been carried out, and, if it has not, to take actions to make it so.
walkdown	A walkdown is that segment of a walkthrough which consists of physically visiting and observing the location in which the activities are to be performed and the equipment that will be used. A walkdown is performed to ensure that the equipment and environment are actually as envisioned and the people involved can perform the required tasks.
walkthrough	The walkthrough is the cumulative, detailed check of the process and facility. Activities that may be used to complete walkthroughs include walkdowns, simulations or modeling.
warning	Warnings alert users to conditions, practices, or procedures that must be observed to avoid loss of life or severe injury. Warnings alert users to potential hazards to personnel.

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Appendix D: Acronyms and Abbreviations

DOE	Department of Energy
IV	Independent Verification
M&TE	Measuring and Test Equipment
N/A	Not Applicable
QA	Quality Assurance
Rev	Revision
SAR	Safety Analysis Report
TSR	Technical Safety Requirements

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Appendix E: Action Verb List

The following list of verbs is not intended to be comprehensive. Verbs are selected from this list where possible so that words have a meaning common to all performers.

Avoid using terms that do not provide specific instructions unless they are followed by specifying information. For example, "increase" used without qualification is almost meaningless, but "increase flow to maintain level above the inlet standpipe" provides the necessary information.

Many of these verbs have similar meanings. Once a verb has been selected for a related series of action steps, use it consistently.

Developing and using a site- or facility-specific verb list is highly recommended. The site-specific verb list may drawn upon the following list of action verbs and may also use verbs that have specific meaning at the site. All verbs on the site-specific verb list should be defined precisely and used consistently in all site procedures.

VERB	DEFINITION (as used in Action Steps)
Actuate	Place into a specific state of functional performance.
Add	Increase the size or quantity.
Adjust	Make an incremental change or series of changes to arrive at a desired condition.
Align	Arrange equipment into a specific configuration to permit a specific operation.
Allow	Permit the completion of a specific action.
Announce	To make known publicly.
Assemble	Put together what is required to provide an operational or functional capability.
Attach	To fasten one thing to another.
Balance	Adjust several parameters at the same time at certain points in a system to specified values.

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Barricade	To shut in or keep out with an obstruction.
Begin	Start an action or activity.
Bleed	Remove fluid from a piece of equipment at a restricted flow rate.
Block	Inhibit a capability of a specific system or piece of equipment.
Bolt	To attach or fasten with bolts.
Bypass	To circumvent a safety circuit (unless a single device provides for bypassing, such as a bypass switch, identify specific actions to bypass).
Calculate	To determine by computation (computation method should also be identified).
Change	To make different in some particular.
Charge	To load or fill (specific actions to charge should be included).
Check	Perform a comparison with stated requirements. No manipulation of equipment by the checker is involved.
Circle	To draw a circle around.
Clean	To rid of dirt, impurities, or extraneous matter.
Clear	To move people and/or objects away from.
Close	Manipulate a device to allow the flow of electricity or to prevent the flow of fluids, other materials, or light.
Collect	Cause the assembly of something in a fixed location or container.
Compare	Determine the relationship of the characteristics or values of different items, parameters, or conditions.
Complete	Fulfill or accomplish an instruction totally.

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Consult	To ask for advice, to take counsel; to refer to.
Connect	Join, fasten, or fit to permit a desired capability
Continue	Maintain or resume the performance of an activity or condition.
Cool	Lower the temperature of equipment or an environment
Coordinate	Arrange for activity involving other personnel.
Correct	Alter to reestablish a desired activity or condition.
Count	To add together.
Cover	Protect or shelter equipment.
Cycle	Cause repetition of an action or activity.
Declare	To make known formally.
Decrease	Produce a smaller value.
Deenergize	Remove the supply of electrical power to equipment.
Depress	Manipulate to effect a specific position of a device.
Depressurize	To release gas or fluid pressure from.
Determine	To find out; to ascertain.
Discharge	To give outlet or vent to a fluid or other contents.
Disconnect	Separate or detach.
Discontinue	To cease to operate, administer, use, produce, or take.
Dispose	Remove from a specific location.
Don	To put on an article of wear.

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Drain	Remove liquid from an enclosure or part of an enclosure, usually to empty.
Draw	To bring, take or pull out, as from a receptacle.
Energize	Provide equipment with electrical power.
Ensure	Confirm that an activity or condition has occurred in conformance with specified requirements (by action if necessary).
Enter	To make report of, set foot in.
Equalize	To make equal or uniform.
Establish	Bring about. Take necessary actions to cause a specified set of conditions to exist.
Estimate	Approximate the size, extent, or nature of a variable.
Evacuate	Vacate.
Evaluate	To assess; to determine the importance, size, or nature of; to appraise; to give a value to based on collected data.
Exit	To leave or withdraw.
Expedite	To accelerate the process or progress of.
Fill	Add fluid to a system or equipment to a prescribed point.
Filter	Pass fluid through a sized medium to stop the passage of unwanted material in the effluent.
Flush	Remove or clean with a washing action of a liquid.
Follow	Comply with an instruction.
Go to	Depart from a position in a procedure and resume at a different location in the procedure or in a different procedure.

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Ground	Provide an electrical path to a system at zero potential.
Guide	To manage or direct movement of.
Hold	Maintain a position for equipment, a place in a procedure, or an act of retention.
Identify	Determine or make known the parameter value or condition as related to a procedure.
Implement	To carry out; to accomplish.
Increase	Produce a larger value.
Indicate	Make known an activity, parameter value, or condition.
Inflate	To blow full with air or gas.
Inform	To communicate knowledge.
Initiate	To begin a process, usually involving several action steps or actions.
Inject	To introduce a new element; to drive a fluid.
Insert	Place or position into; move control rods into the reactor core.
Inspect	To examine; to perform a critical visual observation or check for specific conditions; to test the condition of.
Install	Fix or fit into equipment or a system.
Instruct	Direct or command.
Interchange	To substitute two items, one for another.
Investigate	To search or inquire into.
Isolate	To shut off or remove from service.

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Jumper	To make a connection between two circuit points not normally connected.
Label	To mark or identify.
Latch	To close or fasten.
Lift	Elevate to a higher level or remove, as in removing electrical leads or restrictions.
Limit	Restrict or impose bounds.
Locate	Determine or establish place or position.
Lock	Securely fasten, to prevent capability to function.
Log	To enter into a record of operations or progress.
Lower	Cause to move down or decrease position or value.
Lubricate	To apply a lubricant to.
Maintain	To hold or keep in any particular state or condition, especially in a state of efficiency or validity.
Minimize	To reduce to the smallest amount or degree.
Mix	Intermingle ingredients uniformly.
Monitor	Observe an activity, parameter value, or condition (usually on a continuous basis) to meet an instruction requirement.
Notify	Contact, advise, or communicate to make someone aware of an impending or completed activity, parameter value, or condition.
Observe	To watch carefully.
Obtain	To get or attain.

Appendix E

Open	Manipulate a device to prevent the flow of electricity or to allow the flow of fluids, other materials, or light.
Operate	Cause equipment or system to perform designed functions.
Pass	To go by; move by.
Perform	Carry out specified actions or action steps.
Place	To put or set in a desired location or position.
Plot	To represent graphically.
Plug	To connect or become connected, as in electrical plug; to stop or insert something.
Press	To act upon through thrusting force exerted in contact; to push.
Pressurize	To apply pressure within by filling with gas or liquid.
Prevent	To keep from happening.
Proceed	To go on in an orderly, regulated way.
Pull	To exert force upon so as to cause or tend to cause motion toward the force.
Purge	To make free of unwanted substance such as an impurity or foreign material.
Push	To press against.
Pump	Move a fluid in a piping system by the use of suction, pressure, or both.
Rack in	Insert a circuit breaker into its operating position.
Rack out	Withdraw a circuit breaker into its nonoperating position.
Raise	Cause to move up, or increase position or value.
Read	Obtain information visually.

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Recirculate	Cause repetitive motion of a fluid in a system.
Reduce	Decrease a variable to meet a procedure requirement.
Refer to	Use specified information that is in another location or procedure.
Release	To set free from restraint or confinement.
Remove	To take off, move away, or eliminate.
Repair	To restore to a sound state.
Repeat	Do again.
Replace	Install an equivalent part or component.
Request	Ask.
Reset	Reestablish a piece of equipment, part, or component to a previous condition, parameter value, instrument set point, or mechanical position.
Resume	To begin again after cessation or interruption.
Return to	To go back to a previous action step in the procedure in effect.
Review	Examine with deliberation for confirmation or compliance to an instruction.
Rotate	Cause to turn on an axis.
Sample	Take a representative portion for the purpose of examination.
Secure	Fasten or make safe.
Select	To take by preference of fitness from a number or group; to pick out; to choose.
Send	Dispatch.
Separate	Move apart or detach.

Appendix E

Set	Adjust equipment to a specified value
Shake	To agitate.
Shut down	Remove from operational status.
Silence	To stop from making noise.
Sound	To order, signal, or indicate by a sound.
Stabilize	To become stable, firm, steady.
Start	Originate the motion or function of an electrical or mechanical device.
Station	To assign a person to stand and remain at a certain place.
Stop	To halt movement or progress; to hold back; to halt.
Store	To place in reserve, to hold for later use.
Stroke	Operate a valve over its full travel. The travel time may be measured.
Subtract	To perform a subtraction.
Tag	Identify with a prescribed label.
Throttle	Adjust a valve to an intermediate position to obtain a desired parameter value.
Torque	To cause to twist or turn, as about an axis.
Transfer	To cause to pass from one to another.
Transport	To transfer or convey from one place to anther.
Trip	To manually activate a semiautomatic feature; to cause to fail or stop.
Turn	Adjust with a force on an actuator that positions form a circular movement

Appendix E

Unlock	To unfasten the lock of.
Unplug	To remove from a socket or receptacle.
Update	To revise to include latest information or data.
Use	To avail oneself of; to employ; to utilize.
Vent	Release a gas or liquid confined under pressure.
Verify	Confirm, substantiate, and assure that a specific activity has occurred or that a stated condition exists.
Walk	To move along on foot.
Weigh	To measure the heaviness of as by a scale.
Withdraw	To remove.
Work	To perform a task.

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CONCLUDING MATERIAL

Review Activities:
WSRC; EG&G, ID; EG&G, Rocky Flats;
MMES, Oak Ridge; MMES, Paducah;
MMES, Portsmouth; LANL; Battelle, PNL

Preparing Activity:
DOE-EH-31

Headquarters Offices:
AD, DP, EH, EM, ER, GC,
IG, NE, NS, RW

Project Number:
HFAC-0009

Field Offices:
AL, CH, ID, OR, RL,
RF, SR, SF

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U.S. DEPARTMENT OF ENERGY
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