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DOE STANDARD

GUIDE TO GOOD PRACTICES FOR OPERATIONS ASPECTS OF UNIQUE PROCESSES

U.S. Department of Energy
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Guide to Good Practices for Operations Aspects of Unique Processes

Page / Section	Change
p. vii / Definitions	The definition for "Performance-Based Training" was deleted, and the definition for "Systematic Approach to Training" was added.
p. 10 / Section 4.2 / fourth paragraph	The references to the performance-based training (PBT) approach were changed to the systematic approach to training (SAT).
p. A-3 / Operator Knowledge Resource List / first sentence	The reference to the performance-based training (PBT) approach was changed to the systematic approach to training (SAT).
p. A-3 / Operator Knowledge Resource List	The reference to DOE-NE-STD-1001-91, *Guide to Good Practices for Training and Qualification of Instructors,* was updated to DOE-HDBK-1001-96 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-NE-STD-1002-91, *Guide to Good Practices for Training and Qualification of Chemical Operators,* was updated to DOE-HDBK-1002-96 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-NE-STD-1003-91, *Guide to Good Practices for Training and Qualification of Maintenance Personnel,* was updated to DOE-HDBK-1003-96 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE/NE-0102T, *TAP 2 Performance-Based Training Manual,* was updated to DOE-HDBK-1078-94, *Training Program Handbook: A Systematic Approach to Training.*
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1005-92, *Guide to Good Practices for Developing Learning Objectives,* was updated to DOE-HDBK-1200-97 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1006-92, *Guide to Good Practices: Evaluation Instrument Examples,* was updated to DOE-HDBK-1201-97 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1007-92, *Guide to Good Practices for Teamwork Training and Diagnostic Skills Development,* was updated to DOE-HDBK-1202-97 with the same title.

p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1008-92, *Guide to Good Practices for Training of Technical Staff and Managers,* was updated to DOE-HDBK-1203-97 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1009-92, *Guide to Good Practices for the Development of Test Items,* was updated to DOE-HDBK-1204-97 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1010-92, *Guide to Good Practices for Incorporating Operating Experience,* was removed (document was canceled).
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1011-92, *Guide to Good Practices for the Design, Development, and Implementation of Examinations,* was updated to DOE-HDBK-1205-97 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1012-92, *Guide to Good Practices for On-the-Job Training,* was updated to DOE-HDBK-1206-98 with the same title.
p. A-3 / Operator Knowledge Resource List	The reference to DOE-STD-1058-93, *Guide to Good Practices for Developing and Conducting Case Studies,* was updated to DOE-HDBK-1116-98 with the same title.
p. A-4 / Operator Knowledge Resource List	The reference to DOE-STD-7501-95, *Development of DOE Lessons Learned Programs,* was added.
Concluding Material	The Preparing Activity was changed from NE-73 to EH-31.

FOREWORD

The purpose of this Guide to Good Practices is to provide Department of Energy (DOE) contractors with information that can be used to validate and/or modify existing programs relative to Conduct of Operations. This Guide to Good Practices is part of a series of guides designed to enhance the guidelines set forth in DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*.

KEYWORDS

Integrated Knowledge

Process Support Personnel

Unique Process

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DEFINITIONS

Integrated Knowledge	An understanding of the interrelated functions of facility equipment and systems.
Operator	A qualified person assigned specific responsibilities related to the operation of facility process systems and equipment.
Systematic Approach to Training (SAT)	A training program that includes the following five elements: (1) Systematic analysis of the jobs to be performed; (2) Learning objectives derived from the analysis which describes performance after training; (3) Training design, development, and implementation based on the learning objectives; (4) Evaluation of trainee mastery of the objectives during training; and (5) Evaluation and revision of the training based on the performance of trained personnel in the job setting.
Process Support Personnel (Technical Process Support Personnel)	Personnel responsible for controlling unique processes.
Unique Process	A separate facility process that can affect, or be affected by, an operator's activities, but is controlled by process support personnel.

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GUIDE TO GOOD PRACTICES FOR OPERATIONS ASPECTS OF UNIQUE PROCESSES

1. INTRODUCTION

This Guide to Good Practices is written to enhance understanding of, and provide direction for, Operations Aspects of Facility Chemistry and Unique Processes, Chapter XIII of Department of Energy (DOE) Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*. The practices in this guide should be considered when planning or reviewing employee training and facility management programs. Contractors are advised to adopt procedures that meet the intent of DOE Order 5480.19.

"Operations Aspects of Unique Processes" is an element of an effective Conduct of Operations program. The complexity and array of activities performed in DOE facilities dictate the necessity for all personnel to coordinate interrelated activities affecting unique processes.

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2. OBJECTIVE

The objective and criteria are derived from DOE Order 5480.19. They are intended to aid each facility in meeting the intent of the order.

A system is in place to ensure that the operation of interrelated processes is properly monitored and controlled.

Criteria:

a. Personnel responsibilities are defined with respect to unique processes.

b. Personnel are knowledgeable of unique processes and process interactions.

c. Personnel are able to interpret parameters and provide timely corrective action for process-related problems.

d. Lines of communication exist between operators and process support personnel to promote effective coordination of activities.

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3. DISCUSSION

A unique process is a separate process that is not directly controlled by operations personnel, but can affect, or be affected by, an operator's activities. It could be directly related to the safety or reliability of the facility, compliance with environmental and health requirements, fulfillment of the facility mission, or unrelated to any of these. A unique process may be the result of a specialized procedure (e.g., testing or research) and performed only once, or it may be an established routine. The operations aspects of unique processes can be described as the effects unique processes or activities may have on interrelated systems, and the actions that must be taken to avoid an adverse impact on operations.

Interactions between operations and unique processes can affect the safety and reliability of DOE facilities. In some cases, interactions with unique processes are anticipated in procedures and other operating documents. However, in many cases, an otherwise appropriate and permissible response to parameters in one system can produce an adverse effect in another system. To correctly interpret indications in a system, and to determine the best response, the operator must have an integrated knowledge of unique process interactions within the facility.

Effective operation also requires communication of relevant information between operators and process support personnel. In some cases, the operator must communicate intended actions to the process support personnel to prevent problems in the unique process. In other cases, the unique process is capable of affecting operations, therefore requiring two-way communication between process support personnel and operators. The following examples illustrate some of the effects of unique process interactions.

- A facility operates a chilled water system to support a variety of domestic and research needs. The system contains multiple chiller units which can be operated in combination to accommodate cooling loads. When personnel in a research project started several large pieces of equipment, the added cooling load caused the chilled water temperature to exceed the normal operating range before another chiller unit could be placed on line.

This example illustrates how a unique process can affect an operator's activities. The research was a unique process to the chilled water system operator. Although the operator did not require detailed knowledge of the research, integrated knowledge of the system interactions was needed. Effective communication with the research project personnel would have enabled the operator to anticipate the load increase and ensure that sufficient reserve cooling capacity was on line.

- A periodic chemistry sample from a fluid system is used to evaluate the condition of the system components and determine their fitness for continued operation. Just before the sample was taken, the system operator started a pump that had been in a standby status. The change in flow characteristics caused contamination to be picked up in the sample. The indicated level of contamination normally signals equipment damage, which requires resampling the system and possible shutdown of equipment.

This example illustrates how a unique process can be affected by an operator's activity. To the operator, chemistry sampling is a unique process, even though it is routinely performed. To prevent adverse effects on the sample, the operator requires an integrated knowledge of the process interactions, i.e., how the sampling is affected by pump startup, and needs to inform chemistry support personnel of operating activities that can adversely affect sampling. This would permit coordination of operations and chemistry activities, and would have avoided the need for resampling.

- Technicians working with radioactive materials needed to move the materials through an operational area of the facility. Following their procedures, they took all appropriate precautions to prevent the spread of contamination or personnel exposure during the movement; however, they failed to coordinate their movement with the operations supervisor. The materials set off an operational radiation alarm, causing the operations organization to respond as if an emergency had occurred.

The movement of radioactive material may have had nothing to do with the facility operation or mission. However, the movement was capable of affecting operations and was not under the control of operations personnel; therefore, it constituted a unique process. If the process support personnel (technicians) had coordinated their activities with the operations supervisor, the operations personnel would have prepared for the alarm and avoided the emergency response.

Note that in each of these events, the persons involved were properly trained and qualified to perform their own job responsibilities. What they lacked was knowledge of the effects their activities would have on other processes. An integrated knowledge of the interfacing unique processes, and effective communication based on that knowledge, could have prevented each problem. Integrated knowledge may include:

- Fundamentals of the applicable physical sciences (i.e., chemistry, electricity, physics, thermodynamics, etc.) involved in interfacing unique processes

- Purpose and fundamentals of system design for interfacing unique processes

- Normal, and anticipated abnormal, operating characteristics of interfacing unique processes.

Facilities should ensure that personnel at all levels have sufficient knowledge of interfacing or unique processes to ensure safety and efficiency in the working environment. Training, job experience, and direct communication with process support personnel are all methods to provide this integrated knowledge to operators. Facilities should encourage personnel to be technically inquisitive, to detect, understand, and anticipate problems while monitoring process parameters, and to communicate effectively with process support personnel so appropriate and timely corrective action can be initiated.

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4. GOOD PRACTICES

4.1 Operator Responsibilities

Management should establish written guidance specifying personnel responsibilities related to unique processes. Typical operator responsibilities include:

- Monitoring applicable unique process parameters, as indicated by the instrumentation related to systems under the operator's control
- Identifying trends, out-of-specification parameters, or adverse conditions, and initiating appropriate corrective action
- Consulting with process support personnel (those responsible for the unique process) and coordinating activities
- Identifying the status of unique processes as part of operations turnover.

4.2 Operator Knowledge

Operating personnel should be knowledgeable about unique processes, especially aspects relating to process safety, that are affected by their work or that affect the workplace environment. This integrated knowledge enhances their ability to understand trends, problems, or potential problems. Such knowledge increases their ability to initiate corrective action, or to inform the process support personnel of the situation, and enables them to understand how their actions may affect the unique process.

Integrated knowledge can be developed through training, experience, and communication. Facilities having formal training programs should include topics that provide a fundamental understanding of unique processes. Training should address the process theory, system design and components, and operating characteristics. Personnel whose job interfaces with specific unique processes may benefit from additional training in one or more of the following subject areas:

- Chemistry
- Electricity and/or Electronics
- Heat Transfer and Fluid Flow
- Mathematics
- Physics (classical and/or nuclear)
- Industrial Safety

For example: the operator of an emergency diesel generator is not responsible for operation of the cooling water supply system; however, the operator may benefit from fundamental training in heat transfer and fluid flow to better understand the impact of diesel generator operation on the cooling water system flows and temperatures.

One effective method for identifying specific training needs and developing appropriate training material is the systematic approach to training (SAT). Certain DOE facilities are required to implement SAT, and extensive documentation has been prepared to assist facilities in this process. Appendix A identifies some of the resources available for implementing SAT.

Appendix A also lists some of the training materials that are available for study in certain fundamental subject areas. These materials are designed to be used in individual self-paced study, so they may be used as part of a formal or informal training program.

Many facilities over the years have used cross-training, i.e., training in some aspects of others' job responsibilities, to familiarize personnel with interfacing or unique processes. Cross-training may be part of a formal training program, or it may be performed by rotating personnel to different shift positions as part of an overall familiarization.

Work experience gained through support of, or interface with, unique processes can enhance the integrated knowledge obtained through other methods. In some cases, direct communication between operators and process support personnel may be all that is necessary to ensure that the operator is aware of and considers the potential effects on unique processes.

4.3 Operator Response to Process Problems

Personnel should be able to analyze process-related problems and take appropriate, timely corrective actions. Proper response to process problems requires more than application of procedures. An understanding of the process is necessary in order to correctly interpret parameters and determine the appropriate response. Personnel should also be able to:

- Anticipate the response in interacting systems or unique processes when changes are made to a process under their control
- Anticipate changes in processes under their control in response to changes in processes controlled by others
- Monitor facility conditions (including trends in operations), analyze available information, and diagnose problems
- Evaluate degrading conditions and take appropriate action to prevent the potential consequences
- Recognize the symptoms of abnormal and emergency conditions and prevent or minimize the consequences.

4.4 Communication between Operators and Process Personnel

Open lines of communication must exist between operators and process support personnel. Prior to beginning activities that could affect a unique process, an operator should contact the appropriate process support personnel. This will enable work groups to coordinate interrelated activities. For the same reason, supervisors should include personnel from all affected activities in pre-job planning sessions and briefings.

During abnormal and emergency situations, it is essential that all work groups function as a team to provide prompt corrective action. For groups of personnel to function effectively as a team, the individuals must possess both technical and teamwork skills. Team deficiencies, such as communications, considered insignificant during normal operations, become major obstacles to making decisions and initiating appropriate corrective actions during abnormal conditions. Effective communication between work groups, therefore, is an essential aspect of teamwork, and is vitally important to safe and reliable operations.

APPENDIX A

OPERATOR KNOWLEDGE RESOURCE LIST

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OPERATOR KNOWLEDGE RESOURCE LIST

The following documents provide information helpful for establishing a systematic approach to training (SAT) program.

DOE-HDBK-1001-96	*Guide to Good Practices for Training and Qualification of Instructors*
DOE-HDBK-1002-96	*Guide to Good Practices for Training and Qualification of Chemical Operators*
DOE-HDBK-1003-96	*Guide to Good Practices for Training and Qualification of Maintenance Personnel*
DOE-HDBK-1078-94	*Training Program Handbook: A Systematic Approach to Training*
DOE-HDBK-1116-98	*Guide to Good Practices for Developing and Conducting Case Studies*
DOE-HDBK-1200-97	*Guide to Good Practices for Developing Learning Objectives*
DOE-HDBK-1201-97	*Guide to Good Practices: Evaluation Instrument Examples*
DOE-HDBK-1202-97	*Guide to Good Practices for Teamwork Training and Diagnostic Skills Development*
DOE-HDBK-1203-97	*Guide to Good Practices for Training of Technical Staff and Managers*
DOE-HDBK-1204-97	*Guide to Good Practices for the Development of Test Items*
DOE-HDBK-1205-97	*Guide to Good Practices for the Design, Development, and Implementation of Examinations*
DOE-HDBK-1206-98	*Guide to Good Practices for On-the-Job Training*

DOE-STD-1057-93	*Guide to Good Practices for the Selection, Training, and Qualification of Shift Technical Advisors*
DOE-STD-1059-93	*Guide to Good Practices for Maintenance Supervisor Selection and Development*
DOE-STD-1060-93	*Guide to Good Practices for Continuing Training*
DOE-STD-1061-93	*Guide to Good Practices for the Selection, Training, and Qualification of Shift Supervisors*
DOE-STD-7501-95	*Development of DOE Lessons Learned Programs*

The following DOE Fundamentals Handbooks may be helpful in the development and presentation of fundamentals training, and may be used for individual self-paced study on a continuing basis.

DOE-HDBK-1010-92	*Classical Physics*
DOE-HDBK-1011/1-92	*Electrical Science*, Volume 1 of 4
DOE-HDBK-1011/2-92	*Electrical Science*, Volume 2 of 4
DOE-HDBK-1011/3-92	*Electrical Science*, Volume 3 of 4
DOE-HDBK-1011/4-92	*Electrical Science*, Volume 4 of 4
DOE-HDBK-1012/1-92	*Thermodynamics, Heat Transfer, and Fluid Flow*, Volume 1 of 3
DOE-HDBK-1012/2-92	*Thermodynamics, Heat Transfer, and Fluid Flow*, Volume 2 of 3
DOE-HDBK-1012/3-92	*Thermodynamics, Heat Transfer, and Fluid Flow*, Volume 3 of 3
DOE-HDBK-1013/1-92	*Instrumentation and Control*, Volume 1 of 2
DOE-HDBK-1013/2-92	*Instrumentation and Control*, Volume 2 of 2

DOE-HDBK-1014/1-92	*Mathematics*, Volume 1 of 2
DOE-HDBK-1014/2-92	*Mathematics*, Volume 2 of 2
DOE-HDBK-1015/1-92	*Chemistry*, Volume 1 of 2
DOE-HDBK-1015/2-92	*Chemistry*, Volume 2 of 2
DOE-HDBK-1016/1-92	*Engineering Symbology, Prints, and Drawings*, Volume 1 of 2
DOE-HDBK-1016/2-92	*Engineering Symbology, Prints, and Drawings*, Volume 2 of 2
DOE-HDBK-1017/1-92	*Material Science*, Volume 1 of 2
DOE-HDBK-1017/2-92	*Material Science*, Volume 2 of 2
DOE-HDBK-1018/1-92	*Mechanical Science*, Volume 1 of 2
DOE-HDBK-1018/2-92	*Mechanical Science*, Volume 2 of 2
DOE-HDBK-1019/1-92	*Nuclear Physics and Reactor Theory*, Volume 1 of 2
DOE-HDBK-1019/2-92	*Nuclear Physics and Reactor Theory*, Volume 2 of 2

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CONCLUDING MATERIAL

Review Activities:	Preparing Activity:
DOE	DOE-EH-31
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