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GUIDE TO GOOD PRACTICES FOR SHIFT ROUTINES AND OPERATING PRACTICES

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

AREA MISC

Guide to Good Practices for Shift Routines and Operating Practices

Page / Section	Change
pg. 1 / Introduction	The third paragraph was added.
pg. 9 / Section 4.1.3 / eighth paragraph	The reference to DOE Order 4330.4A, *Maintenance Management Program*, was updated to DOE Order 4330.4B with the same title.
pg. 17 / Supplemental References	The reference to DOE Order 4330.4A, *Maintenance Management Program*, was updated to DOE Order 4330.4B with the same title.
pg. C-1 / Appendix C	The appendix, *Additional Guidance for Nuclear Power Reactors*, was added.
Concluding Material	The Preparing Activity was changed from NE-73 to EH-31, and the project number was corrected.

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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*.

KEY WORDS

Narrative Log
Operating Base
Round Sheet

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DEFINITIONS

Log (Narrative Log)	A chronological narrative record of events or functions.
Operating Base (Shift Operating Base)	The area within a work station (e.g., office, desk, workbench) where a person returns to when not performing other duties (e.g., tours, maintenance, testing).
Operator	A qualified person assigned specific responsibilities related to the operation of facility process systems and equipment.
Round Sheet (Round Inspection Sheet, Round/Tour Inspection Sheet)	A type of data-collection sheet used to record key equipment and system parameters (e.g., readings from instruments and gauges) and operating status (whether operating or shutdown for maintenance or repair) during equipment inspection tours (rounds).
Shift	The normal period of work for an individual or group, e.g., 8:00 am to 5:00 pm.
Shift Routine	A course of action that is followed to accomplish all work station duties in a prescribed manner during a normal working period.
Status	The operational condition or state of readiness of equipment or systems (e.g., on-line, standby, unavailable).
Surveillance	A test, calibration, or inspection that ensures the necessary operability and quality of safety-related items required for the safe operation of a facility.
Turnover (Operations Shift Turnover)	The process of formally transferring duties and responsibilities from one person to another.
Work Station	The physical area, equipment, and systems for which a person is assigned responsibility.

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GUIDE TO GOOD PRACTICES FOR SHIFT ROUTINES AND OPERATING PRACTICES

1. INTRODUCTION

This Guide to Good Practices is written to enhance understanding of, and provide direction for, "Shift Routines and Operating Practices," Chapter II 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 shift routines and operating practices. Contractors are advised to adopt procedures that meet the intent of DOE Order 5480.19.

"Shift Routines and Operating Practices" is an element of an effective Conduct of Operations program. The complexity and array of activities performed in DOE facilities dictate the necessity for a high standard of professional conduct and sound operating practices to promote safe and efficient operations.

Recently, guidance pertaining to this element has been strengthened for nuclear power reactors. This additional guidance is given in Appendix "C" for information purposes. Though this guidance and good practices pertain to nuclear power reactors, DOE sites may choose to use a graded approach for implementing these in nuclear facilities.

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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.

Standards for professional conduct of personnel are established and followed so that personnel performance coincides with the expectations of DOE and facility management.

Criteria:

1. Supervisors and other appropriate personnel are notified of changes in facility status.

2. Personnel follow the facility's industrial safety program.

3. Personnel determine equipment status and area conditions during inspection tours.

4. Round sheets are used to record facility parameters during inspection tours.

5. Personnel maintain exposure to hazards as low as reasonably achievable.

6. Personnel follow specific facility guidance and procedures when responding to abnormal instrument readings.

7. Protective devices are reset using specific facility guidance and procedures.

8. All power or process rate changes are approved by the cognizant supervisor.

9. Personnel have proper authorization before operating any equipment.

10. Personnel use an operating base to perform administrative duties and turnovers.

11. Personnel read only authorized material.

12. Personnel use only devices that relate to the operation of the facility.

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3. DISCUSSION

"Shift Routines and Operating Practices" addresses the professional conduct and good work station practices that result in appropriate attention to facility conditions. It discusses the authority to operate equipment and the status control that is essential to controlling and coordinating facility activities. Emphasis is also placed on effective equipment monitoring and data recording, including notifying supervisors promptly of unusual or unexpected situations. This notification process ensures proper attention is given to changing and off-normal conditions. Industrial safety practices, including radiological and hazardous material protection, are also addressed.

Industrial, military, and commercial utility operating experience has shown that professional conduct and sound operating practices result in a safer, more efficiently run facility. Two key principles to professional conduct and sound operating practices are formality and ownership. Formality is performing all duties according to approved practices and procedures. It ensures a more alert work force and business-like atmosphere. Ownership is an attitude whereby individuals accept total responsibility for maintaining their assigned work station in the best possible operating condition.

The responsibility for safely operating a DOE facility rests with the on-shift personnel. Safe operation is accomplished through adherence to procedures, technical safety requirements (formerly technical specifications or operational safety requirements), and sound operating practices. The authority and responsibility for facility operations should be vested in the cognizant supervisor or manager and be transferred only through formal turnover to a qualified relief.

Establishing clear lines of authority and responsibility for controlling facility operations, including equipment and systems, will enhance facility operations. The authority for operating certain equipment and systems may be given to specific work stations, however the supervisor maintaining ultimate responsibility for the equipment must be notified prior to changes in status. During emergencies, operators should be authorized to take the necessary actions to place the facility in a safe operating or shutdown condition. In this case, the change in status would be reported to the supervisor after the fact.

During special tests, evolutions, or abnormal conditions, personnel should be aware that the responsibility and authority to decide corresponding operating conditions, system alignments, or equipment manipulations rests fully with the on-duty supervisor. This supervisor should not permit any individual to bypass or overrule his/her operational judgment without bringing the matter to the attention of a higher operational authority.

An effective equipment and area monitoring program will help ensure that abnormal conditions and adverse trends are detected in a timely manner. The program should address the equipment and areas to be monitored and the monitoring frequency. This monitoring or inspecting can be accomplished through operator inspection tours (inspection tours). A list of areas and associated equipment under an operator's control should be used to assist personnel in performing inspection tours.

Round inspection sheets (round sheets) can also be used to record equipment parameters during inspection tours. Recording these parameters will assist personnel in detecting trends and serve as

a historical record of facility operations. Trending is necessary to detect abnormal conditions or adverse trends so appropriate action can be taken before equipment malfunction occurs. Establishing procedures which specify when to take readings; how to record readings, how to identify out-of specification readings, how to make corrections on the round sheets; and what actions to take for out of specification readings will improve the accuracy, completeness, and neatness of round sheets. Procedures should also specify a program for developing and maintaining round inspection sheets. Training on these procedures will ensure the proper round sheet information is communicated to all affected personnel.

Sound operating practices also include a strong emphasis on personnel safety practices required to perform a job. Following personnel safety practices should keep personnel alert to detect, prevent, and mitigate all possible hazards. The correct safety practices should be demonstrated to personnel during their initial training and during refresher training (e.g., on a yearly basis), and reinforced continuously, by all personnel, while on the job. Safe work station practices also include maintaining exposure to personnel hazards (e.g., radiation, toxic materials) as low as reasonably achievable (ALARA).

Additional operating practices information for control areas are delineated in DOE Order 5480.19, Chapter III, “Control Area Activities.”

4. GOOD PRACTICES

4.1 Status Awareness and Operating Practices

The primary function of an operator is to monitor and control all assigned equipment safely within the applicable facility guidelines. DOE Order 5480.19, Chapter VIII, "Control of Equipment and System Status," identifies specific facility programs that are designed to aid in safe reliable operation. In addition to those programs, routine operating practices should ensure that the responsible personnel are continuously aware of the status of assigned equipment, and all operations are properly authorized, performed, and monitored. This section describes the routine practices that lead to effective operation.

4.1.1 Authority to Operate Equipment

The overall operation of the facility should be directed by the operations supervisor or cognizant manager. The operations supervisor should ensure that only trained and qualified personnel operate facility equipment and should determine, with the assistance of with the Training Department, work station training and qualification requirements. Facility work stations and the equipment at each work station should be inventoried to ensure all work stations and equipment are identified. Personnel should then be informed of the equipment they are authorized to operate and under what conditions the equipment can be operated. This should be done during the training and qualification process. Support group and subcontractor personnel should be informed of the facility's policy for operation of equipment. This should be done during a general training session before support or subcontractor personnel start work.

Facility policies should specify the activities that may normally be performed by an operator without requesting permission. Examples of activities include the following:

- Pumping specified sumps
- Adjusting controls (e.g., throttle valves, rheostats, switches) that are necessary for maintaining stable process conditions
- Testing local alarm panel lights and sounds.

Personnel should be instructed that safety to personnel, facility, and environment must be maintained over facility production regardless of the situation.

Non-routine operation of controls should not be performed without specific approval by the cognizant supervisor. However, during emergencies, operators must take the necessary actions to ensure the safety of personnel, facility, and the environment. After placing the process in a stable condition, the appropriate supervisors should be immediately informed.

Personnel should be informed of all activities affecting equipment at their work station. Support personnel and subcontractors should contact the person responsible to obtain written or verbal authorization before commencing work, especially if the work will require changing present work station status. To ensure that facility equipment is properly operated at all times, guidance may be established allowing only facility-qualified personnel to operate equipment, even during testing and maintenance evolutions.

4.1.2 Notification of Status Changes

A notification chain or network should be developed to ensure that status information is communicated to the appropriate personnel. Policies or procedures should be established for the timely notification of status changes. Specifics that should be addressed include who needs to be notified, what information needs to be communicated, and the method of communication (e.g., pagers, phone, face to face). Personnel should notify their supervisor of all changes in work station status, especially abnormal and unexpected situations. Supervisors should, in turn, notify the appropriate facility management.

Any person affecting the condition of a piece of equipment not under his/her responsibility for any reason should notify the responsible person before changing the equipment's status, and again afterwards, to inform that status has changed. This would include starting up or shutting down equipment as well as adjusting controls. In addition, if anyone finds an unsafe personnel, equipment, or facility condition he/she should perform all immediate actions that they are qualified to perform (e.g., use a fire extinguisher, administer CPR, open a breaker, shut a valve) and then immediately contact the responsible person.

4.1.3 Inspection Tours

Periodic work station inspection tours should be performed as part of an operator's shift routine. These tours are in addition to the work station walkdowns performed as part of the turnover process. For additional information on turnovers, refer to DOE Order 5480.19, Chapter XII, Operations Turnovers.

Inspection tours should be frequent and detailed enough to ensure that the status of equipment and condition of the work station is known. Each facility should decide the optimum frequency for conducting inspection tours. The frequency and detail of tours should take into account the safety risk associated with the work station. In addition, input should be received from facility maintenance engineers, equipment vendors, and experienced operators when determining touring frequency.

The minimum touring frequency should be at least once per shift. However, the operations supervisor (or cognizant manager) may designate specific areas to be inspected less frequently because of adverse radiological or equivalent personnel safety conditions, or more frequently if problems have been encountered in the past. In these cases, the operations supervisor should specify an alternate inspection schedule. Facility security concerns should not override personnel safety assessment duties.

Inspection tours in radiation and hazardous material areas should be carefully reviewed, planned, and coordinated with the ALARA program to minimize personnel exposure. Tours need to be made in these areas, but the frequency and duration must strike a balance with personnel exposure. Rounds in these areas should be coordinated with other duties and responsibilities (e.g., system alignments, equipment startup or shutdown) as appropriate to minimize exposure. Other methods of minimizing exposure to radiation or hazardous materials is to install microphones, surveillance cameras, and using binoculars.

Personnel should conduct a thorough tour of their work station at the designated times. A tour should be made early in the shift, before the person attends to other duties, to become familiar with the condition and status of equipment at the work station. During the tour, equipment should be inspected to ensure that it is operating properly or, for standby equipment, that it is fully operable. To ensure the tour is effective and efficient, personnel should remain inquisitive; asking themselves questions about their work station and then answering the questions using what they see, hear, smell and touch on the tour.

Personnel should be instructed on proper touring techniques during initial training and qualification. The amount of instruction should depend on the complexity of the work station. Training on how to read parameter-indicating devices (e.g., gauges, meters, chart recorders), how to check equipment temperature (e.g., using the back of the hand for a general indication of the equipment's normal operating temperature), and how to check for system leakage (e.g., using a mirror to check for small steam leaks) should be included, as appropriate. In addition, training should include information on acceptable equipment and system operating parameters (e.g., temperature, pressure, level, flow), including proper trends for all approved operating conditions.

Each facility should establish guidance for handling deficiencies found during inspection tours. At a minimum, abnormal conditions found during tours should be reported to the appropriate supervisor and documented in the narrative log. Each facility should also decide which types of problems can be immediately corrected by personnel before notifying their supervisors and which types should be immediately reported to a control area so that supervisors can initiate corrective action.

Personnel should be encouraged to clean up trash and oil, grease, and water spots discovered during tours to prevent small problems from deteriorating into safety or operational hazards. Problems that might distract personnel from their normal duties should be reported and handled by other appropriate personnel. Equipment deficiencies that cannot be immediately remedied should be documented according to the facility's work control system. Guidelines and information related to work control systems are contained in DOE Order 4330.4B, “Maintenance Management Program.”

4.1.3.1 Area Inspection

Personnel should perform a thorough inspection of their work station and note any deficiencies. Personnel should document and correct deficiencies as

appropriate. Approved supplemental lighting (e.g., flashlight, droplight, portable lighting) should be used to inspect dimly lit work station areas. A checklist may be used to ensure that all items are inspected. A list of some possible inspection items is contained in Appendix A.

4.1.3.2 Equipment Status Checks

The status of equipment (i.e., operating, standby, work-in-progress, or out-of-service) should be determined to ensure proper response to any problems that may arise. Some possible status checks are as follows:

C Operating Equipment

- Motor and pump housing temperatures are within acceptable limits
- System temperatures, pressures, and flows are within acceptable limits
- Proper belt and coupling tightness
- System leakage is within acceptable limits
- Noise and vibration is within acceptable limits
- Ventilation system intakes clear of debris
- Equipment grounding straps connected
- Power consumption (Amps, Fuel Oil)

C Standby Equipment

- Proper valve/circuit breaker lineup (spot check)
- Oil levels are within acceptable limits
- No unusual noises, smells, temperatures, or pressures

C Out-of-Service Equipment

- Boundary components in correct position (spot check).

4.1.4 Round/Tour Inspection Sheets

Round/tour inspection sheets (round sheets) are an effective method for providing personnel with guidance on the extent to which equipment and areas should be inspected during tours. Recording equipment parameters during tours provides a record of equipment performance and can be used to reconstruct events leading up to unusual occurrences or system malfunctions. This record permits short-term trending by personnel so that undesirable trends and equipment problems can be identified and corrected in a timely manner. Round sheets also facilitate the turnover of equipment status and are an effective aid in the training and qualification of new personnel.

Round sheets should be comprehensive; that is, they should include all areas within the purview of a particular work station and all important parameters for equipment. Round sheets should also assist personnel in identifying abnormal and emergency situations. Where appropriate, equipment parameters should include minimum and maximum values or expected operating ranges (i.e., normal range or band of acceptable values) to enable personnel to recognize abnormal readings quickly. When equipment is not in an operating condition (e.g., standby, shutdown for maintenance), the associated parameter block(s) should reflect the status of the equipment. This may be accomplished by the use of codes or notes and annotation in the remarks section. Safety limits derived from Technical Safety Requirements should be highlighted.

A program should ensure that all round sheets are currently and correctly maintained. Rounds sheets should be developed and approved by the appropriate supervisor or cognizant manager, obtaining input from cognizant experts (e.g., vendors, facility maintenance engineers), as appropriate. Work station personnel and appropriate supervisors should supply the input for the sequence in which the parameters appear on round sheets to ensure that tours are conducted efficiently. Equipment and corresponding parameters should be listed on round sheets in a logical order that closely parallels the order encountered during a normal tour. Responsibility for maintaining round sheets should be designated by management. If changes to equipment and systems will require modifications to the round sheet data, the sheets should be updated to accommodate the new data before the affected system or equipment is returned to operation. Changes to round sheets should also be communicated to the appropriate work station personnel. If round sheets change frequently, they should have an approval-for-use signature, revision number, and effective date, as appropriate (refer to Appendix B).

Round sheets may be developed for temporary systems and equipment, depending on the risk to facility operation, proposed length of use, and complexity of configuration. In such cases, the review and approval process stated above should be followed. Personnel should be instructed on the new round sheets before they use them.

A master copy of each round sheet should be kept for updating and restocking the sheet as needed. The program for maintaining round sheets should incorporate a means for verifying that the sheets being used are current and correct. As round sheets are revised, outdated

ones should be discarded. Blank round sheets should be kept in a place accessible to personnel (e.g., control area file cabinet, supervisor's desk, operating base file cabinet). During the revision process it may be necessary to use round sheets with pen and ink changes until the master copy can be updated and revised round sheets distributed. Policies and procedures should address how this situation is handled and personnel should be instructed on their use.

Each round sheet should have enough room to record 24 hours of data or at least a normal shift's worth of data. If more than one data sheet is needed to record all work station data, the rounds sheets should be numbered. The space for recording data should be large enough to allow the full range of values to be recorded legibly. In addition to a place for recording data, round sheets should have the applicable work station printed on the sheet to prevent confusion. There should also be a space for recording the date and the time(s) the rounds were conducted. This information will help when round sheets are reviewed or used to reconstruct events in a chronological order.

Round sheets may include a narrative section if a separate work station narrative log does not exist. Personnel should use the narrative section to document major evolutions, causes of abnormal conditions, and actions taken to correct abnormal conditions. For more information of maintaining the narrative log, refer to DOE Order 5480.19, Chapter XI, “Logkeeping.”

Facility administrative policies and procedures should address the method for identifying out-of-specification parameters. Parameters exceeding the specified maximum or minimum values should be circled in red or otherwise highlighted on the round sheet. If a recorded parameter exceeds the highest or lowest acceptable value, or exceeds a minimum or maximum value, the cause(s) of the abnormal indication should be promptly investigated and reported to the appropriate supervisor, manager, or control area. Supervisors should be kept aware of the situation and should become involved as appropriate for timely corrective action. The cause and status of the abnormal parameters should be explained in the round sheet's narrative section.

Data should be recorded on round sheets at the times specified. When round sheet data is not obtained within one hour of the specified time, the actual time the data was obtained should be noted on the round sheet. The reason for the recording delay should be annotated in the narrative section of the round sheet and reported to the appropriate supervisor.

The recorded data should be legible and should be recorded with an ink pen dark enough to be copied. If a mistake is made on the rounds sheet, the mistake should be corrected. Facility policies and procedures should provide guidance for making round sheet corrections. One method for correcting a mistake is to make a single line through the mistake, initial the lineout, and write the correct data in the same block as the mistake. Since it is impossible to predict when a person will make a mistake, personnel should use only part of the block to record data. This will allow the person to make neat corrections

within the same block. Correction fluid and other opaque agents should not be used to make corrections.

Personnel should be knowledgeable of equipment parameters. They should know where to find the parameter indicating devices (e.g., pressure gauge, thermometer, voltage meter), the scale of the indicating devices, and their normal values. Personnel should understand the significance of each value recorded on the round sheet, whether recorded by him/her or by a previous person. This is particularly true of out-of-specification readings.

The round sheet data should be reviewed by a supervisor each shift to help identify trends or abnormal readings and to verify that the data has been properly recorded. This will require the supervisors be at least as knowledgeable of the subordinate work stations as the assigned personnel. Supervisors should periodically monitor assigned personnel performing rounds to ensure that comprehensive tours continue to be conducted.

4.1.5 Response to Indications

Personnel should believe instrument indications (i.e., treat them as accurate) unless proven otherwise. In situations of doubt, personnel must be instructed to place facility, personnel, and environmental safety above facility production. Ignoring an unusual reading because the person believes an instrument is faulty can cause abnormal conditions to go undetected. Personnel should use other indications, if possible, to confirm unusual readings. Redundant indicators, backup indications, or other process parameters (e.g., a flow gauge indicating proper flow is a process parameter validating that a pump is energized, if the pump's “on” light is not illuminated) could be used to verify an unusual reading. Personnel should also be alert for trends or a deviation from expected trends (e.g., cooling water temperatures rising with no increase in heat load, water flow not increasing, as expected, after starting a pump). Prompt action should be taken to investigate the cause of abnormal or unusual indications to allow timely corrective action. When malfunctioning or inaccurate instruments are discovered, they should be appropriately identified to prevent subsequent confusion. Appropriate personnel should be notified to effect repairs.

4.1.6 Load Changes

The appropriate supervisor, control area lead operator, or manager should approve all load, power, or process rate changes. Since this person is accountable for operation of the process, his/her guidance must be used to safely control the process. The following are example cases of load and process rate changes:

- Changing chemical reaction rates for an experiment
- Changing power level of a power generating station (e.g., coal, nuclear, oil)
- Changing output power of an electrical generator

- Changing flow rate on heat exchanging systems
- Changing air flow rate on filtered air systems
- Changing chemical injection rates
- Starting up or shutting down large electrical equipment that would cause electrical power surges and electrical power load changes.

However, personnel could decrease load or rate without approval, if necessary, to respond to an emergency situation in accordance with the facility's emergency procedures.

4.1.7 Resetting Protective Devices

Protective devices are mechanisms (e.g., circuit breakers, fuses, facility protection channels where multichannel logic exists) that protect a piece of equipment, a system, the facility, personnel, and the environment. When an automatic protective action occurs, the cause should be known, understood, and corrected before resetting the protective devices. Resetting will require that the operator understand how the protective device works, including trip setpoint(s), protective device operation, and current trip signal condition (e.g., signal present or signal absent).

Because the consequences of inappropriately resetting protective devices vary considerably, good judgment and specific guidance are necessary when resetting protective devices. Management should provide the appropriate guidance and procedures to deal with resetting protective devices. Management should specify the types of protective devices that can be reset without formal investigation and how many times a device can be reset before investigating the problem. For example, if a protective device is reset and trips for a second time for no apparent reason, the device should not be reset until the cause is known and corrected.

If a protective device causes a facility trip or unplanned forced shutdown, a thorough investigation is required in accordance with DOE Order 5480.19, Chapter VI, “Investigation of Abnormal Events.”

4.2 Safety Practices

4.2.1 Use of Safety Equipment

Personnel should be instructed on the importance of adhering to the facility's industrial safety program. In addition, they should be informed of the potential safety hazards in their work spaces. Proper hearing, eye, head, foot, and respiratory protection should be worn in designated areas to prevent injury. Similarly, ladders or other approved means should be used to access equipment located in the overhead when permanent steps or catwalks are

not available. Personnel should not climb or walk on facility components and insulation that are not designated as walking or stepping areas.

Each facility should have a policy and checklist for working on or around energized equipment. The type and amount of energy should be considered. Because of the seriousness of the consequences, work on or around energized equipment should be performed only in emergency situations. Personnel required to work under these conditions should be trained on the policy and the use of the checklist. Personnel should exercise appropriate precautions when entering or working on or around energized panels or equipment. For example, personnel should ensure that electrical panel closures are securely fastened before making breakers operable to energize equipment. This reduces the potential for personnel injury if a fault causes breaker arcing during operation.

Personnel working on or around high-pressure or high-temperature systems should exercise appropriate precautions. Facilities should have policies for these situations and train personnel who might encounter these situations. Personnel should follow all facility high-pressure system safety rules, especially when working near pressure relief devices. They should wear appropriate clothing to prevent burns when working around high-temperature systems.

4.2.2 Personnel Exposure

Personnel should be trained to follow good personnel protection practices and minimize their exposure to radiation, chemicals, electromagnetic fields, toxic materials, high heat, high noise levels and other personnel hazards. In particular, personnel should observe the following requirements:

- Adhere to all posted requirements and observe proper practices and precautions while in controlled areas.
- Use appropriate monitoring instruments (e.g., dosimeter, freon detector).
- Know their own exposure levels and take appropriate action to minimize additional exposure.
- Know the proper use of radiation work permits and safe work permits.
- Know inhalation limits, where applicable.
- Report protection deficiencies or hazards promptly to the appropriate supervisors. In addition, take appropriate immediate actions to reduce or correct the hazards.
- Inform appropriate protection personnel before performing evolutions or activities that may change personnel hazard conditions in the facility.

- Inform support personnel working within the work station of the personnel hazards present at the work station.

Factors contributing to personnel exposure should be determined and actions taken to maintain exposure below the ALARA goal. Supervisors should periodically review the status of exposure for personnel under their supervision. An individual's current exposure would then be compared to the appropriate limit so a determination can be made if any additional controls are necessary to prevent personnel from exceeding their limits.

4.3 Operating Bases

An operating base should be established and approved by management for each work station. Each operating base should be equipped with office equipment that allows personnel to maintain necessary procedures and references and to conduct administrative duties. Communication equipment should be available at the operating base. The operating bases should be located conveniently within the area of responsibility, with an alternate area designated in the event the normal area cannot be used because of maintenance or construction. Management should account for the noise level, and radiation and hazardous material conditions before approving an area since turnovers and other duties will be performed here.

4.4 Potentially Distractive Written Material and Devices

Written material that does not relate to work station duties and entertainment devices (such as radios, televisions, tape players, and computer games) should be prohibited at the work station to eliminate distractions. However, personnel may read training bulletins, technical manuals, or review materials that relate to work station duties. Judgment should be used to ensure work station duties are not compromised. Management should provide specific guidance to preclude the use of potentially distractive materials and devices.

Other written material, such as unapproved copies of procedures or other forms of operating instructions, directions, and information, should be controlled to prevent them from becoming distractive. The use of an operator aid posting system has proven effective in controlling information in the operating environment. For more information on the control of operator aids, refer to Chapter XVII, "Operator Aid Postings." In addition, administrative information (e.g., pay period schedules, safety notices) should be posted in designated areas to prevent these documents from becoming distractive.

SUPPLEMENTAL RESOURCES

The following sources provide additional information pertaining to topics discussed in this Guide to Good Practices:

DOE Order 4330.4B, *Maintenance Management Program*.

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter III, "Control Area Activities."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter VI, "Investigation of Abnormal Events."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter VIII, "Control of Equipment and System Status."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XI, "Logkeeping."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XII, "Operations Turnover."

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XVII, "Operator Aid Postings."

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APPENDIX A
SAMPLE LIST OF INSPECTION ITEMS

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SAMPLE LIST OF INSPECTION ITEMS

General Area

- Satisfactory area cleanliness
- Vent and drain caps installed
- Electrical box covers installed and tight
- All hoses and cords properly stored or installed
- Equipment/component labels installed and readable
- Insulation installed and undamaged
- Noise and vibration levels normal
- Equipment access satisfactory and unhampered by scaffolding or other material
- Minimum steam, oil, and water leakage
- Building integrity (physical integrity of structures)
- Safety tags properly completed, adequately attached, and authorized (spot check)
- Maintenance tags applicable and accurate (spot check)
- Fire barriers intact, and no fire hazards present
- Radiation/contamination areas clearly identified
- Hazardous material storage areas clearly identified
- Floor drains open and accessible
- Facility lighting adequate and operative.

Instrumentation and Control Panels

- Power supply available
- Alarms not in alarmed condition
- Recorders operating properly
- Indications within normal ranges (bands)
- Status lights operable
- Alarms operable

Motor Control Centers (MCCs)

- Breakers properly aligned
- Breaker enclosure temperatures normal and no unusual smells
- Breaker position indicating lights operating properly
- Charging springs charged and control power available
- Breaker trips reset

Transformers

- Liquid levels normal
- Temperatures and pressures normal

Wires and Cables

- Disconnected wires and jumpers properly identified
- Hold-down straps secure
- Grounding devices intact

Doors and Gates

- Fire doors closed and not blocked
- Other doors closed and locked as required
- Doors and gates close properly

Sumps

- Liquid levels in normal range
- Sump pumps operating as required
- No oil or organics in sumps

Pumps

- Suction and discharge valves properly aligned
- Suction and discharge pressures in normal range
- Gland seal leakage in normal range

Safety Hazards

- Ladders/gas bottles properly positioned or stored
- Use of proper equipment, such as non-sparking tools, aluminum ladders, etc.
- No water or steam leakage
- No water, oil, or other possible hazards on walking surfaces
- No open panels with potential electrical hazards
- Scaffolds properly erected
- General compliance with facility's industrial safety program requirements
- Open trenches or work areas roped off and posted
- Machine guards and shrouds properly installed.

APPENDIX B
SAMPLE ROUND SHEET

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AUXILIARY BUILDING OPERATOR ROUND SHEET

REV. 002

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	FUEL OIL STORAGE TANK 1A (INCHES)	LUBE OIL STORAGE TANK 1A (INCHES)	WASTE OIL STORAGE TANK 1A (INCHES)	POTABLE WATER STORAGE TANK 1A (INCHES)	DC CONTROL POWER VOLTAGE (VDC)	AC CONTROL POWER VOLTAGE (VAC)	BATTERY VOLTAGE (VDC)	LUBE OIL PUMP DISCHARGE PRESSURE (PSIG)	LUBE OIL RETURN TEMPERATURE (°F)	FUEL OIL PUMP DISCHARGE PRESSURE (PSIG)	FLOOR SUMP LEVEL (INCHES)	COOLING WATER SUPPLY TEMPERATURE (°F)	COOLING WATER PUMP DISCHARGE PRESSURE (PSIG)	MAIN ROOM AIR FLOW (SCFH)	AUXILIARY ROOM AIR FLOW (SCFH)	MAIN ROOM AMBIENT TEMPERATURE (°F)
MAXIMUM	60	38	25	50	28	130	28	40	180	75	24			30	30	95
HIGH NORMAL	54	32			26	125	26	35	150	62		70	25			
LOW NORMAL	20	15			22	115	22	30	110	58		40	20			
MINIMUM	10	8		5	20	110	20	25 [1]	90	55				5	5	50
TIME																
0000																
0200																
0400																
0600																
0800																
1000																
1200																
1400																
1600																
1800																
2000																
2200																

SHIFT STATUS CHECKS

	SHIFT	N	D	E
MAIN ROOM EMERGENCY EQUIPMENT CHECK		☐	☐	☐
AUXILIARY ROOM EMERGENCY EQUIPMENT CHECK		☐	☐	☐
FIRE SUPPRESSION SYSTEM CHECK		☐	☐	☐
MAIN ROOM SAFETY CHECK		☐	☐	☐
AUXILIARY ROOM SAFETY CHECK		☐	☐	☐

	SHIFT	N	D	E
SUPERVISOR REVIEW		☐	☐	☐

[1] The lube oil pump automatic shutdown occurs at 24 psig.

Remarks _____

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APPENDIX C
ADDITIONAL GUIDANCE FOR NUCLEAR POWER REACTORS

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This Appendix contains noteworthy additional guidance pertaining to shift routines and operating practices at DOE nuclear facilities.

1. Authority to Operate Equipment

The shift manager directs overall operation of the plant. Control room operators and shift managers need to be aware of all activities affecting plant equipment. Some activities that do not affect safety, regulatory requirements, or operating capability may be performed without the control room operator or shift manager being informed. However, the operations manager determines, defines, and documents these activities. The operations manager defines the operator areas of responsibility for each of these activities. Such activities include pumping certain uncontaminated sumps and making routine minor adjustments to systems in manual control. These activities are documented in a log that shift supervisory personnel and control room operators review. During emergencies, operators take immediate actions necessary for personnel and plant safety without having prior approval; however, they promptly inform the appropriate supervisors of these actions. Shift supervisory personnel and shift technical advisors in the control room refrain from manipulating plant equipment.

Clear expectations should be established for the conduct of system operation by groups other than operations. System or component manipulations that can directly affect core reactivity are only performed under the licensed (senior reactor operator or reactor operator) supervision of the operating crew. Station standards and practices for system and component operation by other groups are the same as those of the operations department. Nonoperations personnel who operate important facility systems should be trained to a level commensurate with that provided to operations personnel.

2. Crew Resource Management

Operating crew resources should be periodically reviewed to verify that they sufficiently support crew responsibilities and assigned tasks during normal, abnormal, and emergency plant conditions. Include the following aspects in this review:

- Sufficient staff should be provided to handle expected normal plant evolutions as well as reasonable abnormal occurrences. A minimum of two senior reactor operators (SROs) and two control board operators (reactor operator licensed or above) are needed at all times on each unit to respond to emergencies. One SRO is qualified as a shift manager and provides oversight during emergencies. The other SRO directs the crew's response to the emergency.

- Appropriate controls should be established to minimize distractions in the control room such as excessive overlapping or simultaneous evolutions. The crew should be augmented with additional operating personnel during complex normal or infrequently performed evolutions, such as plant startups, plant shutdowns, or special tests.

- Sufficient supervision should be provided to implement emergency plan requirements until additional resources can be summoned.

- Duties that require control room operators or supervisors to leave the control room to respond to emergency conditions should be limited. For example, assignment of control room operators and supervisors to fire brigade or medical response duties or to communicate with outside agencies is carefully considered against the need for these personnel to be in the control room during possible concurrent plant transients. Difficulties have been encountered when these support functions were assigned to control room personnel; therefore, other appropriately trained personnel are assigned these responsibilities.

- Sufficient nonlicensed operators or additional licensed operators should be provided to perform normal, abnormal, and emergency shutdown activities outside the control room. These operators are not assigned other duties that could interfere with these responsibilities, such as fire brigade or emergency medical response duties.

- To the extent possible, assigned responsibilities in an emergency should be the same as those during normal day-to-day activities.

- The possibility of simultaneous transients on both units should be considered when staffing dual-unit sites.

Clear guidance should be provided to operating crew supervisors for managing crew resources. To monitor and reinforce expectations for crew resource management, crews should be observed and coached during normal plant operations and during simulator training. Simulator casualty training is routinely performed with the minimum staffing levels expected during actual plant casualties.

Shift technical advisor (STA) functions are implemented with a dedicated, qualified individual or with a combined SRO/STA position. In either approach, the STA role is a key team role that fosters monitoring and independently assesses the appropriateness of crew response to casualties.

If a dedicated position is used, the most effective STAs are those who routinely work on shift with a designated crew. This ensures that the STA is fully informed of plant status should an emergency occur. Also, experience has shown a greater degree of teamwork and credibility if the STA is an integral member of the crew. If an on-call STA is used, the STA should participate in sufficient shift activities (such as crew turnovers and plant tours) to maintain awareness of plant status and evolutions in progress. This helps ensure that this individual can be an effective member of the response team upon arrival in the control room.

When a combined position is used, the STA function is normally combined with the senior licensed individual functioning as the shift manager or the work control room supervisor. For the combined STA/shift manager approach, it is essential that the individual maintains a broad perspective of overall plant response. If the combined STA/work control supervisor approach is used, the individual must monitor critical safety parameters to provide an advisory input to the crew. This individual cannot be drawn into other duties or tasks that detract from this monitoring.

4. Crew Teamwork, Operating Practices, and Diagnostic Skills

Teamwork, operating practices, and diagnostic skills are essential for successful completion of the many complex tasks operating crews perform. Operations personnel work as a team to effectively manage stationwide resources such as personnel, information, and time. Good teamwork is strongly dependent on the relationship of the shift manager and other operating crew members to plant management, as well as on the understanding of and attitude toward the standards and expectations set by station management. Teamwork skills include the following:

- communicating, including open communication among team members
- providing leadership
- problem-solving and decision-making
- team-building
- constructively challenging the actions and decisions of other team members
- resolving conflict
- fostering questioning attitudes
- cross-checking and monitoring
- prioritizing work
- avoiding hasty decisions and hurried actions

To successfully operate the plant, the operating crew integrates technical knowledge and skills by systematically applying necessary diagnostics. Operating personnel are thoroughly trained and evaluated on the plant's operational limits and margins, why the limits and margins exist, and how

they are used to achieve safe and reliable plant operation. Operating crews apply knowledge of reactor theory, thermodynamics, fluid dynamics, and instrumentation and controls to operation of the plant.

Operating practices promote event-free performance. Standards are established for practices such as the following:

- procedure adherence
- communications
- self- and peer-verification
- component manipulation
- pre- and post-evolution briefs
- supervisory oversight and direction
- operating parameter monitoring
- response to equipment abnormalities
- on-the-job training
- logkeeping
- shift turnovers

Establishing observable standards for these practices helps operations managers and supervisors reinforce desirable behaviors.

Operating crew teamwork, operating practices, and diagnostic skills should be routinely monitored to reinforce good crew performance and to identify and remedy weak performance. Also, interpersonal relationships should be considered in crew composition.

3. Operator Workarounds

Equipment deficiencies that adversely affect plant operations or cause operators to take compensatory actions should be identified and assessed. Operators rely on plant equipment to operate as designed to properly respond to abnormal and emergency conditions. When equipment does not operate as designed, operators take compensatory actions. Even during normal operations, a large burden can be placed on operators that detracts from their ability to monitor the plant. Often, individual equipment deficiencies do not pose an unreasonable burden on operators; but in the aggregate, multiple deficiencies pose a significant challenge or distract operators during their day-to-day routines.

Equipment deficiencies, particularly those that are long-standing, increase the probability of inappropriate or inadvertent operation of plant systems and may degrade operator ability to

respond to and mitigate plant transients. These deficiencies are repaired expeditiously. Compensatory actions for equipment deficiencies that significantly affect plant operation should be established and thoroughly communicated. These compensatory actions anticipate all operating conditions. The operating crews thoroughly understand the status of all equipment, how it affects overall plant operation, and required compensatory actions.

When assessing equipment deficiencies, the effect that the deficiency has on operator ability to respond to plant transients and emergencies should be included. Also, equipment deficiencies in the aggregate should be reviewed to determine their combined or cumulative affect on the operators during plant transient response. Equipment deficiency effects should be assessed frequently enough to determine how emergent equipment problems affect plant operators. Equipment deficiencies should be prioritized and categorized to support timely resolution.

4. Infrequently Performed Tests or Evolutions

The operations department has a lead role in ensuring that infrequently performed test or evolution briefings are conducted prior to evolutions that may affect plant conditions. Thorough briefings of all personnel involved should be held and possible adverse consequences of the test or evolution addressed, as well as contingency plans for potential problems. Before any test or evolution is conducted that is outside the bounds of normal plant procedures, the operating crew supervisor should verify that the activity has been reviewed and approved. Supervisors should confirm that their crews have written guidance and training to perform activities successfully.

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CONCLUDING MATERIAL

Review Activities:
DOE
DP
EH
EM
ER
NE
NS

Preparing Activity:
DOE-EH-31

Project Number:
MISC-0013