An Executive Guide to Field Observation

Practical Approaches to Facility and Activity Walkdowns

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HSS
Office of Health, Safety and Security

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Abbreviations Used in This Report

ALARA	As Low As Reasonably Achievable
DOE	U.S. Department of Energy
ISM	Integrated Safety Management
P&ID	Piping and Instrumentation Diagram
QA	Quality Assurance
REM	Roentgen Equivalent in Man
RWP	Radiological Work Permit

1.0 Introduction

The Department of Energy (DOE) is unique among Federal agencies in its commitment to a strong onsite presence in the management of agency missions throughout regional, field, and site offices. It is the Department's objective to enhance the safety and reliability of all DOE activities by promoting a strong operational awareness, facilitated by periodic onsite visits to the field by senior DOE executives.

1.1 Purpose and Scope

When executives from Headquarters tour a site, they do not usually have the same level of knowledge or operational awareness as the onsite DOE staff. Consequently, this Guide has been developed for those senior executives with line management responsibilities to enable them to ask relevant safety and procedural questions and obtain a better operational awareness during tours of facilities in the field. Although designed for dialogue with contractor personnel, this guide may also be used to pose questions to onsite DOE staff and managers. This Guide and Reference Cards cover the implementation of safety management concepts and DOE rules regarding contractor performance, environmental compliance, and safety standards.

1.2 Overview

In order to facilitate a more useful and disciplined site visit, this Guide provides three reference guides (on two cards) that are similar in size to the DOE badge and can be worn with the badge to allow for easy access to suggested lines of inquiry during a tour or visit to a DOE project. This Executive Guide explains each item or line of inquiry on the reference card in sufficient detail to allow the visitor to ask pertinent questions based on what is observed. The reference cards are not all-inclusive lists but are sufficient to allow sampling of work activities by persons who are not subject matter experts. Detailed lines of inquiry related to specific safety systems, structures or components are not discussed herein because they require more technical knowledge, insights, and familiarity with engineering and safety analyses than would normally be expected from a senior executive. It is not necessary for visitors to ask all of the items on the reference card. Rather, visitors are encouraged to take the cards into the field and use them to refresh their memory of such details and thereby promote a more informative tour.

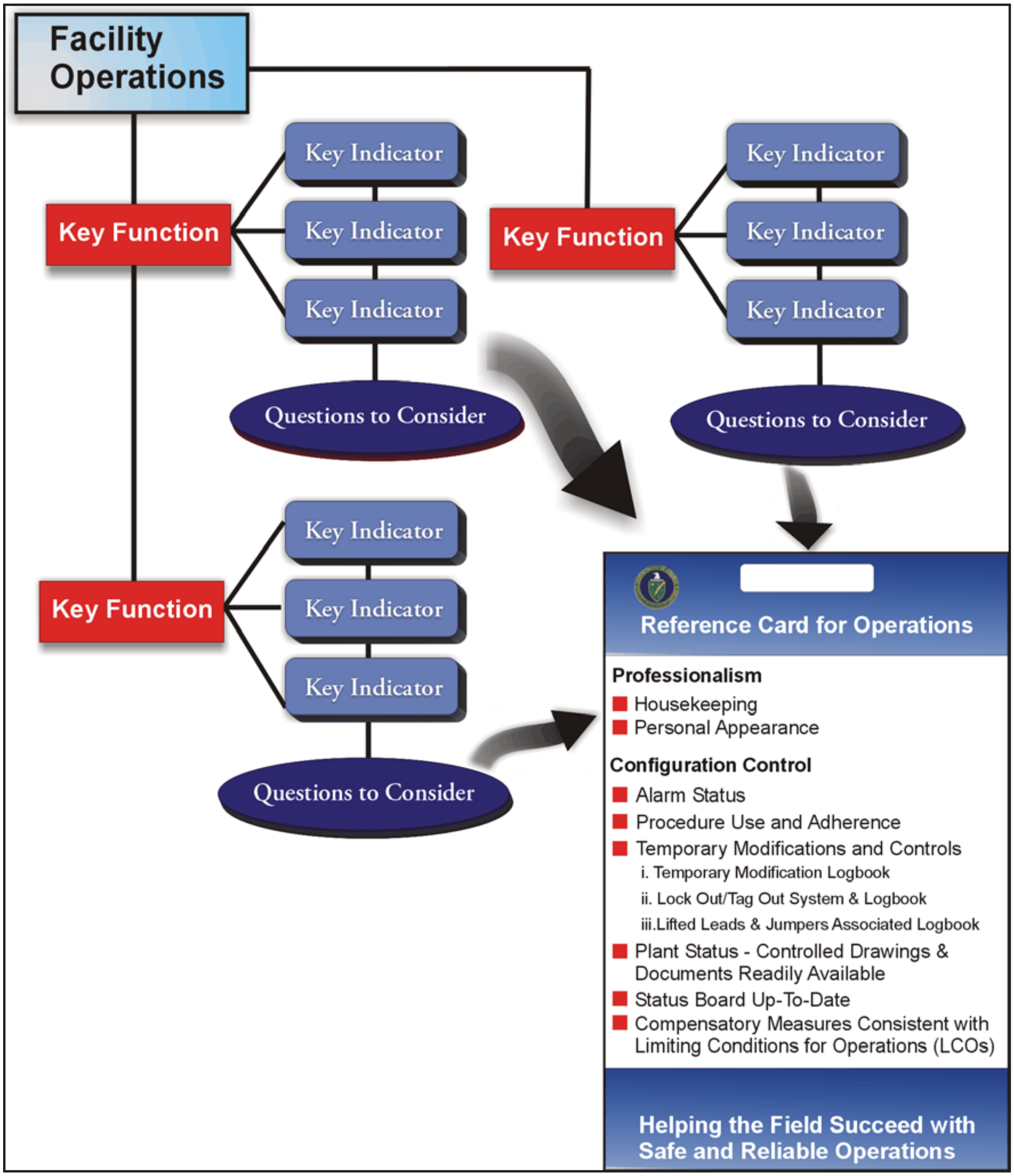
1.3 Navigating this Guide

This Guide is composed of three chapters, which cover the following life cycle phases at operational DOE facilities:

- Facility Operations
- Facility Construction
- Decontaminating and Decommissioning (Site Cleanup and Closure)

Each chapter begins with a list of Key Functions, which are benchmarks for success in each of the operational areas outlined above. Each Key Function is followed by a list of Key Indicators for that function. Key Indicators are areas of interest that can provide insight as to whether the Key Functions for each operation are being observed and implemented, or ignored.

A list of "Questions to Consider" follows each list of Key Indicators. These questions are derived from the Key Function and Key Indicators for each particular phase; they are intended for use in discussions with onsite personnel. This Guide includes Reference Cards that summarize the Key Functions and Key Indicators for ready reference during a tour. The following graphic illustrates the relationship between Key Functions, Key Indicators, Questions to Consider, and Reference Cards for a given operation.



1.4 Introduction to Safety Management Implementation

Integrated safety management (ISM) is a DOE requirement codified in procurement regulations and defined in DOE policy and guidance documents. ISM applies to all phases of a DOE project. It is the purpose of this Guide to point out fundamental attributes of an effective ISM program that may or may not be visible to a visitor. This introduction discusses some of the common ISM implementation practices and attributes that may be reflected in one or more of the life cycle phases. These attributes and practices are not mandatory DOE requirements; however, based on past experience, they have been proven effective in achieving high levels of performance, reliability, and safety.

- In design/construction, the contractor engineering design group is responsible for assuring that the conceptual plant design incorporates DOE needs and requirements. As the conceptual design evolves into the final design, so do the safety analyses. Concurrent safety and hazards analyses identify key safety features required for design and identify parameters necessary for safe operations. Operators should provide input to the design team at an early stage to bolster the practicality and functionality of the proposed design.

- During construction, contractor quality assurance checks are incorporated into a monitoring and inspection program to ensure that safety requirements are properly integrated into the design and subsequently implemented during construction.

- Completion of construction occurs with a validation of functions confirmed during post-construction system testing. Assumptions used in hazards analyses are tracked for verification during testing at the conclusion of plant construction. Procedures developed and used during testing are also used as the baseline of procedures for the operations phase.

- The transition from construction to operations occurs in phases allowing structures, components, and systems, both mechanical and electrical, to be transferred over a period of many months. The contractor operations group, with assistance from engineering and safety groups, prepares the proper surveillance, maintenance, and operating procedures once the major components and systems have been "turned over." Consequently, it is very likely at any given time to find half the plant under control of the construction contractor while the other half is under the control of the operations contractor. This division of responsibility results in two different sets of management and administrative controls with two different organizations and crafts. This condition requires careful coordination and oversight.

- The operating limits and constraints, safety limits, and other parameters defined through the design and safety process are integrated with administrative controls into an "operating safety envelope" of specific procedures. These procedures are the key interface documents for operators and translate analytical efforts into instructions for plant operation and maintenance. Design engineers are required to concur with procedures and work packages that could affect plant design or plant response.

- Design bases, with the approved safety analyses and associated assumptions, establish the operating parameters, limits, and constraints reflected in the operating procedures.

- Safety is not an add-on but an integral part of the job, starting with the conceptual design and evolving with the design as it matures. Conceptual design cost estimates and schedules reflect the inclusion of critical safety systems and functions.

- The contractor operations group is responsible for assuring that all work and operations are conducted in accordance with pre-approved procedures and the DOE-approved safety limits. The operations group (plant manager, operations manager, shift manager, shift supervisor, plant operator, etc.), either individually or collectively, do not have the freedom or flexibility to change safety requirements or procedures on their own. Any change requires review and concurrence by the designated representative from operations, engineering, quality assurance, and safety groups.

- The plant manager is responsible for day-to-day operations, while the contractor engineering group is responsible for assuring that the plant design meets long-term DOE needs and that the original design criteria and safety requirements continue to be satisfied. Operating experience is used to develop solutions to preclude future recurrence; that is, mistakes and equipment failures are used as a learning device to prevent repetition. This is sometimes referred to as "striving for excellence."

2.0 Facility Operations

Facility Operations Control Room

Facility Operations oversees all facets of day-to-day operation of the facility. From preventive maintenance of equipment and facilities to record keeping and configuration control, Facility Operations ensures continuous smooth and safe operation of the facility. The following Key Functions have a decisive impact on the quality and success of Facility Operations.

Facility Operations Key Functions

- Professionalism
- Configuration Control
- Technical Proficiency
- Record Keeping
- Preventive Maintenance

2.1 Professionalism

Professionalism can provide valuable insight into the quality of management. The following are key indicators of professionalism and recommendations of what to observe during a tour.

Professionalism Key Indicators

- Housekeeping
- Personal Appearance

2.1.1 Housekeeping

Good housekeeping reflects well on plant management, reinforces a sense of ownership, and most importantly, improves safety and performance. Poor housekeeping indicates habits or behaviors that warrant closer scrutiny, such as poor procedural adherence, poor craftsmanship, cutting corners to save time, and recording data improperly.

An Example of Poor Housekeeping

2.1.2 Personal Appearance

The appearance of personnel also indicates how well a plant is being managed. In well-managed operations, personnel take pride in their appearance. Operators with torn pants, shirt tails hanging outside their trousers, and a slovenly appearance can be warning signs of more serious problems, such as poor fitness for duty (e.g., failure to take medications in a timely manner), substance abuse (e.g., overdose of medications, illegal narcotics use), or lack of mental alertness (e.g., lack of sleep). Likewise, a plant manager who is always dressed in a business suit may not be spending much time out on the floor.

Questions to Consider for Professionalism

- *Are emergency exits clearly marked and readily accessible? Are waste containers or boxes of extra supplies stored so that they block or impede easy egress?*

- *Did the contractor respond to prior requests for access to observe work in spaces requiring protective clothing, and did they make arrangements to accommodate the current observation ?*

- *Are seemingly minor safety issues, such as debris or loose paper on floors, addressed by personnel promptly, or are these problems simply ignored?*

- *Does personal appearance reflect a sense of pride and ownership for how work is being done?*

- *Do control rooms, laboratories, and process areas appear neat and orderly, with attentive staff?*

- *Are facility grounds, parking lots, and buildings tidy and well maintained?*

- *Are tools, spare parts, and equipment in maintenance and shop areas neatly stored?*

- *Are shop floors clean and free from spills of lubricants, coolants, or other fluids?*

- *Are hazardous materials properly stored, with adequate containment measures to prevent release of accidental spills?*

2.2 Configuration Control

A plant is designed to operate within defined parameters and design limits. Engineering contractors are expected to identify key process parameters, define minimum and maximum values for such parameters, and translate operating limits into documented procedures. Operating in accordance with procedures assures that the plant is maintained within its safety envelope. The following are key indicators of proper configuration control and recommendations on what to observe during a tour.

Configuration Control Key Indicators

- Alarm Status
- Procedure Use and Adherence
- Temporary Modifications and Controls
  - Temporary Modification Logbook
  - Lockout/Tagout System and Logbook
  - Lifted Leads and Jumpers and Associated Logbook
- Plant Status (availability of controlled drawings and documents)
- Up-to-Date Status Board
- Compensatory Measures Consistent with Limiting Conditions for Operations

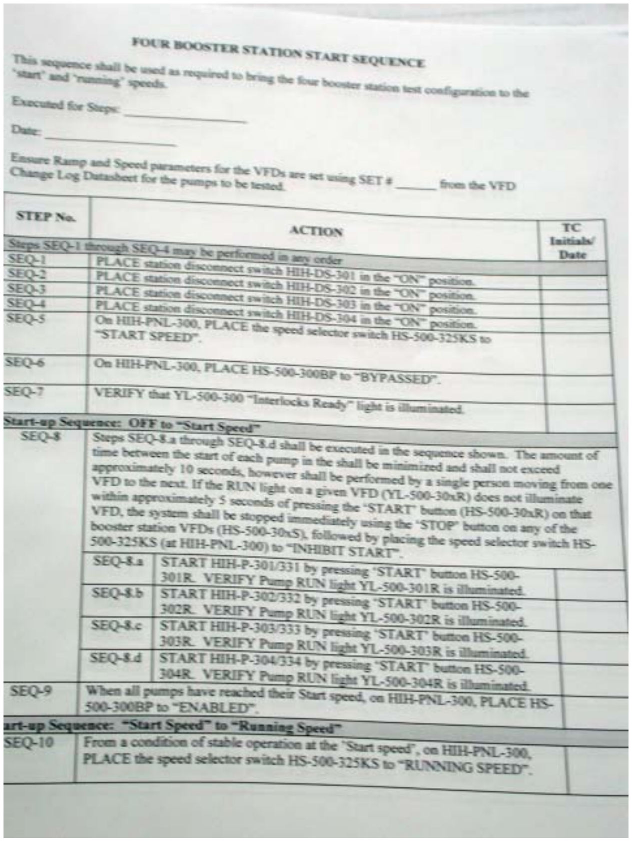
2.2.1 Alarm Status

The plant is designed to alert operators to abnormal conditions or when key parameters are exceeded. Alarm system status is one indicator of whether the operator is attentively and accurately monitoring plant parameters. It should be noted whether abnormal conditions are properly managed *before* alarm conditions exist or operators rely on alarms to identify the needed action.

2.2.2 Procedure Use and Adherence

The key link between the design engineer and operations is the procedure. There should be clear evidence of procedures being used to control planned events, as well as responses to transients and alarm conditions. Operational constraints imposed by procedures should be prominently displayed.

There also should be a process for periodic verification that operations are within the envelope of constraints imposed by the procedures.



FOUR BOOSTER STATION START SEQUENCE

This sequence shall be used as required to bring the four booster station test configuration to the "start" and "running" speeds.

Executed for Steps: ____________

Date: ____________

Ensure Ramp and Speed parameters for the VFDs are set using SET # ______ from the VFD Change Log Datasheet for the pumps to be tested.

STEP No.	ACTION	TC Initials/ Date
Steps SEQ-1 through SEQ-4 may be performed in any order		
SEQ-1	PLACE station disconnect switch HIH-DS-301 in the "ON" position.	
SEQ-2	PLACE station disconnect switch HIH-DS-302 in the "ON" position.	
SEQ-3	PLACE station disconnect switch HIH-DS-303 in the "ON" position.	
SEQ-4	PLACE station disconnect switch HIH-DS-304 in the "ON" position.	
SEQ-5	On HIH-PNL-300, PLACE the speed selector switch HS-500-325KS to "START SPEED".	
SEQ-6	On HIH-PNL-300, PLACE HS-500-300BP to "BYPASSED".	
SEQ-7	VERIFY that YL-500-300 "Interlocks Ready" light is illuminated.	
Start-up Sequence: OFF to "Start Speed"		
SEQ-8	Steps SEQ-8.a through SEQ-8.d shall be executed in the sequence shown. The amount of time between the start of each pump in the shall be minimized and shall not exceed approximately 10 seconds, however shall be performed by a single person moving from one VFD to the next. If the RUN light on a given VFD (YL-500-30xR) does not illuminate within approximately 5 seconds of pressing the "START" button (HS-500-30xR) on that VFD, the system shall be stopped immediately using the "STOP" button on any of the booster station VFDs (HS-500-30xS), followed by placing the speed selector switch HS-500-325KS (at HIH-PNL-300) to "INHIBIT START".	
SEQ-8.a	START HIH-P-301/331 by pressing "START" button HS-500-301R. VERIFY Pump RUN light YL-500-301R is illuminated.	
SEQ-8.b	START HIH-P-302/332 by pressing "START" button HS-500-302R. VERIFY Pump RUN light YL-500-302R is illuminated.	
SEQ-8.c	START HIH-P-303/333 by pressing "START" button HS-500-303R. VERIFY Pump RUN light YL-500-303R is illuminated.	
SEQ-8.d	START HIH-P-304/334 by pressing "START" button HS-500-304R. VERIFY Pump RUN light YL-500-304R is illuminated.	
SEQ-9	When all pumps have reached their Start speed, on HIH-PNL-300, PLACE HS-500-300BP to "ENABLED".	
art-up Sequence: "Start Speed" to "Running Speed"		
SEQ-10	From a condition of stable operation at the "Start speed", on HIH-PNL-300, PLACE the speed selector switch HS-500-325KS to "RUNNING SPEED".	

A step-by-step startup procedure

2.2.3 Temporary Modifications and Controls

Changes to a plant, either temporary or permanent, need to be performed in a disciplined manner with the involvement of engineering and operations management. Improper changes or temporary modifications can invalidate safety bases and/or engineering controls. Temporary modifications should have age limits (e.g., 30 days) so that they do not inadvertently become unauthorized permanent changes.

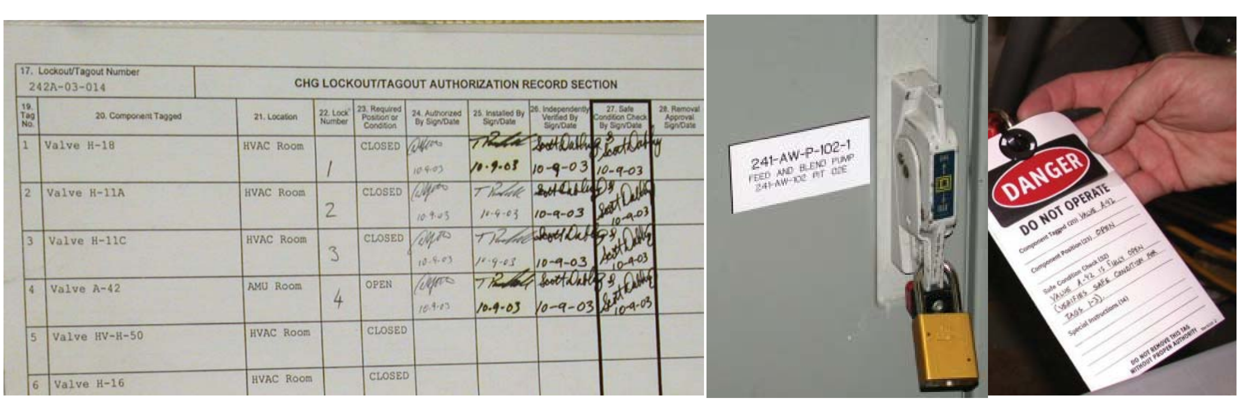
Shift supervisor's caution tag on a valve, which provides special instructions

2.2.3.1 Temporary Modification Logbook

All temporary modifications must be recorded in a controlled document, such as a logbook, with a unique number to facilitate tracking of the colored tags placed on components to highlight the situation. Such entries and associated colored tags keep track of deviations from normal operations.

2.2.3.2 Lockout/Tagout System and Logbook

Temporary mechanical modifications should be performed using the lockout/tagout system whereby tags are placed on plant components to alert operators



A lockout/tagout logbook, lockout on a circuit breaker, and tagout on a valve that this equipment is not in its normal alignment. A formal process is used to identify temporary changes in the configuration of the plant. DOE-approved compensatory measures should be in place.

2.2.3.3 Lifted Leads and Jumpers and Associated Logbook

Electrical control circuits for interlocks and alarms can be taken out of service using a formal and controlled system for "lifted leads and jumpers" (i.e., electrical wires temporarily removed or bypassed), indicated by tags put on the actuator switches on the control panel.

2.2.4 Plant Status

Operators need to know the status of key plant safety systems on a real-time basis so they can address anomalies as they occur and restore the systems to normal operating parameters. Detailed piping and instrument diagrams (P&IDs) (controlled blueprint drawings) and vendor operating manuals for key components should be available in the control room for ready reference by operators.

Controlled drawings and blueprints (P&IDs) must accurately reflect plant operations before test personnel may transfer plant ownership to operators

2.2.5 Up-to-Date Status Board

Status boards should identify critical equipment that is not available or taken out of service, and details should be provided in critical logs.

A computerized status board with red indicators for alarms

2.2.6 Compensatory Measures Consistent with Limiting Conditions for Operations

Whenever a key system or safety component is not available, the authorized "speed limit" should be reduced commensurate with the DOE approved authorization basis—the operational equivalent of a "license"—and compensatory measures put in place. The term "Limiting Conditions for Operation" defines the mandatory functions and limits for safe operations and defines restrictions for when conditions are not met.

Questions to Consider for Configuration Control

- *How many alarms are being silenced at this time?*
- *May I please see the controlling procedure for any evolution in progress?*
- *How many systems are currently tagged out of service?*
- *Where are the controlled drawings, operating procedures, and vendor manuals for the plant kept?*
- *Is there a status board I can see that keeps track of systems or functions taken out of service?*
- *How long can such systems stay out of service?*
- *What restrictions are currently in place for systems taken out of service?*

2.3 Technical Proficiency

A visiting executive should focus on the knowledge and skills that operators demonstrate in daily practices. Weaknesses identified through interviews or observations of work in progress should drive the need for a review of training program adequacy. It is acceptable to talk with the operators on shift, but first, seek permission. Second, make it clear that you are not to detract from their ability to carry out their assigned duties. If an emergency or alarm occurs, stop the conversation and step back out of the way. The following are key indicators of technical proficiency and recommendations on what to observe during a tour.

Technical Proficiency Key Indicators

- Proper Use of Procedures
- Radiological Safety
- Shift Turnover Process

2.3.1 Proper Use of Procedures

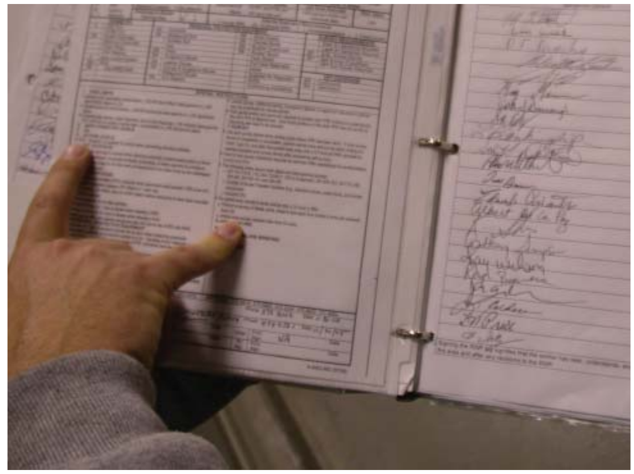
Operating procedures and constraints derived from safety and hazards analyses are integrated into plant procedures. Those procedures are the critical linkage documents between the safety analysts and the operators.

While strict step-by step compliance with established procedures should be the norm, operators must at the same time remain cognizant of their actions. If something does not make sense for existing conditions, work should stop. Operators should engage in conscientious, "thinking" compliance, not blind compliance.

Stop-work requests made by operators indicate an effective system that expects operators to take responsibility for their actions. On the other hand, if DOE must interject in order to stop work, then something may be awry. Question how many times operators have exercised their stop-work authority.

2.3.2 Radiological Safety

Radiological safety is based on the premise that all individuals are properly trained and responsible for their own radiological safety. Workers who could be exposed to radiation are required to wear and monitor dosimeters that measure the amount of radiation absorbed during the performance of their work. In addition, monthly cumulative exposure is measured using each individual worker's film badge.



All site workers must sign a job-specific RWP before entering a radiological area—as must site visitors

10 CFR 835, Occupational Radiation Protection, establishes regulatory limits for occupational exposure to radiation for specific organs and the whole body. The rule dictates that operators cannot receive a whole-body radiation dose of more than 5 Roentgen Equivalent in Man (REM) over one year due to job activities. To assure that operators do not exceed this limit, DOE mandates the use of administrative control levels. These levels must be based on projected work activities and prior experience, and must conform to As Low as Reasonably Achievable (ALARA) principles.

Compliance with ALARA principles requires that contractors establish controls to limit operator exposure to radiation through proper work planning, use of protective clothing and equipment, intensive preparation (e.g., "dry runs" or simulation of planned work), and remote monitoring for radiological "hot-spots" where workers may receive particularly high doses.

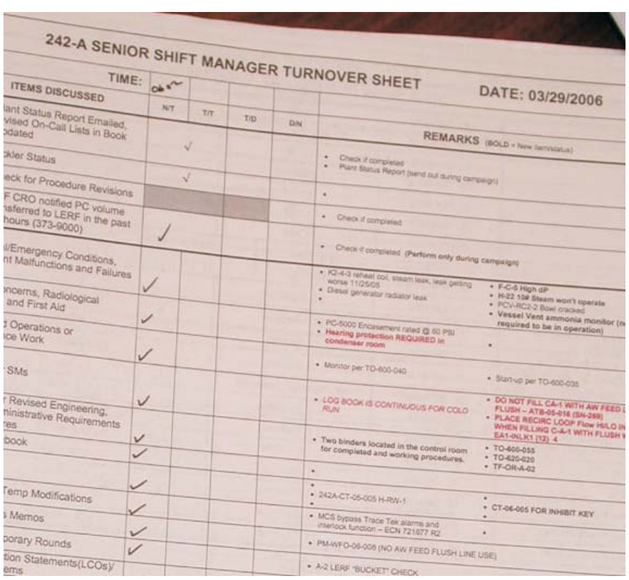
Controlling exposure time, distance, and shielding is vital to the concept of ALARA

Administrative control levels and protective measures established during the work planning process are documented within a radiological work permit (RWP). An RWP should identify the nature of the work, radiological control levels, and required protective equipment. All nuclear-trained workers performing radiological work should be intimately familiar with the associated RWP and should sign the document before starting work.

If your tour passes a radiological work area, ask your escorts to show you the job-specific RWP and ask whether you may review the most recent radiological survey of the area. Be aware of "hot spots" with high readings. If a particular RWP sets control levels in excess of the 300 to 500 mrem range, ask your escorts to explain the reasoning behind such high limits. (Note that projected doses greater than 2000 mrem must be approved by DOE Headquarters.)

2.3.3 Shift Turnover Process

There should be a rigorous review process between those going off shift and their replacements to exchange information regarding the current state of facility operations and whether any planned or unplanned incidents have occurred since the last shift change. A formal checklist for shift managers and supervisors should be available, in place, and completed before transfer. It is acceptable to request a review of the turnover checklist. That checklist should highlight expected evolutions, possible problems, and other issues of which operators should be aware. Procedures used during turnover should explicitly refer to steps that allow for proper continuance and/or restart of the procedure or process.



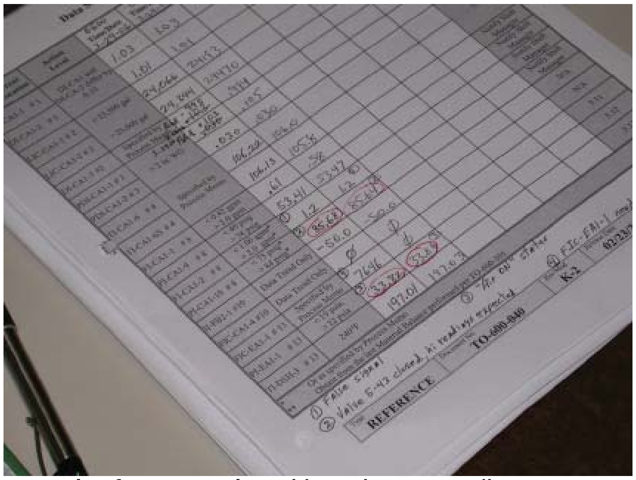
Example of a shift turnover checklist

Questions to Consider for Technical Proficiency

- *What was the most noteworthy item recorded on the shift-change checklist when you reported for duty?*
- *What kind of training and qualification program did you go through to perform this job?*
- *Are you aware of any "Stop Work" situations occurring in the last 3 months, 6 months, or year?*
- *Did management actually "Stop Work" when a situation was last identified to them?*
- *How comfortable are you working with radiation? What information are you provided regarding your assigned tasks and the related potential radiation exposure, the precautions to minimize that exposure, and the measures to monitor that exposure? Do you know your current total amount of annual exposure?*
- *What is the administrative control level for the RWP that covers our entry into this area for observation?*
- *After an extended time away from work, such as after a vacation, what steps do you take to feel knowledgeable and comfortable about resuming your shift duties?*
- *Please show me the checklist used by the shift supervisor before he or she assumed their duties.*

2.4 Record Keeping

Well-kept records track and trend equipment performance and collect information for a lessons-learned program. Following an unplanned event, written records are the primary source for developing a chronology of events that is used to identify the root cause of a problem. Interviews with operators are necessary, but keep in mind that their recollection of facts can fade with the passage of time.



Example of a process log with equipment readings

Plant activities and real-time operating data should be examined to see how well raw information is being captured and used. Once problems are identified and lessons learned are disseminated, records should be maintained that reflect the efficacy of processes that apply lessons learned to prevent a recurrence. The following are key indicators of proper record keeping and recommendations on what to observe during a tour.

Record Keeping Key Indicators

- Log Keeping
- Review of Operating Logs and Information
- Required Reading Program

2.4.1 Log Keeping

Logs are a running history of plant activities, maintained in real time, and not after the fact, by shift personnel and supervisors. Investigations of accidents or abnormal events rely on data in the logs to identify underlying problem(s) and when such problems took place. Log entries should be in ink and should indicate ownership by position and name. It is acceptable to review and ask questions regarding information in the logs.

2.4.2 Review of Operating Logs and Information

Maintenance of logs is essential to facilitate shift turnover; review of those logs at turnover helps operators avoid mistakes encountered by a prior shift. The oncoming shift can identify operating procedures or work practices that encountered difficulties and understand any corrective actions that were taken. Some watch-standers avoid reviewing the log history before assuming responsibility for a shift; this practice can lead to problems. It is acceptable for you to review the logs and ask current watch-standers to clarify unique situations that may have occurred in the previous days or weeks.

Typical logbook and logsheet maintained by shift personnel

2.4.3 Required Reading Program

Operating crews commonly undergo refresher training by reviewing lessons learned from past problems. However, with minimum three-shift coverage for 24/7 operations, alternative means are used to disseminate information, such as a required reading program. Information may include changes in procedures, lessons learned, or changes in standard practices. Required reading should include a book of information, identification of personnel familiar with the contents, and a signature page denoting that person has read the information. This can be easily checked by asking to see the required reading folder.

Questions to Consider for Record Keeping

- *Please show me the logbook or chronology of recent facility operations.*
- *Who can make entries into this log, and what are they required to write about?*
- *How do the operators learn about relevant mistakes made at this plant?*
- *Can you show me the "required reading" folder?*

2.5 Preventive Maintenance

Structures, systems and components that perform vital production and safety functions should be reliable and operate properly whenever called upon. In support of these vital functions, operating data is collected, trended, and analyzed to identify when critical parts are not performing properly. DOE has a maintenance policy that requires periodic checks to verify component integrity, before the part fails. "Fix it before it breaks" is the DOE standard. The following are key indicators of proper preventive maintenance and recommendations on what to observe during a tour.

Preventive Maintenance Key Indicators

- Proper Use of Round Sheets
- Work Request Backlog
- Work Package Completion
- Plant Testing

2.5.1 Proper Use of Round Sheets

Data on equipment performance is routinely recorded in the working spaces on logs referred to as "Round Sheets." Round Sheets identify specific parameters to be recorded and the expected normal operating range, and should contain a narrative for conditions that are out of specification.

2.5.2 Work Request Backlog

When equipment malfunctions, work requests are submitted by the operations group to the maintenance group. The file of submitted work requests can be reviewed to examine how long it takes to fix a problem. Excessive numbers of high-priority work requests outstanding for more than three months may indicate that management tolerates plant operations with major equipment out of service.

2.5.3 Work Package Completion

A Work Package is a planning tool used to accomplish a unique task (e.g., repairing malfunctioning equipment). Work Packages should reflect participation in the planning and procedure preparation by engineers, maintenance personnel, crafts, safety, and operations representatives, and should contain the signatures of the respective supervisors. Work Packages should include system status (lockout/tagout), specify parts to be replaced, the procedural steps to be used in performing the work, and the functional tests to be conducted after the work is done. It should, in short, reflect the ISM principles: (1) Define the scope of work; (2) Identify and analyze hazards; (3) Develop and implement controls; (4) Perform work within controls; and (5) Provide feedback and continuous improvement. A pre-briefing should also be conducted to ensure that all participants are aware of safety precautions, prerequisites, and acceptance criteria.

2.5.4 Plant Testing

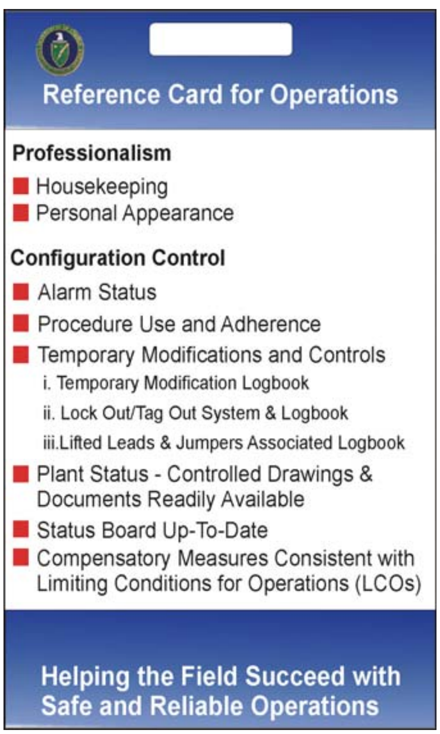
In accordance with a stated frequency and periodicity, key components and systems should be tested to make sure they will work properly when called upon. Also, after repair work has been performed or replacement parts installed, the affected system and component should be functionally tested to verify acceptable performance. Improper work or inadequate system lineups will become apparent as a result of such testing before returning the system to service.

Questions to Consider for Preventive Maintenance

- *How do you know if a piece of equipment is operating properly?*
- *What do you do if it is not operating properly?*
- *How large is the current backlog for work requests?*
- *How long do you normally have to wait before something gets fixed?*
- *What is the age of the oldest work request?*
- *Please show me the plan and schedule for fixing all of the open items on the work list.*
- *Who decides when a system needs to be taken out of commission?*
- *How do you determine what precautions or preventive measures need to be taken when a system is taken out of service?*
- *Please show me a surveillance test procedure that is routinely used to verify that a critical system is operating properly and can carry out its function.*

2.6 Reference Card for Facility Operations

Reference Card Front



Reference Card Back

3.0 Facility Construction

The following list contains several noteworthy characteristics of a successful construction project:

- Final design by engineering is typically approved before the start of construction. However, some rare circumstances may justify concurrent design and construction.
- Safety and hazards analyses are initiated during conceptual design and evolve through the final design.
- Results of safety analyses are used to identify key safety features and systems.
- Quality assurance programs are used during design engineering, fabrication, and plant construction to focus on assuring the adequacy of key structures, systems and components.
- A startup testing program is used to validate key plant functions before operations are allowed.
- Completion of construction is accompanied by a turnover of responsibility from construction to operations.

The following Key Functions have a decisive impact on the quality and success of Facility Construction:

Facility Construction Key Functions

- Professionalism
- Quality Assurance
- Comprehensive Test Program
- Transition from Operations to Ownership

An executive may not encounter these four management functions simultaneously during a single visit to a construction project due to the

discrete phase of construction under way at the time of their tour. Note, however, that many management functions during construction are very similar to those of an operating facility.

3.1 Professionalism

Professionalism during construction can provide valuable insight into the quality of management. The following are key indicators of professionalism and recommendations on what to observe during a tour.

Professionalism Key Indicators

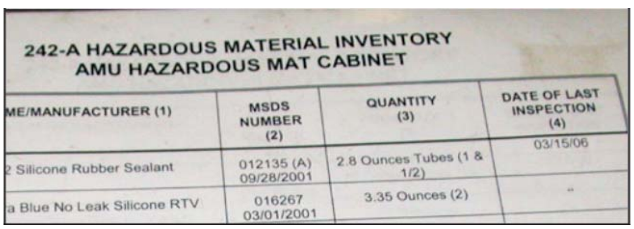
- ➢ Site Housekeeping
- ➢ Worker Safety

3.1.1 Site Housekeeping

Cleanliness—the absence of clutter, extraneous materials, and loose trash (beyond areas designated for a tour)—and the prompt cleanup of work areas upon completion of work are examples of good housekeeping that reflect well on site management. For example, at the end of a day or a shift, tools and equipment should be properly stored and debris collected and removed. On the other hand, poor housekeeping is an indicator that shortcuts may be in use to meet scheduled milestones or that other habits and behaviors are being tolerated that could affect safety and reliability.

3.1.2 Worker Safety

Everyone on a construction site should be vigilant about personal safety and, accordingly, wear appropriate protective clothing. Hard hats, safety glasses, hearing protection, and steel-toe shoes should be mandatory. Additional protective clothing and equipment must be in use for hazardous operations, such as welding. Fall protection, such as a safety harness, should be in evidence during work on scaffolds, cherry pickers, or other high structures. "Tool box" meetings at the start of a shift are a common way for crafts supervisors to highlight planned work to be done, procedures in use, and unique circumstances that may present new hazards. Warning signs should be clearly posted, and controls must be in place to alert passersby to unique and potentially dangerous situations, such as welding, lifting of heavy objects, or testing of heavy machinery.



242-A HAZARDOUS MATERIAL INVENTORY
AMU HAZARDOUS MAT CABINET

ME/MANUFACTURER (1)	MSDS NUMBER (2)	QUANTITY (3)	DATE OF LAST INSPECTION (4)
			03/15/06
2 Silicone Rubber Sealant	012135 (A) 09/28/2001	2.8 Ounces Tubes (1 & 1/2)	
a Blue No Leak Silicone RTV	016267 03/01/2001	3.35 Ounces (2)	"

An inventory sheet on a job site locker containing hazardous materials

QUESTIONS TO CONSIDER FOR PROFESSIONALISM

- *What are my personal requirements for safety equipment when I step onto this construction site?*
- *Are emergency exit routes clearly posted, readily identifiable, and accessible?*
- *Where are the tools stored when work is finished for the day?*
- *How is a specific job site controlled so that the work does not pose a hazard to others walking by?*
- *What was the most important topic of discussion during your morning "tool box" or plan of the day meeting?*

3.2 Quality Assurance

Ensuring the reliability and safety of key plant features before, during, and after installation is a challenge. An effective quality assurance (QA) program begins with the engineering design effort, is incorporated into the fabrication of facility components, and must be present during construction to protect critical safety systems from the time they arrive on site until they are installed, tested, and verified to be ready for use. The following are key indicators of good QA and recommendations on what to observe during a tour.

Quality Assurance Key Indicators

- Lay-Down Areas
- Non-Conformance Tagout System
- Hold Points and Procedures

3.2.1 Lay-Down Areas

Equipment, materials, and components that are to be installed in a facility under construction are temporarily stored on site in "lay-down" areas. Lay-down areas must be maintained in an orderly manner and must provide protection against damage from both ongoing construction activities and the outside elements.

A properly maintained lay-down area

3.2.2 Non-Conformance Tagout System

There should be an active QA inspection program to assure conformance with final design. This is most often apparent in the form of non-conformance tags that QA personnel place on out-of-specification equipment. A visitor can read these tags to see when they were placed to assess the degree of real-time monitoring of installation by QA inspectors, and whether a formal plan and schedule are in place to correct such deficiencies in a timely manner.

3.2.3 Hold Points and Procedures

Critical components and systems that are essential to reliability or safety may warrant extra attention by QA personnel. Installation procedures often include "hold points" where detailed inspection occurs by QA personnel to facilitate a thorough review before completion of work. These installation procedures must be present and in use at the job site.

Questions to Consider for Quality Assurance

- *How can I distinguish between the crafts personnel and QA inspectors?*
- *Are there any critical jobs under way that warrant QA presence? Please show me.*
- *How can I tell whether work has been inspected and accepted by QA personnel?*
- *Please show me a non-conformance tag, tell me when was it placed, and tell me how the problem will be resolved.*
- *Please show me the procedures and blueprints that the construction crafts use at the job site.*
- *Please describe to me how the crafts use procedures and blueprints to perform their assigned work for a key system.*
- *Please explain a "hold point" and show me a procedures for work in progress that has such a measure in place.*

3.3 Comprehensive Test Program

During the definition stage of a project, mission needs, safety requirements, and reliability targets should be defined in advance of construction activities. Expected operational parameters are determined, and the corresponding design and safety analyses utilize bounding assumptions to assure that the desired functions can be achieved. During the testing phase

Example of Test Engineer's Tag

of a construction project, elements of the plant are subjected to actual operating conditions to verify that each component, system, and function performs as intended. The following are key indicators of a comprehensive test program and recommendations on what to observe during a tour.

Comprehensive Test Program Key Indicators

- Role of Future Operators
- Test Procedures Are Written and Complete

3.3.1 Role of Future Operators

Although contractor construction and testing personnel may be involved with testing, it is the role of the future operators to manipulate individual components and systems and actually conduct the tests themselves. An approach that progressively tests individual components, and then performs a system function test on the integrated components, provides confidence that the total system will be placed successfully into operation. Furthermore, if plant operators perform the manipulations under the guidance of test engineers, the operators will retain "corporate knowledge" of how the plant responds.

3.3.2 Test Procedures Are Written and Complete

Ensuring that the as-built plant is consistent with design drawings is a critical part of the test program, as is rigorous testing of all future plant procedures. Consequently, a testing program should include inputs from engineering, operations, and test personnel. A formal process should be in place to assure that original design assumptions, safety requirements, and criteria are incorporated into the test procedures and validated. Tests must be run in accordance with prepared and approved procedures that control the conduct of each test. Progress of a test program and progress toward a readiness review can be measured by the number of test procedures written, approved, and completed, and by the absence of open items.

A well-defined and rigorous testing program culminates in a formal review by senior DOE and contractor management. This review will evaluate the adequacy of completed construction and plant operational readiness. Prior to a DOE operational readiness review (or the equivalent), the contractor for operations should also perform a separate review of readiness for operations, including staffing and qualification examinations.

Questions to Consider for a Comprehensive Test Program

- *How does one tell the difference between operators who are doing testing and construction crafts personnel who are still building the plant?*
- *How does one know whether a test was successful? Please show me a completed package.*
- *How many open items are allowed for a completed test before you have to redo the test?*
- *How many tests have been completed for individual systems?*
- *For a plant under construction, how do you isolate the system or component being tested from the part not finished? Can you give me an example?*

3.4 Transition from Construction to Operations

A plant's readiness for transition from construction to operations can be measured by two factors: first, by the number of responsibilities turned over to operations personnel; and second, by the number of finalized procedures that have been verified as safe and effective. The following are key indicators of this readiness for transition and recommendations on what to observe during a tour.

Transition from Construction to Operations Key Indicators

- Number of Structures, Systems, and Components Turned Over to Operations
- Operating Procedures and Processes

A test tag on equipment being transferred to operations

3.4.1 Number of Structures, Systems, and Components Turned Over to Operations

Day-to-day ownership for the access, control, operation, and maintenance of structures, systems, and components that have been satisfactorily tested should reside with the contractor operations organization, not the construction or testing organization.

3.4.2 Operating Processes and Procedures

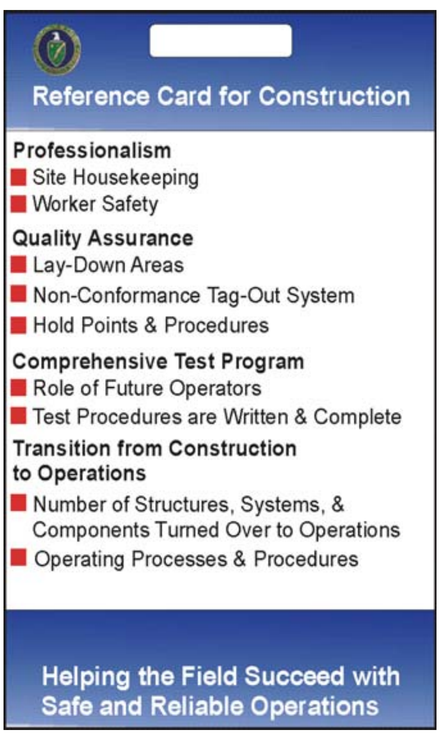
A set of procedures for operating the plant, maintaining the plant, and surveillance of plant systems should exist and should have been validated to be safe and effective for the plant in question. Such procedures need to be accurate and complete because they form the key linkage to the safety authorization basis.

Questions to Consider for Transition from Construction to Operations

- *How does one tell the status of construction completion and testing in progress?*
- *When a system or component is turned over to operations, is there a limitation on the number of open items that need to be corrected before such transfer can occur?*
- *Who is the senior operations person in charge of testing? What will be his or her role once construction is complete?*
- *Who is writing the operating procedures? Are there any available to read?*
- *How does the testing program interface with the training department? How do you compile lessons learned from the testing program to teach new recruits years later?*
- *Who is the senior onsite person from the training department?*
- *How do you valicate that the "as-built" plant, procedures, and blueprints are consistent before operations are started?*

3.5 Reference Card for Facility Construction

Reference Card Front



Reference Card Back

Back of Reference Card for Facility Construction is the Reference Card for Site Cleanup and Closure

4.0 Decontaminating and Decommissioning (Site Cleanup and Closure)

Whenever an existing plant or facility is to be taken permanently out of service through demolition, the overall process must involve cleanup and closure. Cleanup begins with site characterization, through sampling and analysis of the materials, to determine which materials may exceed allowable concentrations of radiological or other hazardous constituents. These materials are then separated from the uncontaminated materials for either treatment to render them non-hazardous or for offsite shipment to a licensed site for disposal. Closure is the process of assessing and confirming, again through sampling and analysis, that the decommissioned site is free of radiological or other hazardous substances that could pose a threat to human health or the environment.

The demolition of buildings and subsequent cleanup and site closure involves extensive pre-planning, characterization of building conditions to ascertain the nature and extent of potentially hazardous materials, and active worker participation in establishing job specific procedures. This process is in keeping with ISM principles, where worker involvement is a critical element to assure proper consideration of safety and health procedures. The following Key Functions have a decisive impact on the quality and success of Decontaminating and Decommissioning (Site Cleanup and Closure):

Decontaminating and Decommissioning Key Functions

- Procedures
- Site Housekeeping
- Worker Safety
- Monitoring

4.1 Procedures

The following are key indicators of good procedure use, and recommendations on what to observe during a tour.

Procedures Key Indicators

- Procedure Availability at Job Site
- Procedures in Use During Work

4.1.1 Procedure Availability at Job Site

All work activities must be controlled by specific, rigorous procedures that not only describe the demolition means and methods, but also prescribe the health and safety measures to be taken. These procedures should be readily available at the job site, and workers should be able to answer questions regarding step-by-step compliance.

4.1.2 Procedures in Use During Work

Procedures must be used while work is being performed. Also, daily “tool box” or pre-shift briefings should occur between the workers and their supervisors. Such briefings should reinforce safety precautions and step-by-step procedure adherence, identify issues that may introduce new site hazards, and provide a forum for the discussion of lessons learned applicable to the tasks at hand.

Questions to Consider for Procedures

- *Can we observe actual work in progress? How can I tell if workers are following the procedural prerequisites and steps called for?*
- *What was the most significant item discussed at this morning's planning meeting (or "tool box session") before your shift started?*

4.2 Site Housekeeping

The following are key indicators of good site housekeeping and recommendations on what to observe during a tour.

Site Housekeeping Key Indicators

- Tool Storage
- Contaminated Heavy Equipment/Tool Storage
- Heavy Equipment Maintenance and Storage
- Storage of Hazardous Materials

4.2.1 Tool Storage

At the end of a day or a shift, tools should be properly cleaned, stored, and ready for use the following day or the next shift.

4.2.2 Contaminated Heavy Equipment/ Tool Storage

Heavy equipment and tools for use in radioactive contamination areas should be clearly marked as such (through color-coding, for example) and stored separately inside the work area to avoid the spread of radioactive contamination to clean areas.

4.2.3 Heavy Equipment Maintenance and Storage

Heavy equipment should be properly maintained to keep its safety features working properly, and work areas around heavy equipment should be clearly labeled and identify potential hazards from heavy equipment. Heavy equipment should be staged overnight in designated areas only. Although such equipment may be leased from third parties, the DOE contractor conducting the cleanup/demolition must be held accountable for the proper and safe operations and maintenance of equipment.

A radiological buffer area at a cleanup site

4.2.4 Storage of Hazardous Materials

During demolition, materials that are identified as contaminated with radiological or hazardous constituents above allowable limits must be segregated from other debris and stored for future treatment or disposal. Temporary storage of these materials must prevent the possibility of airborne or waterborne exposure by means of some level of containment, which is normally specified in the worksite procedures.

Questions to Consider for Site Housekeeping

- *How and where are tools stored when not in use for a specific job?*
- *How much of the heavy equipment is leased? How do you know it has been properly maintained and safe for use?*
- *Does any heavy equipment have alarms (e.g., an alarm for travel in reverse)? Can someone conduct a test to demonstrate how the alarms work?*
- *How are work areas with known or potential radioactive contamination identified?*
- *Where is hazardous demolition debris stored? What measures are in place to prevent airborne or waterborne exposure to these materials?*

4.3 Worker Safety

The following are key indicators of worker safety and recommendations on what to observe during a tour.

Worker Safety Key Indicators

- Protective Clothing
- Tripping Hazards and Fall Protection

4.3.1 Protective Clothing

All personnel in work areas must be wearing hard hats, safety glasses, protective shoes, hearing protection, and any other protective gear deemed necessary to protect against injury. Often additional measures are required, such as disposable overalls to prevent contaminated dust from collecting on regular clothing, and respirators to prevent inhalation of hazardous particles. In situations involving heights, fall protection (e.g., safety harnesses) must also be provided and used properly.

Warning sign for excavation area

4.3.2 Tripping Hazards and Fall Protection

Open trenches must be properly posted and sidewalls reinforced to prevent collapses. Tripping hazards should be kept to a minimum, and cautions should be posted if no alternatives are available. Warning signs should be conspicuously posted, and controls must be in place to alert passersby to unique situations, such as welding, cutting, demolition, or use of heavy equipment.

Questions to Consider for Worker Safety

- *What are some examples of "fall protection" that are used on site?*
- *What are the specific levels of protective clothing that I need to visit different areas on site?*
- *What is the greatest challenge facing management on this site relative to worker safety? Can you show me some examples in the field?*
- *What was the most significant topic of discussion during your morning "tool box" or plan of the day meeting?*
- *What warnings or postings are used on site to alert workers to hazards?*
- *How is a specific job site controlled so that the work does not pose a safety hazard to others walking by?*
- *How do we know an individual worker is "fit for duty"? For example, is there a policy relating to substance abuse, abuse of medical prescription drugs, alertness of an individual, etc.? How is it enforced?*

4.4 Monitoring

In addition to industrial hazards, such as rubble, trenches, scaffolding, and movement of heavy equipment, there are hazards associated with the potential release of hazardous materials or radioactive debris that may be embedded in structural materials or present as a residue on plant process equipment. These materials may be subsequently released as airborne contamination during demolition. The following are key indicators of monitoring and recommendations on what to observe during a tour.

Monitoring Key Indicators

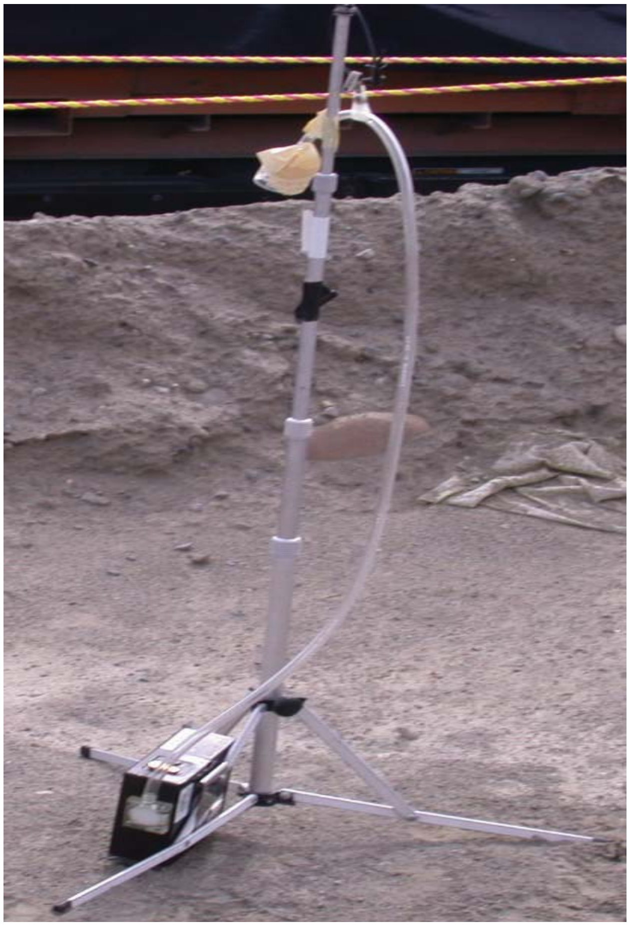
- Airborne Monitoring in Work Areas
- Exit Portals
- Operator Safety and RWPs

4.4.1 Airborne Monitoring in Work Areas

During demolition, radioactive materials or other potentially hazardous materials that were stored, processed, manufactured or used at the facility may become airborne. Radiation monitors capable of detecting the presence of radioactive materials and elevated levels of potentially hazardous dust should be in place in the immediate vicinity of work in progress.

4.4.2 Exit Portals

Portal radiation monitors should be positioned at exit points to assure the absence of radioactive contamination on persons, clothing, and hand-carried items. Also, training and procedures should be in place to assure that workers know what actions to take upon receipt of an alarm either in the field or upon exit from the work area.



A portable airborne radiation monitor

4.4.3 Operator Safety and RWPs

Operators are responsible for their own radiological safety, and must adhere to properly posted and prepared warnings. Radiological work permits (RWPs) are an integral part of performing work in a potentially radiological environment. RWPs are used to identify existing radiological work conditions, prerequisites, and protective clothing for entry, work or observation, and to establish administrative control levels. All workers performing any work involving radiation hazards should be intimately familiar with the associated RWP and its cautions and constraints, and should sign the document accordingly. In addition, ALARA principles (see Radiological Safety, Section 2.3.2) apply to all decommissioning activities.

Questions to Consider for Monitoring

- *At operating nuclear sites I've observed the use of dosimeters. Are dosimeters used at this site?*
- *What health requirements does a worker at this site need to meet medically in order to be able to work in a radiation or hazardous environment?*
- *How do you meet ALARA radiation exposures at this site? Can you show me an example?*
- *Can you briefly explain to me how the RWP governing entry into an area identifies unique situations and what expected readings might be?*
- *Do you use airborne radiation monitors? Where are they located, and why at those points?*
- *What are the potential contaminants (asbestos, radioactive dust, lead, beryllium, etc.) at this site?*

4.5 Reference Card for Site Cleanup and Closure

Reference Card Back

Back of Reference Card for Facility Construction is the Reference Card for Site Cleanup and Closure

Reference Card Back

Detailed Index for Facility Operations

Detailed Index for Facility Construction

Detailed Index for Site Cleanup and Closure