Energy Facility Contractors Group

Work Planning and Control Program

Guideline Document
(Final Draft Release)

April 12, 2012

Energy Facility Contractors Group

Work Planning and Control Program Guideline Document

Approval: This Work Planning and Control (WP&C) Program Guideline Document is approved by Energy Facility Contractors Group (EFCOG) and recommended for use by all member contractors.

Submitted: Tim Flake / 4/12/12

Tim Flake, Work Management Sub-Group Project Manager, EFCOG — Date

Reviewed: _____ / _____

Norm Barker, ISM/QA Chair
EFCOG — Date

Approved: _____ / _____

Roy J. Schepens, Board of Director
EFCOG — Date

Approved: _____ / _____

Robert J. Milazzo, Board Director and Sponsor for ISM/QA Group
EFCOG — Date

Please take note: This guideline contains parenthetical notations in the Table of Contents and abbreviations in the Section titles that refer to Integrated Safety Management **(ISM) Core Functions (CF) and Guiding Principles (GP) that will aid in understanding ISM flow down.**

Core Functions

1. Define Scope of Work
2. Analyze Hazards
3. Develop and Implement Hazard Controls
4. Perform Work Within Controls
5. Provide Feedback and Continuous Improvement

Guiding Principles

1. Line Management Responsibility for Safety
2. Clear Roles and Responsibilities
3. Competence Commensurate With Responsibility
4. Balanced Priorities
5. Identification of Safety Standards and Requirements
6. Hazard Controls Tailored to Work Performed
7. Operations Authorization

TABLE OF CONTENTS

List of Figures

List of Appendices

This page is intentionally blank.

FOREWORD

This guideline provides a recommended, thorough approach to accomplish activity-level work conducted at U.S. Department of Energy (DOE) sites, facilities, and projects. The approach includes operations, maintenance, construction, decontamination and decommissioning (D&D), and laboratory research and development (R&D) activities. It is addressed to Management and Operations (M&O) and Prime Contractors responsible for DOE sites with instructions for applying it to the work of lower-tiered sub-contractors. It has evolved from existing programs at several DOE sites and guidance from DOE Program Secretarial Officers and from industry.

This guideline reflects the collective experience of DOE Prime and M&O Contractors and contains elements considered essential to a well-functioning WP&C system. It is intended to be robust and applied specifically, according to the hazards and complexity of work activities at a given site.

This guideline describes suggested non-mandatory approaches for meeting DOE requirements and directives. This guideline does not contain requirements and is not to be construed as requirements in any audit or appraisal for compliance with DOE requirements and directives. In some instances, DOE requirements and directives have been referenced to provide context with the guideline (see 48 Code of Federal Regulations (CFR) 970.5223-1, *Integration of environment, safety, and health into work planning and execution*[1] and 10 CFR 851, *Worker Safety and Health Program*[2]).

This guideline was developed by the Work Management sub-group of EFCOG with the participation of many member companies and DOE sponsors. In addition to this human capital contribution, the following reference documents were utilized in developing this guideline:

- *Work Planning and Control Program Standard*[3]*;*
- *Activity Level Work Planning and Control Processes - Attributes, Best Practices, and Guidance for Effective Incorporation of Integrated Safety Management and Quality Assurance in Activity Level Work Planning and Control Practices*[4]*;*
- *EM Work Planning and Control Guidelines*[5]*; and*
- Institute of Nuclear Power Operations (INPO) AP-928, *Work Management Process Description*[6].

The Work Management sub-group reports to the ISM/Quality Assurance (QA) group and further information can be obtained from the EFCOG website at http://www.efcog.org/. Contractors are advised to use this guideline to identify opportunities for improvement within their sites, facilities, and projects' WP&C programs, processes, and procedures. We encourage Contractors and Federal employees to comment on or participate in the EFCOG sub-group to further improve this guideline and related best practices as EFCOG and member contractors strive for excellence in WP&C. Please direct correspondence to the EFCOG Work Management Subgroup Leadership contacts listed at http://www.efcog.org/wg/im_wm/index.htm.

This page is intentionally blank.

1.0 GLOSSARY

Active controls: Hazard controls that require a change of state or personnel action to accomplish the safety function.

Activity-level work: Any job, task, or sub-task performed at DOE sites or facilities where hazards are present or are introduced by the work or the work environment (regardless of who is performing the work or the organization with which they are affiliated). The hazards involved could be potentially adverse to worker health and safety, the environment, safeguards or security because of exposure to radiological, chemical, industrial, biological, or other task or facility identified hazards. As used in this guideline, activity-level work does not apply to activities such as commuting to and from work, administrative/office work and associated administrative vendor services such as food/vending machine services that do not directly affect or potentially impact the facilities, equipment, or surrounding work environment.

Activity-Level Work Control Document (ALWCD): A document that records at a minimum the scope of an activity, the Responsible Manager (RM), location, a list of activities/tasks, hazards and controls associated with the activity. This is the work document that is used in the field to implement activity level work. This includes technical procedure, test plans, work instruction, etc.

Critical Step(s): An ALWCD work instruction step or series of steps that, if performed improperly, will cause irreversible harm to plant equipment or personnel, or will significantly affect facility operations. An action, if performed improperly, that has an immediate negative consequence that cannot be reversed or undone.

Emergency Work: (i.e., not Emergency Response) is an activity or activities that are required to support and further mitigate the circumstances of an incident after immediate actions have been taken. Emergency work requires expedited action to stabilize a situation to prevent serious personnel injury, environmental harm, security breaches, or property loss, and typically involves Maintenance, Construction, or Operations. Once the situation is stabilized the emergency work is stopped and a work request is generated to complete the repairs/restoration. This work will typically be classified as the highest priority but not all high priority work needs to be Emergency Work.

Employees: Employees as used in this guideline include subcontractor employees (see 48 CFR 970.5223-1(a)(2)[1])

General Hazards: Hazards located within a facility or site area and routinely encountered by personnel entering, passing through, or inhabiting a facility/site. These hazards are addressed by training given to all employees and personal protective equipment (PPE).

General Hazard Analysis: The documented identification, analysis, and specification of mitigation for those industrial safety and industrial hygiene hazards routinely encountered in a wide variety of work tasks and work environments. General hazards and controls are limited to those mitigated by worker's site/facility safety orientation and training and general PPE (such as gloves, hearing protection, sturdy footwear for foot protection, eye protection including safety glasses/goggles/face shield, etc.).

Hazard: A hazard is a situation that poses a level of threat to life, health, property and environment. Hazards can be a source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel or damage to a facility or to the environment (without regard to the likelihood or credibility of accident scenarios or consequence mitigation).

Job Hazard Analysis (JHA): A documented analysis for specific activity level work; identifies activity-wide, task specific and work environment safety and health hazards; and defines controls to eliminate or mitigate hazards to protect personnel and/or the environment. Another common term in industry is job safety analysis.

Joint Prioritization: The continual evaluation and re-sequencing of work needs. This process begins following work approval and ends at work completion. Joint prioritization is performed by operations, maintenance and any other stakeholders, resulting in mutual agreement on the right work, at the right time, and with the right resources.

Model ALWCD: A template to create other ALWCDs. New ALWCDs orders can be developed from the model ALWCD once operating experience, activity specific information, and appropriate authorization/approval/released has been addressed.

Passive Controls: Hazard controls that may already exist as part of facility/equipment design and do not require change of state or personnel action to complete the safety function.

Pause Work: Is a request by any employee for a pause in the work activity, including clarification or resolution on a potential problem, concern, or issue. Organizational processes define when work release is required to resume work.

Post-Job Briefing/Post-Work Review: A review and analysis conducted at the completion of work activities aimed at improving the effectiveness of the activity. Lessons learned/operating experiences for continuous improvement are derived from this review.

Pre-Job Briefing: A briefing with formalization and details consistent with the complexity and hazards of the activity to be performed. Examples include: (1) a self-readiness check for individual workers working alone performing routine tasks, (2) an oral discussion between the Work Supervisor (WS)/Persons in Charge (PIC) and the worker/support personnel, or (3) a formal, documented briefing between the WS/PIC and the worker/support personnel that is part of the ALWCD for initial, complex, and/or hazardous work.

Risk: The quantitative or qualitative expression of the possibility of an event occurring that considers both the probability that a hazard will cause harm and the consequences of that event. For the purpose of this guideline, risk is determined by the frequency and complexity of the work activity and the hazards of the work and the environment.

Roundtable: Sometimes referred as a “table-top.” A roundtable is often done in conjunction with a walk down (often the second walk down). The RM, in discussion with the Subject Matter Experts (SMEs), decides when to conduct roundtable review of ALWCDs to facilitate communication between the WS/PIC, Work Planner, operations/facility personnel, system engineer (if one is assigned), SMEs and the workers. The RM or Work Planner may determine

that a roundtable review is not necessary. However, for new, complex operations or significant changes in the scope of work or tasks, a roundtable review should be considered. A goal of the roundtable review is to ensure that all hazards are identified, have adequate controls and that the controls are compatible. The objective is to ensure all hazards' controls have been developed to assure the work is done safely and in compliance with applicable requirements.

Safety: Activities that encompasses environment, safety, and health (ES&H), including pollution prevention and waste minimization (see 48 CFR 970.5223-1(a)(1)[1]).

Skill of the Worker (SOTW): The basic discipline specific skill sets that are defined for workers. Skill sets obtained through approved methods (i.e., Facility Training requirements) and accepted training/education and site experience are defined as SOTW. Line management evaluates, defines, and documents SOTW based upon accepted practices, training, and qualification, familiarity with tools and equipment, processes, and methods. SOTW is not a type of work; it is a factor in determining the level of detail in work documents to appropriately control work activities and ensure expected results.

Step: An action that must be performed in order to complete a work instruction task (e.g., **OPEN cooling water** discharge valve, **START** cooling water pump, etc.).

Stop Work: The authority given any employee to immediately cease an activity that, in the view of that person, could result in imminent danger (i.e., harm to persons or the environment if work continues). Resumption requires mitigation of the hazard and formal authorization from management.

Tailoring: Adapting something, such as a safety program, practice, or requirement, within the ISM system to suit the needs or purposes of a particular operation/activity, taking into account the type of work and associated hazards.

Task: A step (i.e., action) or series of steps designed to contribute to a specified end result for an activity. It has an identifiable beginning and end that is a measurable component of the duties and responsibilities of a specific activity (e.g., **Initiate cooling water system operation**, etc.).

Walkdown: A method to identify the tasks needed to accomplish the activity and the hazards and controls associated with the tasks. A walkdown also confirms that the controls selected align appropriately with the field conditions. This should be led by the Work Planner or RM and may include the Facility Manger, SMEs, system engineers, representative workers, and the work requestor.

Work: See "Activity Level Work".

Worker: A worker is anyone who performs assigned activity-level work tasks. Examples of workers include crafts, researchers and scientists, engineers, technicians, operators, and maintenance and test personnel. Workers can be contractor or subcontractor personnel that either work at the facility where the work is being performed or work elsewhere at the site or off site and are present at the facility to perform or support ongoing work activities (see also "employee").

Work Acceptance: A determination that the work: 1) was accomplished successfully, 2) did not introduce or cause other deficiencies or problems, and 3) met applicable design, safety, and interface criteria.

Work Approval: A formal process performed by line management to ensure that the ALWCD has been reviewed and is approved as a workable document.

Work Authorization: A formal process performed by an individual in authority who is responsible for overall facility/project activities. All preparations/prerequisites (e.g., notification, permits, approvals, etc.) and required controls have been identified and capable of implementation. The process needs to evaluate the current facility/project conditions and configuration to coordinate and integrate other scheduled work activities; minimize impacts such as priority, schedules, and resources; determine availability of required facilities, systems or equipment; address conflicting controls (including integration of workers from different companies/organizations); and address access restrictions. Work authorization may be performed as part of the site's scheduling process.

Work Instruction: Instructions that provide the specific information, details, and actions on how to perform the tasks and associated step(s) necessary to carry out an ALWCD.

Work Package: The ALWCDs that are planned, reviewed, and approved at the front end of the WP&C process. In addition, the work package may contain activity execution information, technical or operating procedures, drawings, progress notes, etc., that may be necessary to refer to during the performance of work.

Work Planner: A Work Planner is a trained and qualified individual responsible for facilitating the activity level work planning process in development of ALWCDs.

Work Planning: The process in which at minimum the scope of work being performed is adequately defined including:

- Hazards associated with the work and the work environment have been identified and analyzed to determine the controls to be implemented to ensure worker safety.
- Impacts and controls relating to facilities and equipment are identified.
- Documented Safety Analysis (DSA), security aspects, and environmental impacts and relating controls are identified.
- Applicable work process requirements are identified (i.e., applies the appropriate graded approach for the work being planned).
- Any acceptance criteria for work performed is established.
- The work document is developed outlining discrete steps/tasks to complete the work activities.
- Activity-specific training and qualifications is identified.

- The plan developed provides information for input into the scheduling process (sequencing and timing, resources such as personnel, tools, materials, support, training, etc.).

Work Release: A formal process performed by an individual in authority who is the designated point of release responsible for all work and site conditions in a facility or area. The process needs to evaluate work readiness for the specific activity, just prior to executing the activity, by conducting or ensuring:

- Work is authorized and the ALWCD is reviewed to understand the scope of work including critical steps and associated hazards and controls.
- Compatibility of concurrent work activities.
- Work environment conditions and configuration support the specific activity.

This page is intentionally blank.

2.0 LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
ALWCD	Activity-Level Work Control Document
CF	Core Function
CFR	Code of Federal Regulations
CRAD	Criteria and Review Approach Document
DSA	Documented Safety Analysis
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
ES&H	Environment, Safety, and Health
EFCOG	Energy Facility Contractors Group
FIN	Fix-it-Now (Teams)
FM	Facility Manager
GP	Guiding Principle
HPI	Human Performance Improvement
INPO	Institute of Nuclear Power Operations
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
LLNL	Lawrence Livermore National Laboratory
M&O	Management and Operations
NNSS	Nevada National Security Site
PIC	Person in Charge
PM	Preventive Maintenance
POD	Plan of the Day
POW	Plan of the Week
PPE	Personal Protective Equipment
PSA	Probabilistic Safety Assessment
QA	Quality Assurance
R&D	Research and Development
RI	Responsible Individual
RM	Responsible Manager
RWP	Radiological Work Permit
SSC	Structures, Systems, and Components
SME	Subject Matter Expert
SOTW	Skill of the Worker
SOM	Shift Operations Manager
SOW	Statement of Work
TSR	Technical Safety Requirements
USQ	Unreviewed Safety Question
WP&C	Work Planning and Control
WS	Work Supervisor

This page is intentionally blank.

3.0 PURPOSE

The purpose of this guideline is to establish best practices to effectively incorporate DOE ISM CF and GP and QA criteria into M&O and Prime Contractor (Contractor) activity-level WP&C programs, processes, and procedures.

This guideline describes the essential elements for a robust WP&C system at the activity level and provides a framework for achieving continuous improvement and excellence through operational experience and feedback. Embracing the specific elements described here and incorporating them appropriately into site and facility systems will influence values, assumptions, behaviors, beliefs, and norms that affect the way work is planned, controlled, and conducted. Contractors are strongly encouraged to compare their existing WP&C systems to this guideline and identify opportunities for improvement.

4.0 APPLICABILITY

This guideline provides recommended best practices for DOE Contractors to develop and improve activity-level WP&C systems. In adopting these guidelines into their systems, Contractors remain responsible for planning and executing activity-level work in accordance with the requirements in their contract and to flow down applicable requirements to subcontractors at all tiers, regardless of the performer of the work (see 48 CFR 970.5223-1(h)[1]). Contractors are also responsible for activity level work performed by others, for example, by service providers and tenants.

5.0 SCOPE

The guideline's scope encompasses activity-level work conducted at DOE Contractor sites, facilities, and projects. The elements this guideline provides should be applied to activity-level work performed within operations, maintenance, construction, D&D, and/or laboratory R&D. It is recognized that Contractors' terminology for describing elements of their WP&C systems may differ from the terminology in this guideline. It is also accepted that certain guideline elements may not apply equally to all types of work or may be applied to different degrees in order to achieve the desired improvements in WP&C.

This guideline describes the flow-down of Integrated Safety Management System (ISMS) CF and GP that form elements of a WP&C program. The Contractor shall be accountable for the safe performance of work and ensure the management of ES&H functions and activities become an integral but visible part of the Contractor's work planning and execution process (see 48 CFR 970.5223-1(b)[1]).

DOE Contractors may grade their application of these elements based upon the complexity and hazards of the work. This guideline can also be used to identify opportunities for improvement within their sites, facilities, and projects' WP&C systems.

6.0 TAILORING AND GRADED APPROACH (GP6)

GP6: Tailor control to prevent and mitigate associated hazards for work being performed.

The Contractor's programs shall comply with the ES&H requirements applicable to their contract (see 48 CFR 970.5223-1(h)[1]) and the Contractor shall describe how to exercise a degree of care commensurate with the work and the associated hazards (see 48 CFR 970.5223-1(b)[1]). Sites where multiple work management programs are utilized, Contractors should describe process interfaces between those programs. Administrative and engineered controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards (see 48 CFR 970.5223-1(b)(6)[1]). Emphasis should be on designing the work and/or controls to reduce or eliminate the hazards and to prevent accidents and unplanned releases and exposures. The purpose of tailoring is to determine the level of effort, degree of detail, and rigor of application of the WP&C guideline elements, remaining consistent with their importance to safety, cost, schedule, and success of the program.

An effective graded approach for WP&C guideline elements considers the complexity of the activity, associated hazards, and other risks associated with the proposed activities. The grading process provides the flexibility to plan and control work in a manner that best suits the site or facility while maintaining contractual requirements.

Risk is a fundamental consideration in determining the extent to which controls should be applied. The varying degrees of the controls employed depend on function, complexity, consequence of failure, reliability, repeatability of results, and economic considerations.

The level of effort, degree of detail, and rigor to be applied to WP&C systems should be based on activity-specific or facility-specific factors:

- The impact/consequences on safety, safeguards, and security;
- The types of hazards (radiological, biological, chemical, physical, etc.) and associated consequences involved if not properly controlled;
- The life-cycle stage of a facility or activity;
- Impact/consequences on the programmatic mission of a facility;
- The particular characteristics of a facility or activity;
- Any other relevant factors (e.g., cost schedule, program success, etc.).

Contractors may apply the graded approach to classes/categories of facilities or activities (e.g., roof replacement on office buildings as a class), but care should be exercised to ensure that the characteristics of a particular work instance are consistent with the assumptions and analysis used to grade the class. For example, roof replacement on a chemical lab building is likely not consistent with the grading that may be documented for working on office buildings. In this instance, a separate grading should be performed considering applicable factors/criteria to determine the necessary controls.

The logic, method of implementation, and basis for grading should be documented and communicated, and the necessary degree of rigor should be documented by work processes (procedures, instructions, specifications, and controls).

7.0 REQUIREMENTS AND DIRECTIVES (GP5)

GP5

The requirements for an effective WP&C process are derived from the following regulations and directives:

- 10 CFR 830, *Nuclear Safety Management*[7]
- 48 CFR 970.5223-1[1]
- 10 CFR 851, *Worker Safety And Health Program*[2];
- DOE O 210.2, *DOE Corporate Operating Experience Program*[8];
- DOE O 422.1, *Conduct Of Operations*[9]*;*
- DOE O 430.1B, Chg 2, *Real Property Asset Management*[10]; and
- DOE O 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*[11].

8.0 ROLES AND RESPONSIBILITIES (GP1- GP2)

GP1, 2

Responsibilities listed below are assigned to functional category positions. Implemented procedures assign specific titles of the appropriate personnel with associated roles and responsibilities (e.g., Facility XYZ Operations Manager as one of the RM, etc.). Line management is responsible for the protection of employees, the public, and the environment. Line management includes those Contractor and subcontractor employees managing or supervising employees performing work (see 48 CFR 970.5223-1(b)(1)[1]). The Contractor's program documents shall define clear and unambiguous lines of authority and responsibility for ensuring ES&H are established and maintained at all organizational levels (see 48 CFR 970.5223-1(b)(2)[1]).

Senior Management

- **Approve**s Emergency Work prior to execution.
- **Performs** independent review of high impact work during the ALWCD approval process.
- **Assigns** WP&C program roles and responsibilities.

Responsible Manager (Line Management):

- **Ensures** a complete understanding of the work scope and work environment where the work will be performed in order to effectively execute assigned responsibilities.

- **Ensures** timing of work activities supports safe work performance.
- **Ensures** the work activity is adequately funded.
- **Ensures** critical resources (equipment and trained personnel) for safe performance of work are available before authorizing work.
- **Ensures** the safety and health of workers during the implementation of work activities.
- **Ensures** overall safety of the workers.
- **Ensures** compliance with site/facility DSA.
- **Ensures** activities affecting systems or components that require independent verification have been identified.
- **Ensures** task specific mitigations from JHAs are properly incorporated into the ALWCDs.
- **Ensures** the feedback process is effectively implemented.
- **Ensures** proper release of equipment and work areas.
- **Ensures** subcontractors perform work in accordance with ISMS principles and contract requirements. At a minimum, meets with the Organization Subcontractor Technical Representative and the Subcontractor's Supervisor to review in detail the processes they will follow, identify potential hazards, and describe methods to control those hazards.
- **Ensures** work activities are coordinated with Facility Management.
- Implements the Contractor's procedures to ensure line managements' responsibility for safety, clearly defined roles and responsibilities, competence commensurate with responsibility, and a clearly documented graded approach program.
- **Reviews and approves** all requests for work.
- **Reviews and approves** ALWCDs for compliance and completeness and performs post work acceptance/completion.
- **Reviews** and approves changes to ALWCDs.
- **Controls** the activity-related schedule, including setting priorities and integrating/interfacing with operations/projects/site/facility activities.
- **Manages** the schedule change control process to ensure maximum utilization of resources.
- **Approves** the activity related schedule and any changes.
- **Authorizes** shutdown of machinery, equipment, and systems.
- **Reviews** approved ALWCDs to ensure conditions for performing the work are established, verifies the work is authorized, and grants work release.
- **Reviews** incoming requests for work for project/site/facility impact.

Work Requestor/Initiator/Responsible Individual (RI) for Work Initiation:

- **Describes** proposed scope of work to include possible deliverables, milestones, and mission critical needs.
- **Provides** accurate, detailed data and notifies the Project Manager /Facility Manager (FM)/Shift Operations Manager (SOM) of field-observed conditions requiring interface support, awareness, or any follow-up work.
- **Contacts** the Project Manager/FM/SOM for urgent or facility impacting items immediately.
- **Initiates** a request for work.

Work Control Management:

NOTE: Responsible Management or designee may fill the role of Work Control Management in this guideline.

- **Ensures** SMEs identified as part of the Planning Team concur and participate in development of the ALWCD.
- **Ensures** the proper level of review and approval is identified and obtained for different types of ALWCDs.
- **Ensures** ALWCDs are ready to work prior to the execution week.
- **Ensures** resources are available to support all scheduled work.
- **Ensures** ALWCDs have been properly completed and closed out.
- **Screens** requests against Davis-Bacon Act requirements, as applicable.
- **Makes** an initial determination of the type of work document to be used for each work task based upon the rigor level (complexity or failure mode consequence) of the work activity.
- **Makes** an initial determination if a Work Planner/Planning Team is necessary, based on the graded approach. If a Work Planner is necessary, selects Work Planner and/or Planning Team members that should be comprised of the appropriate personnel (e.g., Work Preparer/Work Planner, Workers, Operations, Principal Investigator, SMEs, etc.).
- **Screens** requests for work ensuring work scope and associated boundaries are clearly defined.
- **Resolves** obstacles to schedule execution.
- **Conducts** periodic assessments of the work control process in accordance with Contractor Assurance System guidance.
- **Serves** as qualification authority for Work Planners.

Preparer/Work Planner:

NOTE: For R&D, RI or designee may fill the role of Work Planner in this guideline.

- **Leads** the Planning process in work site scoping walkdowns, roundtables, work scope definition, job hazard identification, analysis and control selection, and ALWCD development.
- **Reviews** Lessons-Learned and feedback for entries with applicability to the work to be performed.
- **Takes** Human Performance Improvement (HPI) into consideration (see Appendix C).
- **Develops** the ALWCD incorporating input from the Planning Team, the RM, and appropriate task-related requirements.
- **Coordinates** the integration of controls and preparation of the required permits (e.g., radiological work permits (RWP), hot-work permits, confined space permits, etc.).
- **Coordinates** ALWCD comment resolution and submits the package for concurrence by WS and relevant SMEs and approval by the RM.
- **Ensures** all documents necessary for completion of the work are included in the ALWCD (e.g., work instructions, drawings, permits, etc.).
- **Makes** sure controls based on the hierarchy of control principles (e.g., engineered, administrative, and/or PPE) are clearly delineated in the ALWCDs or supporting documents.
- **Specifies** inspections and acceptance criteria; identifies hold and witness points.
- **Ensures** special task specific training and medical screening and surveillance requirements are specified. Coordinates input for feedback and lessons learned in a timely manner to capture information for process improvement.

Subject Matter Expert: (e.g., Technical Experts and/or Environmental, Safety and Health [ES&H] types including Radiological Controls, Safety, Industrial Hygiene, Engineering, etc.)

- **Participates** in the work-site job/task walkdowns, roundtables, JHA and control selection, and ALWCD development as part of the Planning Team consistent with the Contractor's WP&C process.
- **Supports** RM, Preparer/Work Planner in reviewing ALWCDs to ensure that the hazard controls have been incorporated consistently with requirements.
- **Contributes** to the development of ALWCD instructions ensuring that steps with DSA or other regulatory permit requirements are properly incorporated.
- **Ensures** planning decisions are consistent with programmatic requirements.
- **Specifies** inspections, acceptance criteria, and hold and witness points.
- **Reviews** SME discipline-related, subcontractor-prepared submittal documents for suitability.

- **Supports** RM, Preparer/Work Planner in reviewing applicable completed ALWCDs to ensure that required data is properly recorded in accordance with programmatic requirements.
- **Concurs** with the ALWCD as part of the approval process (see Section 13.3).

Work Supervisor:

NOTE: For R&D, the RI/ PIC may fill the role of WS in this guideline.

- **Ensures** the ALWCD is approved, and work is released.
- **Ensures** the prerequisites for work have been performed.
- **Ensures** hazard controls are implemented.
- **Ensures** personnel executing the work have attended the pre-job briefing or are briefed separately and are fit to perform work.
- **Participates** in the planning walkdown (as needed).
- **Ensures** ALWCD Readiness Walkdown is conducted.
- **Ensures** referenced documents are current prior to start of work.
- **Ensures** workers are aware of their responsibility to stop or pause work and notify supervision whenever changing conditions or unidentified hazards are encountered or work practices compromise quality or safety.
- **Ensures** controls based on the hierarchy of control principles (e.g., engineered, administrative, and/or PPE) are clearly delineated in the ALWCDs or supporting documents.
- **Ensures** proper turnover of work status when transferring WS responsibilities.
- **Ensures** good housekeeping practices are followed during performance of work; work areas are cleaned and restored after completion of work or work-activity cycle.
- **Ensures** compliance with ALWCDs including working within scope, documentation of work, and feedback during execution.
- **Ensures** proper completion of documentation including work history.
- **Ensures** post-job reviews are conducted for completed work.
- **Participates** as a Planning Team member in the ALWCD walkdown or roundtables.
- **Concurs** with the ALWCD, confirming workability, as part of the approval process.
- **Conducts** pre-job briefings to review scope of work, hazards, and controls with assigned workers.
- **Ensures** workers are trained, qualified and meet special program requirements (e.g., medical screening and surveillance requirements) to perform their duties.
- **Supervises** work activities to meet ALWCD requirements.
- **Complies** with the ALWCD change control process.

- **Prepares and submits** feedback and lessons learned in a timely manner to capture information for process improvement.

Worker:

- **Representative worker(s) Participates** in the work site job/task walkdowns, roundtables, job-hazard analysis and control selection, and ALWCD development consistent with the Contractor's WP&C process.
- **Representative worker(s) Participates** in ALWCD Readiness/Validation walkdown prior to start of work to ensure the adequacy of the ALWCD.
- **Participates** in the pre-job briefing and does not perform work until properly briefed and the scope of work and hazard control strategies are clearly understood.
- **Complies** with ALWCDs including working within scope, documentation of work and feedback during execution.
- **Completes** documentation properly, including work history.
- **Identifies** and proposes the best tools and work practices for the job.
- **Identifies** any special material requirements for the work to the WS and/or Work Planner.
- **Performs** only work that he or she is qualified to perform.
- **Uses** required controls based on the hierarchy of control principles (e.g., engineered, administrative, and/or PPE) specified in the ALWCD or for General Hazards (as prescribed in general safety training, management policy, and/or as posted for hazard mitigation).
- **Completes** work activities safely in accordance with the ALWCD.
- **Adheres** to the requirements of supporting documents including the RWP, permits, and site-specific waste management instructions.
- **Adheres** to Stop Work or Pause Work direction and notifies the WS if the work instructions cannot be followed as written, a change of scope is identified, changing conditions or unidentified hazards are encountered, or work practices will compromise safety or the environment.
- **Participates** in the Post-job review and identifies feedback and process improvement opportunities to the WS.

9.0 TRAINING (GP3)

GP3: Competence Commensurate with Responsibility

Contractor's training program shall ensure that competence is commensurate with responsibility (see 48 CFR 970.5223-1(b)(3)[1]). This includes processes that establish the competencies for personnel so that the experience, knowledge, skills, and abilities required for performing assigned work are established, documented, and maintained. Workers (e.g., crafts, operators, engineers, researchers, specialists) and their managers/supervisors are responsible for ensuring that only those qualified personnel who meet the requirements perform work independently.

(Personnel who are not fully trained and qualified should be supervised by personnel who are fully trained and qualified for the specific job at hand.)

All personnel with responsibilities for WP&C program activities, including managers, Work Planners, supervisors, SMEs, and workers, should receive training on- the organization's procedures. Continuing training focusing on process changes and lessons learned should be conducted periodically. ISMS CFs and GPs and WP&C program overview should be included in the training programs of personnel with WP&C Program responsibilities.

Contractor training systems produce records of the training and qualification of first line supervisors, workers, SMEs, work control managers and Work Planners and personnel who authorize and release activity level work. Additional training for RM, Project/Site/FMs/ Work Control Managers, SMEs, WSs, researchers, craft, and other workers at levels commensurate with their roles and responsibilities in the following areas should be considered:

- Hazard Identification;
- Hazard Analysis and Control Selection;
- Stop/Pause Work Authority;
- Walkdown Overview;
- Walkdown Specifics;
- ALWCD Development, use, and compliance;
- ALWCD Authorization;
- ALWCD Approval and Change Control;
- Scheduling;
- Work Release;
- Pre-/post-job Briefings;
- Work Acceptance;
- ALWCD Closeout;
- Feedback & Improvement Details; and
- WP&C Program Oversight & Assessment.

Site-specific Training and Qualification for Preparers/Work Planners should specify the following:

- Education, knowledge, and experience criteria;
- Organization, site, and/or facility-specific training and qualification requirements;
- Mentoring, disqualification, and the remedial training process; and
- Identification of qualification authority.

Specific ALWCD Preparer/Work Planner training includes elements commensurate with their roles and responsibilities in the following areas:

- Roles, responsibilities, authorities, and accountabilities of interfacing organizations;
- WP&C program procedures;
- Hazard-analysis process procedures;
- Incorporation of hazard controls into ALWCD work instructions;
- How to apply applicable requirements, standards, permits, regulations, etc. to work planning;
- The appropriate selection and use of SMEs;
- Facilitation/leading and appropriate use of Planning Team meetings, walkdowns and roundtables;
- Use of feedback and improvement material; and
- Technical writing skills, as applicable.

10.0 INTEGRATED SAFETY MANAGEMENT SYSTEM (ALL GP AND CF)

All GP and all CF (see page 3 for legend)

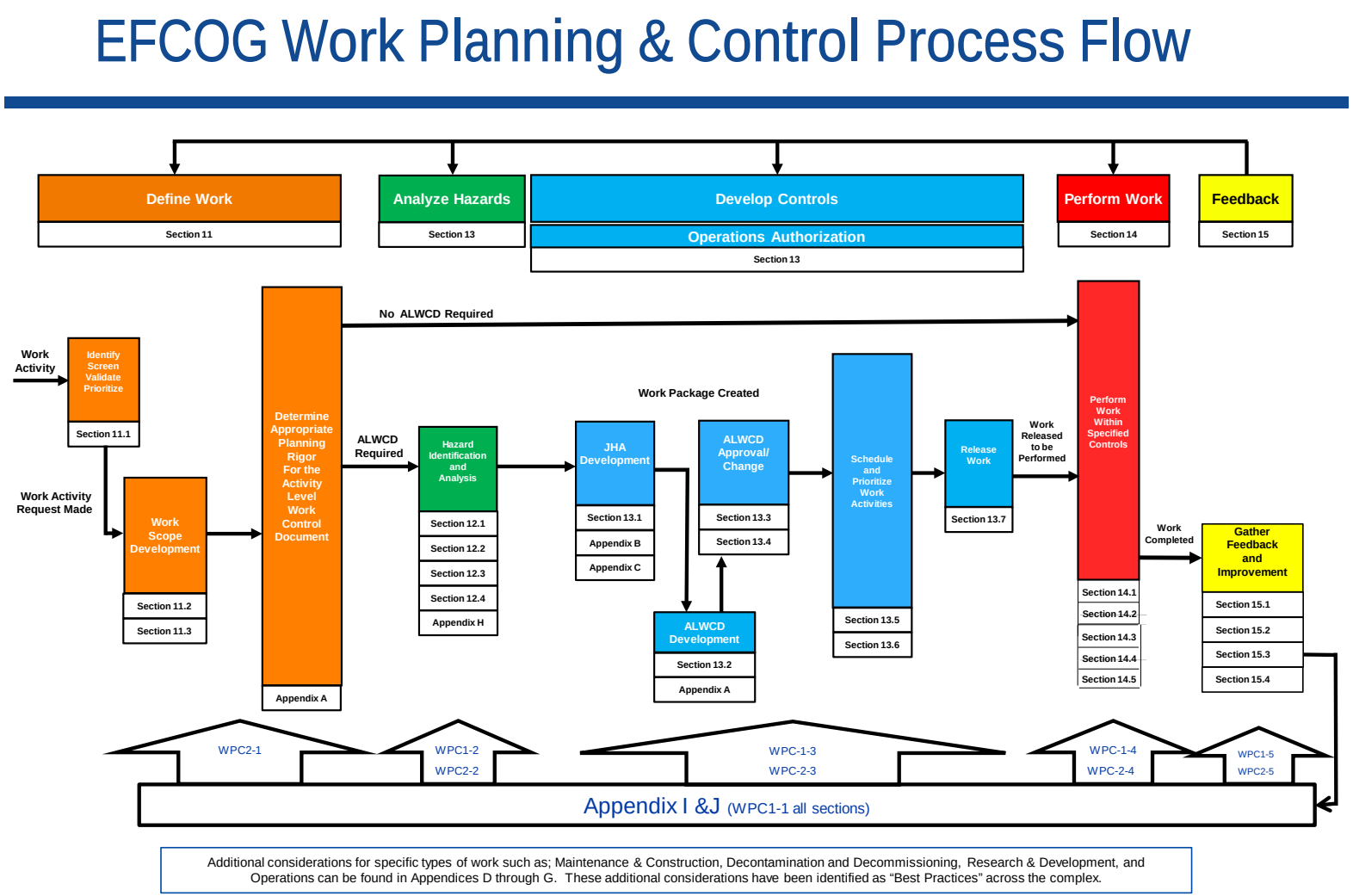
A Contractor's ISMS is an integral part of the business processes for work planning, budgeting, authorization, execution and change control (see 48 CFR 970.5223-1(e)[1]). WP&C as described here is an iterative process that incorporates the ISM CFs and GPs to accomplish work safely (see Figure 1).

Contractors shall ensure programmatic resources are effectively allocated to address ES&H, programmatic, and operational considerations of an ISMS (see 48 CFR 970.5223-1(b)(4)[1]).

The WP&C process defines work activities and boundaries in sufficient detail to allow a work-Planning Team to identify hazards, develop appropriate controls, and produce an appropriate Activity-Level Work-Control Document (ALWCD). Workers then implement the ALWCD controls and perform work within controls. The extent of documentation and level of authority for authorizing operations to commence shall be tailored (see section 6) to the complexity and hazards associated with the work (see 48 CFR 970.5223-1(b)(7)[1]). Feedback and continuous improvement is sought, evaluated, and incorporated throughout the process.

Appendices A-J provides additional details and examples to improve existing WP&C programs and their execution.

Figure 1. ISMS Work Planning & Control Process Flow



11.0 DEFINE THE SCOPE OF WORK (GP4-GP6; CF1)

GP4: Balanced Priorities; GP5; GP 6

CF1: Define Scope of Work

Contractors shall define the scope of work (see 48 CFR 970.5223-1(c)(1)[1]).

11.1 Identify, Screen, Validate and Prioritize Work

The work activity needs to be defined in sufficient detail and clarity that hazards associated with the work can be identified; appropriate controls can be selected; and appropriate schedules and priorities can be established.

The following lists of examples are elements that may need to be addressed:

Identification

- Name of requester/contact information,
- Detailed description of the activity including previously identified or known hazards,
- Detailed location of the activity (facility name/building number/room number),
- Perform scoping walkdown,
- Identification of the applicable structure, system, or component (SSC),
- Identification of DSA information (e.g. hazard categorization, Technical Safety Requirements [TSRs], Limiting Conditions of Operations, etc.), and
- Requested date to complete the activity.

Screening/Validate

- Description adequacy,
- Determine if work needs to be performed,
- Corrective action program applicability,
- Evaluation of the activity against the facility and safety-basis impact,
- Evaluation of the need for safety/security involvement,
- Recommend work planning level (e.g., ALWCD type),

NOTE: This evaluation is preliminary at this point and does not preclude changes later in the ALWCD development process (e.g., during walkdowns or roundtables).

- Evaluation of preliminary hazard, and
- Approve work planning to proceed.

Prioritize

- Characterization,
- Scheduling window or process type, and
- Resources and support services—identify and prioritize.

Emergency Work

Emergency Work is defined as any work that requires immediate action to prevent serious personnel injury, environmental harm, security breaches, loss of mission critical systems or data, or property loss. Emergency Work Processes are not a substitute for emergency response such as firefighting, but can support emergency response once the emergency is under control and the work environment stabilized. This work will typically be classified as the highest priority and it is intended that Emergency Work is rarely used. Emergency Work should be approved by Senior Management and this authority should not be delegated.

Emergency work processes contain provisions for:

- Senior Manager approval,
- The release of emergency work,
- A structured process to document all work performed,
- Resource assignments, SME, workers, supervision,
- The presence of applicable SME's to provide real time guidance for resolving safety issues, including safety controls, and provide necessary inspection, witness, or verification points as required to indicate work was performed per current standards,
- Conducting a pre-job brief including discussion of hazards and controls,
- Any testing required and acceptance criteria,
- Post-job review, and
- Process for final disposition of documents used and retention requirements.

11.2 Work Scope Development

The importance of developing a complete, detailed, and accurate scope of work should not be underestimated, and sufficient time and resources need to be allocated for this activity to be successful. In order for the hazards to be identified correctly and the work to be performed safely, the activity level should be discrete and discernible so that the work activity is accurately described, bounded, and clearly communicated through the ALWCDs to the WSs and workers.

In addition to the planning walkdown or roundtable discussions, a separate scoping walkdown may be performed if needed as determined by RM or WS to facilitate work scope development. Individual and/or group walkdowns are necessary to refine the scope of a particular activity and facilitate hazard identification. Documentation of scoping walkdowns is not required, as the

output of the walkdown should be reflected in the work scope description of the ALWCD. The number of walkdowns and the personnel needed to complete or participate in the walkdowns will vary depending on the complexity and hazards of the activity. For activities requiring an ALWCD, the scoping walkdowns facilitates the Work Planner's efforts in developing draft work instructions and hazard identification for use in the JHA process.

The Work Scope should be developed considering the following types of information:

- The purpose and type of activity or work being performed, the location, and the desired outcome;
- Identified, discernible, specific tasks necessary to accomplish the scope of work;
- Principle types of hazards directly involved or expected to be encountered, especially unique hazards involved with both the activity and the work environment;
- Closely associated/located work activities, systems, or components that are not part of the scope;
- Uncertainties that could affect the performance of facility systems;
- History of the facility and/or activity performance, including records, process knowledge, etc.;
- Lessons Learned applicable to the work to be performed;
- DSA, defense in depth, and environmental or regulatory impacts that could result from performance of the work or special techniques or tools that might challenge facility or site DSA;
- Any special tools or techniques that will be used that could introduce their own hazards; and
- Screen against Davis-Bacon Act requirements, as applicable.

11.3 Planning Team

A Planning Team assists in the development of ALWCDs, particularly for high-hazard, high-complexity, and/or infrequently performed work. The Planning Team for such activities includes Worker representation, a Work Planner, and a Safety Professional. Additional use of Planning Teams should be detailed in Organizational WP&C processes/procedures. The Planning Team participates in all phases of ALWCD preparation from scope definition, to JHA walkdown/roundtables, through ALWCD development.

Additional functions/organizations to consider for Planning Team participation encompass the following depending on the nature of the work (see Appendix H for example method of identifying SMEs):

- PIC/RM,
- WS,
- Facility management representatives, and

- SME Representatives (Technical and/or ES&H professionals):
  - Radiological Controls,
  - Engineering,
  - Industrial Hygiene,
  - Industrial Safety,
  - Environmental,
  - Nuclear Safety,
  - Fire Protection,
  - Security,
  - Operations,
  - QA, and
  - Other SMEs identified.

When feasible, the Planning Team conducts planning activities as a single group. It is recognized that activities such as training, sickness, personal schedules, and ongoing site activities will not always accommodate a single-group approach.

Also, when feasible, include an individual (or several) workers who will accomplish the work as part of the Planning Team. Workers are involved in work planning to draw upon their knowledge and experience, to understand their concerns, and to get their input concerning preferred methods and approaches to work (what works and what does not, obstacles frequently encountered and how to avoid them, etc.). This helps to familiarize workers with the tasks to be performed and to obtain their consent with the selected approach for accomplishing the work.

Additionally, workers and supervisors ensure the ALWCD and associated work instructions (if provided) can be completed as written. SMEs are involved in work planning to ensure hazards and associated controls are identified; specify inspections, hold points and acceptance criteria; and to ensure planning decisions are consistent with respective programmatic requirements.

Applications of HPI and QA by the Planning Team are important contributions (see Appendix C). Using prior worker feedback from ALWCD status logs, data sheets, work histories and logs, along with lessons learned from the Organization's Operating Experience program, are encouraged.

For work affecting operating facilities, the Planning Team interacts with Operations as part of the planning process. Operations must have full understanding of the scope of the planned work and will provide operations-related input including the facility conditions under which the work can be performed and operating modes to be established before the work can be accomplished. Additionally, Operations will be consulted on the proposed scope and method for accomplishing post-work testing intended to verify operability, returning equipment to service, and re-establishing facility conditions/operating modes.

11.4 Define Acceptance Criteria

Establish acceptance criteria as needed for clearly determining whether the work was performed successfully without causing other problems or deficiencies. The level of formality of the acceptance criteria and associated documentation is commensurate with the complexity, hazards, or mission-significance of the work. This will range from none for low-hazard, simple tasks (e.g., relocating simple laboratory equipment, staging non-hazardous materials or equipment, or general clean-up) to specific acceptance criteria for higher-hazard, complex, or mission-critical tasks (e.g., SSC maintenance, relying on performance specifications or particular operational alignments). Acceptance criteria ensures work specified in the ALWCD has been completed and documented; system engineer interfaces are specified, when appropriate; and proper restoration of equipment, systems, etc. after verifying design and safety functions are preserved.

Some activities, such as long-term R&D or some construction projects, may have milestones or project phases that contain acceptance criteria. Where these criteria exist, they need to be clearly understood in terms of ALWCD acceptance criteria. Acceptance criteria may not be applicable for some work (e.g., where the outcome is unknown, cannot, and need not be precisely determined in advance as may be the case with research and experimental work).

12.0 ANALYZE HAZARDS (GP1; GP3–6) (CF2, CF5)

GP1, 3, 4, 5, 6:

CF2: Analyze Hazards; 5: Provide Feedback and Continuous Improvement

12.1 Hazard Identification and Analysis

Hazards shall be identified and analyzed for activity-level work performed (see 48 CFR 970.5223-1(c)(2)[1]). The Contractor shall ensure that, before work is performed, the associated hazards are evaluated which, if properly implemented, provide adequate assurance that employees, the public, and the environment are protected from adverse consequences (see 48 CFR 970.5223-1(b)(5)[1]). This should be accomplished by a graded approach depending on the extent of hazards and complexity of the work scope as described in this section. The hierarchy of controls for addressing hazards is to first eliminate or substitute hazards where feasible and appropriate. This is the desired method to prevent exposure of workers to a hazard. Then, if elimination or substitution is not an option, control of worker exposure to the hazards must occur in the following order of preference (see 10 CFR 851.22(b)[2]):

1. Engineered controls - Controls that eliminate or reduce exposure to a hazard through the use or substitution of engineered machinery or equipment (e.g., work remotely, glove boxes).
2. Administrative controls - Work procedures such as written safety policies, rules, supervision, schedules, and training (e.g., tag out)
3. PPE - Includes all clothing and other work accessories designed to create a barrier against workplace hazards. (e.g., safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons, and work boots).

Contractors shall ensure that engineered and administrative controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards (see 48 CFR 970.5223-1(b)(6)[1]). Emphasis should be on designing the work and/or controls to reduce or eliminate the hazards and to prevent accidents and unplanned releases and exposures. For emphasis, engineered controls should be considered (preference should be given to passive controls over active controls) and reliance on PPE should be a last resort.

The Contractor's WP&C program documents shall specify how hazard controls are developed and implemented (see 48 CFR 970.5223-1(c)(3)[1]). Each site/project/facility defines the hazard analysis process for identifying, analyzing, and mitigating (specifying controls) for activity-level hazards, including the consideration of "what if" scenarios and error-likely situations. The hazard analysis process includes a method for categorizing hazards as either facility/site general hazards or job-specific hazards. The process provides methodology to document the identified hazards and the mitigations/ associated controls necessary to protect personnel. JHAs are documented, specific to a task with hazards identified and controls specified, and developed by a Work Planning Team. The level of involvement in the development of the JHA by the Work Planner and the Work Planning Team (work group, worker, and SMEs) is determined by the types of hazards (e.g., chemical, radiological, physical, electrical, and fall, etc.), elimination or mitigation controls for the hazards identified, and tools/equipment to perform the work.

12.2 General Hazard Analysis

A General Hazard Analysis is the documented identification, analysis, and specification of mitigation for those industrial safety and industrial hygiene hazards routinely encountered in a wide variety of work tasks and work environments. General hazards and controls are limited to those mitigated by:

1. Worker's site/facility safety orientation and training and
2. General PPE (e.g., gloves, hearing protection, sturdy footwear for foot protection, eye protection such as safety glasses/goggles/face shield, etc.).

Workers are trained in general safety and health requirements and are expected to apply controls as the hazards for the situation and tasks present themselves. A critical aspect in all cases is the individual's responsibility to remain cognizant of job conditions and to stop/pause work if a hazard emerges or is encountered that was not appropriately addressed.

Often, postings such as signs or warning barricades identify hazards and controls to alert workers to the need for applying general/non-specialized PPE. Some examples are hearing protection for a high-noise hazard in an emergency diesel-generator room (when the diesel is running), eye protection when using shop equipment, or use of hard hats in areas with overhead bumping hazards. ALWCDs need not specify general hazards and controls because workers are trained to identify these types of hazards and the controls needed to mitigate the hazards. Specifying general hazards and controls in ALWCDs could result in diluting the importance of addressing the controls for hazards associated with accomplishment of specific tasks and the work environment detailed in the ALWCD.

12.3 Job-Hazard Analysis

A documented analysis for specific activity level work to identify activity-wide, task specific and work environment safety and health hazards and to define controls either to eliminate, or to adequately mitigate hazards to protect personnel. A JHA may vary in complexity, depending on the hazards and necessary controls to protect the worker. The input of the Work Planning Team to assist the Work Planner in the development of the JHA is dependent on the hazards identified from walkdowns or roundtables. For situations in which the hazards and/or controls are conflicting, the Work Planner facilitates resolution with the applicable SMEs. For repeatedly performed tasks, it is allowable to use an existing approved JHA, provided the hazards and controls have been verified.

The JHA includes a planning/JHA walkdown or roundtable and JHA development.

12.4 JHA Walkdown/Roundtables

Walkdowns ensure that the Work Planner/Planning Team has an opportunity to fully recognize hazards associated with the planned work. The expectation is that walkdowns include examination of work environments where activities are to be performed. The Work Planner develops a draft JHA and work scope/instruction for use during the walkdown.

The Work Planner/Planning Team walks down the requested work to:

- Document the work needed, objective to be accomplished, condition to be achieved or corrected, problem being addressed, expected outcome, etc.
- Identify the specific tasks necessary to accomplish the work.
- Identify the hazards associated with the work environment and each task/activity necessary to accomplish work.
- Identify any hazards that can be eliminated or reduced from the work tasks through process-re-engineering or other changes.
- Assess and quantify the hazards (e.g., noise decibel levels; radiation dose rates; chemical volumes or airborne levels; temperature limits or extremes; fluid or gas pressures; electrical voltage and amperage; weight of lifted or suspended components, etc.) so that analysis will result in identification of appropriate controls.
- Verify the equipment, components, locations, etc. described in the requested work are correct and accurate.
- Identify the applicable and affected documents (e.g., procedures, drawings, specifications, vendor manuals, training materials, etc.), and the latest versions/revisions.
- Identify planned transitions and the associated hazards and control.
- Determine that the work activity is clearly and adequately bounded/limited (e.g., physical boundaries such as equipment/components to which work activity is limited, specific work environment to which work is confined; conditions under which work can be performed; and organizations responsible for the various tasks, etc.).
- Determine if the work activity can affect personnel or facility safety, can pose challenges to facility equipment, processes, or operations (e.g., resulting in shutdowns, delays, and significant costs or losses), resulting in unacceptable/undesirable consequences.
- Identify associated equipment, parts, and components with systems, processes, and operations to aid work-planning efforts to ensure the impact on facility mission and safety is understood and to schedule multiple tasks affecting related systems, processes, or operations at the same time to minimize operational impact.
- Document work-site conditions, including use of photographs if necessary, to ensure appropriate consideration of special or unique planning requirements or circumstances (e.g., lookouts/watches, permits, constraints or interferences to use of normal/routine practices or procedures, resources, support needs such as equipment, labor, engineering or operations, etc.).

A walkdown may be augmented by conducting a roundtable using walkdown information, technology, and/or information gained by examination of pictures, drawings, specifications, or other technical data. However, roundtables and the use of technology and data reviews should not be used to circumvent the need for a walkdown. A walkdown is always preferred and should be performed unless it is not feasible (e.g., As Low as Reasonably Achievable [ALARA] considerations, equipment not set up when job was planned or room is sealed) or the risk is

unacceptable or outweighs the benefits. In situations such as this, at a minimum, a roundtable should be conducted.

If a portion of the work environment is not accessible or the walkdown could not be performed, steps should be included in the work package to verify that conditions are as planned. If conditions are not as planned, Stop/Pause Work and implement the change control process.

Work Planners/Planning Teams may perform a roundtable in conjunction with a walkdown. The Work Planner/Planning Team, in consult with the SMEs, decides when to conduct roundtable reviews of ALWCDs to more effectively communicate with personnel involved in the planning of the activity. The RM or Work Planner may determine that a roundtable review is not necessary. However, for new, complex operations or significant changes in the scope of work or tasks, a roundtable review should be considered. The objective of the walkdown/roundtable review is to interactively ensure all hazards have been identified; all hazards have adequate controls; the identified controls are compatible; and to determine the work can be done safely and in compliance with applicable requirements.

13.0 DEVELOP AND IMPLEMENT CONTROLS (GP1; GP3–7) (CF3, CF5)

GP1, 3, 4, 5, 6, 7: Operations Authorization

CF3: Develop and Integrate Controls; 5: Provide Feedback and Continuous Improvement

13.1 JHA Development

For simple tasks, the JHA walkdown, roundtable, and development may be combined. The Work Planner/Planning Team performs the following:

- Develop a draft JHA and work scope/instructions for use during JHA development.
- Review relevant Lessons Learned and feedback for continuous improvement.
- Discuss activity-specific controls required by DSA, ALARA Job Review, Industrial Hygiene Exposure Assessment, Shock and Arc Flash Hazard Analysis, and other hazard assessment/analysis documents and appropriately incorporate into the JHA.
- Review previous radiological and industrial hygiene surveys when applicable.
- Discuss known radiological, chemical, and metallurgical processes either associated with the work environment directly or which send waste or product material to the location.
- Review Material Safety Data Sheets and manufacturer/vendor provided safety documentation.
- Review drawings, notes, video, photographs and conduct discussions with team members familiar with the work site.
- Validate/update the work scope.
- Review/validate the basic job tasks and modify any draft work instructions.

- Discuss and identify the hazards associated with the work environments and each job task or step including potential undesirable events (e.g., the potential consequences of improperly performing and/or not performing the step, etc.).
- Include consideration of potential transients or accidents (i.e., "what if" scenarios such as spills, fires, exposures, failures, changing conditions, interference, alarms, unexpected equipment actuations, errors, etc.) and their consequences.
- Prescribe specific controls necessary to eliminate or mitigate the identified hazards for the protection of workers, the public, and the environment.
- Review work tasks from a human performance perspective to identify and either eliminate or develop contingencies for error likely situations.
- Select controls that seek to prevent or mitigate the hazards using the following hierarchy:
  - Eliminate the hazards,
  - Control the hazards through engineered controls (preference should be given to passive controls over active controls),
  - Control the hazards through administrative controls, and
  - Control the hazards using PPE to protect the worker from the hazard.
- Analyze the identified hazards collectively to arrive at the optimum set of controls for the work being performed and to ensure that the selected controls do not conflict with each other or introduce additional hazards. The level of control established for a hazard should be maintained throughout the activity or until the hazard has been eliminated or reduced (controls can be graded to level of hazard reduction).
- Consider the development of an implementation strategy in cases where the steps to implement a control might be necessary. This might include special training, pre-job briefing points, special postings, procedures or work instructions.

The final JHA should be reviewed per site procedures.

13.2 ALWCD Development

Another tool used to implement work control is the use of ALWCDs. Examples of these documents include the following:

- Technical procedures, which are typically used for routine, repetitive work and
- Work packages, which are typically used for unique maintenance and construction activities.

Guidance provided here and in Appendix A is consistent with DOE-STD-1029-92, *Writers Guide for Technical Procedures*[12], but does not encompass the exhaustive detail provided in that standard.

Work Planning is an iterative function that includes Work Scope Development, Job Hazard Identification and Analysis, Hazard Control incorporation and work instruction development

(including identification of critical steps). It is expected that portions of each process will be performed simultaneously in preparing an ALWCD. The complexity and hazards of the activity, the location where the work is being performed, and the frequency which it is performed, each affect the probability of safe, high quality work being repeated consistently every time the activity is performed. As such, organizational processes/procedures consider these factors when determining the type of ALWCD, manner of incorporating JHA controls into the ALWCD, and the subsequent level of detail communicated to the worker.

Organizational approved WP&C processes/procedures define the graded approach utilized by the Organization while performing its contractually identified scope of work. The graded approach includes identifying the types of, and use categories for, ALWCDs utilized during the performance of this work. ALWCD types and use categories should be based upon the activity's complexity, hazards, frequency of use and the location where the work is being performed.

Typical ALWCD types include: Detailed, Moderate, Minor, and Model. See Appendix A for additional considerations and examples of work instruction.

Level 1: Detailed ALWCD

Detailed ALWCDs are most appropriate for activities that are highly complex, highly hazardous, and performed infrequently. Organizations establish criteria for detailed ALWCDs, including:

- Comprehensive scope statements,
- Precautions and limitation,
- Prerequisites/initial conditions,
- Special training and medical requirements,
- Special tools and equipment,
- Work instructions,
- Post performance activities,
- Close out,
- Status logs/data sheets, and
- Miscellaneous paperwork.

Appendix A contains a recommended detailed ALWCD format including information to consider while developing detailed ALWCDs and associated work instructions.

Level 2: Moderate ALWCD

Moderate ALWCDs would be appropriate for activities that are moderately complex, moderately hazardous, and performed frequently. Moderate ALWCDs contain either general direction or step-by-step instructions, as appropriate to the SOTW and complexity/hazards of the activity. A moderate ALWCD may be appropriate in cases where there were no special hazard controls needed. Moderate ALWCDs may also be appropriate for activities that are fairly complex, fairly

hazardous, and performed infrequently when detailed instructions are available in existing documents such as vendor manuals, operating procedures, etc. When work instructions are already available, they do not need to be developed and communicated to workers in the ALWCD, except through branching to or referencing another ALWCD or inclusion of the existing work instructions in the base ALWCD. See Appendix A for branching and referencing guidance. Reliance on the SOTW should be deemed appropriate only after careful consideration of the factors discussed in Appendix B. In general, moderate ALWCDs rely less on detailed work instructions and more on the SOTW.

Level 3: Minor ALWCD (No Work Instructions Required)

Minor ALWCDs would be appropriate for routine activities that are fairly simple, do not affect nuclear safety, do not increase the probability of upset conditions, are performed frequently, and rely solely on SOTW to mitigate hazards that are minor in nature. As such, work instructions do not need to be developed and formally communicated to the worker in either an ALWCD or through cross-reference to an existing work instruction or another ALWCD. Minor ALWCDs contain a Statement of Work (SOW) with a bounding scope statement and limitations with reliance on SOTW. Reliance on the SOTW should be deemed appropriate only after careful consideration of the factors discussed in Appendix B.

Model ALWCD

ALWCDs ranging from detailed to minor are often used to perform repetitive or reoccurring work activities. Model ALWCDs should be used for activities that have duplicate or very similar work when the activity is next performed. The most recently closed work package, containing the ALWCD with associated feedback, should be used by the Work Planner/Planning Team as a model ALWCDs the next time “like” work is performed. Prior to each use, model ALWCDs are to be reviewed to ensure the accuracy of the task description and identifications of hazards/environmental aspects and controls are appropriate to the intended work. The review incorporates safety feedback for improvement, previous comments, operating experience, activity specific information and appropriate authorization/approval/release prior to execution.

ALWCD Use Categories:

Organizational WP&C processes/procedures also establish expected ALWCD use categories which detail the expected manner in which ALWCD work instructions should be performed. Example use categories include continuous use and reference use.

Continuous Use

ALWCDs categorized as continuous use (sometimes referred to as “use every time”) should be utilized for activities where improper performance could result in unacceptable consequences. ALWCDs categorized as Continuous Use should be at the work location, open to step work instruction being performed, completed as written in a step-by-step sequence, and with sign-offs/documented unless otherwise specified. Detailed ALCWDs should be considered for continuous use categorization.

Reference Use

ALWCDs categorized as reference use, should be utilized for routine activities where improper performance will not result in unacceptable consequences. These ALWCDs do not require documented verification upon satisfactory completion of the individual steps or the complete task. ALWCDs categorized as reference use should not be required to be located at the work location but should be readily available upon request. Step-by-step compliance with work instructions is necessary, but can be accomplished by workers periodically referencing the ALWCD, effective Pre Job Briefings, and/or SOTW. Moderate ALWCDs containing step-by-step work instructions should be considered for reference use categorization.

Workability Review

ALWCD workability review (sometime referred to as validation and verification) is a demonstration that the ALWCD is workable (can be performed by the workers exactly as written) and is endorsed by worker supervision. Workability reviews may include verifying the ALWCD work instructions and action steps are properly sequenced and are within the intended worker SOTW, along with verifying written equipment labeling information matches actual component labeling, availability of parts, and supporting calculations (e.g., arc flash hazard analysis, respiratory protection, etc.) are available to select appropriate PPE. Workability reviews should be the final step in ALWCD development prior to being submitted to the Unreviewed Safety Question (USQ) process in accordance with local DOE-approved USQ procedure and document approval. Organizational WP&C processes/procedures establish the type(s) of ALWCDs warranting workability reviews, different workability review methods, and personnel expected to participate in the workability review process. Additionally, some ALWCD changes may be significant enough to warrant workability reviews. Workability review methods may include:

- **Simulated evaluation**: worker performs simulation of ALWCD work instructions and action steps at the work site.
- **Roundtable**: worker evaluation of the technical content and usability of ALWCD work instructions and action steps through a “talk-through” process.

If workability review comments are received, resolve comments with the worker that performed the workability review; incorporate resolutions into the ALWCD draft, and obtain reviewer concurrence with the resolutions prior to submitting for approval. Comments should be routed to Work Control Management and Work Planners as part of the Organization’s feedback and improvement process.

13.3 ALWCD Approval

Route the ALWCD for formal review and approval. Different levels of work may require different levels of approval based upon work complexity and hazards. Incorporate any review comments, repeating the following development steps if necessary:

- Identify names/titles of Work Planner or Planning Team;

- Receive review and concurrence from responsible work control management or designee that the ALWCD has been properly developed and reviewed;
- Route to appropriate affected organizations (e.g., operations, maintenance, engineering, and any other SMEs, as appropriate) for review including that hazard controls and programmatic requirements are appropriate for the work and concurrence;
- If necessary, complete Senior Management Review for high impact work. Organizations develop criteria for high impact work such as high hazard, high complexity, first time use, multiple work groups, etc.;
- If necessary, submit to the approved USQ process (in accordance with local DOE-approved USQ procedure); and
- Route to the appropriate RM (Program/Site/FM) for final approval.

13.4 ALWCD Change Process

Changes to approved ALWCDs could be made following the organization processes in place for changing technical documents. These processes need to ensure that changes in work scope, field conditions, or work execution are thoroughly reviewed, analyzed (including adequacy of existing hazards analysis and specified controls), documented, and approved before being implemented:

- Requirement for the clear identification of the ALWCD change's scope in order to adequately develop supplemental work instructions and identify associated hazards and controls;
- Identification of personnel authorized to make changes;
- Definition of administrative/editorial changes versus technical changes including criteria and the process for the change/revision including local DOE-approved procedure requirements for submitting changes to the USQ process;
- Identification of personnel authorized/required to concur and/or approve change requests;
- Format of incorporating changes into ALWCD;
- Establish criteria for revisions including significance and number of changes allowed prior to revising the ALWCD;
- Criteria for reconvening the Planning Team for ALWCD changes;
- Requirement to review existing hazard analysis after any changes to the ALWCD to determine if new hazards were created, any existing hazards were modified, addition of conflicting controls, or any existing hazards eliminated by the change; and
- Requirement to brief workers on the changes.

13.5 Scheduling and Authorization

Schedule approved work activities according to priorities and resources available. The RM coordinates work scheduling with facility management as well as others integral to performance of the work. The formality of the schedule and scheduling process depends upon hazards,

complexity, nature of the work (e.g., R&D, operations, maintenance, construction, D&D, etc.; see Appendix D for examples of detailed scheduling) methods, mission-significance, and potential for the work to impact or be impacted by other work or workers.

The sequence and timing of activities reflects the availability of resources consistent with applicable requirements. Schedule and integrate work with other ongoing work activities and facility, system and equipment availability. Scheduling should be accomplished through an "integrated scheduling" method that clearly indicates the status of approved/authorized work. Some work activities will not require a formal schedule. These activities may be scheduled using alternate processes such as white boards, pass down logs, or daily briefings. Approved work that has been through the established planning and scheduling process is considered authorized awaiting release.

Sites describe approval and change control methods for formal schedules in work-control process descriptions.

13.6 Integrated Scheduling

Integrated scheduling meetings can assist in obtaining commitment for all responsibilities to the workweek schedules. The meeting is designed to provide clarity about the jobs/work activities to be worked, to achieve consensus on the most important work to be scheduled, and to establish commitment to accomplish the scheduled work. Here is a list of examples of these meetings:

- Plan of the Week (POW),
- Plan of the Day (POD),
- Facilities Activity List,
- Weekly interface meetings, and
- New work/activity reviews.

The above list of planning meetings and tools should be used to ensure clear expectations are communicated to RMs and workers for daily work assignments. Use of these meetings and tools enhance teamwork, communication, joint prioritization, and coordination of activities throughout the scheduling of day-to-day activities to ensure that facility conditions support the work and confliction issues are identified, discussed and resolved prior to the release of work. Based on the complexity and the failure-mode unacceptable consequences, managers can decide if work activities should be communicated weekly or daily.

13.7 Readiness/Work Release

Just prior to executing the work activity, a designated point of release authority responsible for all work and site conditions in a facility or area needs to grant work release.

NOTE: Routine activities previously defined and approved by line management (e.g., operator rounds, instrument source checks, pre-operational equipment checks, basic shop work, etc.) may not require specific listing on facility schedules. These activities

may not require a formal release and may be performed on an ongoing basis, unless otherwise directed by the release authority.

The designated point of release authority:

- Confirms the activity is authorized.
- Confirms the ALWCD is approved.
- Confirms current conditions are consistent with ALWCD.
- Reviews the ALWCD to understand the scope of work with emphasis on HPI critical steps (see Appendix C and Appendix D).
- Reviews the impact of tools, instruments, and temporary or portable equipment on installed systems and equipment.
- Considers the impact of the work on the safety basis.
- Conducts a final check to confirm the facility can support the work (configuration/ operations), factoring in operability of redundant equipment and/or compensatory actions, effect of work on other released work activities, and facility conditions required for work to be performed.
- Signs/grants work release to indicate the hazard controls identified for the defined scope of work are appropriate, that facility/work environment conditions support the work for the specified duration (the period of time during which the work is allowed to be performed should be clearly defined); and equipment/system restoration and/or acceptance requirements are satisfactory.

14.0 PERFORM WORK WITHIN CONTROLS (GP1-7; CF4-5)

GP1-7; CF4: Perform Work Safely; CF5: Provide Feedback and Continuous Improvement

14.1 Pre-Job Brief

A pre-job briefing (based on site requirements) may be conducted each work period (day or shift if there is more than one per day) prior to performing work or periodically as noted below. The WS or designee may conduct additional pre-job briefings at the start of a new task or suite of tasks, when new personnel are assigned or there is a major change. Workers participating in activity level work requiring a pre-job briefing must attend the brief. Workers joining the work activity late must be briefed by the WS or designee before starting work.

Pre-job brief frequency, detail and extent will vary according to the complexity of the tasks and consequence of recognized failure mode, mission-significance, and the experience of the workers. At the more frequent, detailed, and extensive end of the range is work that is hazardous, complex, performed for the first time, and/or performed by teams or multiple individuals with different skill sets. This work may require the integration and coordination of several tasks. At the less frequent, detailed, and extensive end of the range are individual workers working alone performing routine activities.

The pre-job brief should be conducted initially and periodically as needed in a work environment that fosters attention and participation. The briefing may take the form of a self-readiness check to verify: the task(s) to be performed, the hazards, and the controls are as expected, the materials or equipment needed is available, and there are no unanticipated conditions or operations that would conflict with the task(s). If there is an unanticipated condition or conflict, advise the supervisor of the situation to determine how to proceed. A self-check should be conducted even where the work is repetitive or routine.

Prior to performing work, the WS or designee reviews the specific tasks to be performed, and verifies field conditions are consistent with those analyzed during work planning by conducting a ALWCD readiness walkdown with the workers who will conduct the work.

The WS or designee, and workers then conduct the pre-job brief to review and confirm their readiness to perform the work. The content of the pre-job brief includes:

- Provide situational awareness of factors (e.g., weather conditions, noise, lighting, etc.) that may impact the work, other ongoing work, or collocated workers.
- Confirm the workers have the current ALWCD and understand the tasks and associated hazards and controls for work to be performed that day/shift.
- Confirm workers have read and signed the ALWCD prior to performing work.
- Confirm the workers', supervisor's, and support personnel training and qualifications are current to perform assigned tasks.
- Confirm worker's, supervisor's and support personnel required medical screening and surveillance are current to perform assigned tasks.
- Confirm workers understand the work scope and boundaries for the activity.
- Confirm workers understand any critical steps associated with the activity, how mistakes can be made at those points, what the worst thing that could go wrong, and what barriers or defenses are needed.
- Assign responsibility for performing specific tasks to specific worker(s) and support personnel.
- Evaluate worker readiness and fitness-for-duty that day.
- Reinforce that workers are expected to apply and follow procedures (in accordance with ALWCD use categories in Section 13.2), observe limits, and work within the released scope of work.
- Reinforce that workers are expected to promptly communicate to their supervisor changes in the work scope, situations where procedures cannot be followed or other conditions that may require re-evaluation of the work.
- Reinforce that workers are expected to immediately pause work or stop work on any activity that they believe to be unsafe or out of scope, and are to prevent others from performing the activity until appropriate reviews are completed.
- Verify the work package(s) being used on the job site is/are accurate and the current version.

- Verify conditions are as expected and discuss the work environment hazards and controls.
- Identify what could go wrong, and what type of recovery would be necessary.
- Verify work assignments are clear and understood.
- Discuss responsibilities, authorities and limitations.
- Discuss activity coordination between different work groups.
- Discuss the expected result.
- Provide workers an opportunity to ask questions or seek clarification.

14.2 Stop/Pause Work Expectations and Responsibilities

Workers:

- Know the work environment including physical and radiological hazards of the work;
- Use all senses to detect changes in conditions and hazards;
- Stop/Pause Work when changes in conditions or hazards are identified;
- Follow ALWCDs as written or Stop/Pause Work if ALWCDs are wrong or cannot be executed as written;
- Stop/Pause Work if work is outside the scope or limits of ALWCDs, permits, or pre-job briefings; and
- Stop/Pause Work if safety is being jeopardized.

Managers and supervisors fully support each request to Stop/Pause Work. Applicable DOE safety regulatory requirements prohibit conveying stigma, recrimination, or punishment for stopping/pausing work.

For unplanned interruptions during the performance of work that result in a change in work scope, newly identified hazards, work document cannot be performed as written, or the facility being placed in unstable condition, the following actions should be taken:

- Stop the work,
- Place the equipment in a safe condition,
- Notify the WS/PIC and authorizing manager (e.g. Project Manager/FM/SOM),
- Document the cause, date and time of the interruption if using a formal (written) work document (e.g., ALWCDs, procedures, round sheets, log book entries, etc), and
- Follow project/site/facility change control processes for ALWCDs to resume work.

After the issue or condition is under control or stable and before resuming work, ensure the ALWCDs and controls are adequate to perform the work safely. This may include re-evaluation of the facility system configuration, safety hazards and controls, compensatory actions,

precautions/limitations and other controls for safe resumption of work and subsequent revision of the ALWCD. Organizational processes define when work release is required to resume work.

14.3 Performing Work

Following the pre-job briefing, employees shall conduct the work in accordance with the ALWCD (see 48 CFR 970.5223-1(c)(4)[1]). Work activities should be performed and recorded in accordance with approved processes and procedures.

Workers:

- **Understand** that they have the responsibility and authority to Stop/Pause Work if conditions are deemed unsafe or if there is doubt concerning how to proceed safely;
- **Know** who the PIC at the job site is;
- **Know** where to go, what to do, and who to call for help if new or different hazards or circumstances other than addressed in work planning is encountered;
- **Look** for co-located hazards that the ALWCD did not address. If such hazards exist, stop or pause work, and inform supervision;
- **Assess** current field conditions at the work site to ensure conditions are as expected to perform the work safely. If conditions are not as expected, stop or pause work, and inform supervision;
- **Verify** they are at the right component specified in the ALWCD;
- Follow **ALWCD use categories (see Section 13.2).**
- **Conduct** the work in accordance with the ALWCD, ensuring compliance with safety, conduct of operations and quality expectations (e.g., performing work instruction steps as written, work is stopped if the work instructions cannot be performed as written, performing steps in specified sequence, completing step before proceeding to next step unless otherwise allowed, etc.);
- **Follow** alarm/upset condition/abnormal operating procedures as applicable; and
- **Ensure** safety issues and or errors discovered during the course of performing work (e.g., errors in equipment labeling or location, or in drawings, procedures, and other documents) are reported promptly, and the effect on current work activities thoroughly assessed before proceeding.

During the course of the work, the WS/PIC and line management routinely solicits feedback from the workers and monitor work activities to ensure compliance with safety, conduct of operations and quality expectations.

Issues should be properly documented and addressed.

14.4 Work Documentation and Acceptance

Results of the work process should be documented in accordance with the ALWCD (i.e., forms properly filled out; results, observations, and comments recorded; adequate information provided describing issues, problems, deviations, abnormal conditions, as-found and as-left conditions, etc.; and resultant actions taken). Documentation includes feedback, concerns and observations related to the specific work activities performed.

The RM or designee accepts completed work. Post-work acceptance activities may include verification that the work was performed correctly; the outcome is acceptable/ successful; that systems and equipment affected by the work operate correctly and are restored to normal/desired operational status (this may include separate post maintenance testing); and verification that the work environment has been restored, including packaging and removal of any wastes generated during the course of work, and is left in a clean and orderly condition. The acceptance process includes confirmation that post-work testing and acceptance activities in the field effectively verified that system and equipment performance criteria and requirements are met (e.g., parameter values are within ranges specified by engineering). This may include interface with system engineers (e.g., modifications, temporary modifications and SSC functional testing) prior to equipment/systems being returned to service. The formality of the acceptance is commensurate with the type of work.

15.0 PROVIDE FEEDBACK AND CONTINUOUS IMPROVEMENT (GP1-2; CF5)

GP1, 2

CF5

15.1 Feedback and Improvement

Organizational WP&C processes/procedures provide for soliciting feedback from workers and support personnel regarding the quality of all stages of the WP&C process, not just the Post-job Brief.

Workers and support personnel are encouraged to communicate information for improving the work or WP&C process governing procedures, or reducing hazards or environmental impacts. WSs evaluate in-progress work and feedback provided from workers and take appropriate action. A follow-up discussion takes place with any individuals who provided the information for closure. Additionally, Work Planners and Work Control Management continuously evaluate the work control process, including the performance of work, and recommend improvements to individual work packages or the WP&C process.

Examples include:

- Stop work documentation,
- R&D research results,
- Pre/Post-job brief comments,
- Lessons Learned,

- Performance improvement/successes,
- Work instructions that can't be performed as written, and
- Confronted hazards which were not identified during the JHA process.

This feedback is only one of many elements of the Organization's continuous improvement processes, and should be forwarded to Work Control Management and Work Planners for WP&C process improvement, tracking and trending, and individual ALWCD improvement.

15.2 Post Work Review and Closeout

Once the work is completed and accepted, the WS obtains feedback, including both positive and negative aspects, from the workers and support personnel for use in making WP&C process improvements.

NOTE: Feedback is essential to improving WP&C processes and activities. However, the post-job review process may be less stringent for moderate and minor work.

The WS will review the ALWCD for completeness and return it to Work Control Management for closeout and lessons learned incorporation. The work closeout process shall include instructions for obtaining feedback on adequacy of controls and improving safety management (see 48 CFR 970.5223-1(c)(5)[1]). Closing ALWCDs, including WP&C system updates, document control, archiving, and record retention are additional topics for consideration.

Response to the provider of the feedback occurs to encourage further feedback and guard against giving the impression that feedback is being ignored, discouraging workers and support personnel from providing future feedback.

Other steps for final work package closeout include:

- All required documents and records are included and complete and
- Revisions have been made to documents affected by the work, such as facility drawings, the Master Equipment List, training materials, facility procedures, relevant historical information (e.g., equipment maintenance and repair history, calibration data), facility design basis documentation (e.g., System Design Descriptions, etc.).

15.3 Assessments

Assessments are another method to ensure continuous improvement. In addition to the feedback processes associated with individual ALWCDs, the assessment processes evaluate the WP&C program on a periodic basis (either self-assessments or assessments by Contractor Assurance). These processes include organization self-assessments and internal independent assessments as well as operational awareness activities. Self-assessments of WP&C program elements should be done using the Criteria and Review Approach Documents (CRADs) (see Appendix I and Appendix J) that provide assessment objectives, criteria, and approach guidelines for performing assessments of the activity level WP&C program and its implementation. For nuclear facilities,

each CRAD element should be evaluated at a frequency of at least once every three years. The program also provides feedback mechanisms to identify trends in WP&C.

Issues identified during these assessments and operational awareness activities shall be processed in accordance the Contractor's Issues Management System (see 48 CFR 970.5223-1(g)[1]).

15.4 Measuring System Effectiveness

As a part of the feedback and continuous improvement process, Contractors WP&C program documents should detail how system effectiveness will be measured (see 48 CFR 970.5223-1(d)[1]). Additionally Contractors should provide for tracking and trending the results of assessments, oversight activities, and other feedback. Appendix I and Appendix J provide methods for evaluating effectiveness of the WP&C program and its implementation.

This page is intentionally blank.

16.0 SOURCE DOCUMENTS

1. DOE G 433.1-1A, *Nuclear Facilities Maintenance Management Program Guide for use with DOE O 433.1B*. U.S. Department of Energy. Washington, D.C. September 2011.
2. DOE G 440.1-1B, *Worker Protection Program for DOE*. U.S. Department of Energy. Washington, D.C. October 2011.
3. DOE G 450.4-1C, *Integrated Safety Management System Guide*. U.S. Department of Energy. Washington, D.C. September 2011.
4. DOE-HDBK-1028-2009, *Human Performance Improvement Handbook*, Volume 1 & 2. U.S. Department of Energy. Washington, D.C. 2009.
5. AP-908, *Materials and Services Process Description and Guideline*, Revision 2. Nuclear Energy Institute, Washington, D.C., 2003.
6. *The Standard Nuclear Performance Model: A Process Management Approach*, Revision 3. Nuclear Energy Institute, December 2002.
7. NUMARC 93-01, *Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Sites*, Nuclear Management and Resources Council (Now the Nuclear Energy Institute), Revision 3, July 2000.
8. NX-107, *Work Package Planning Guide*. The Nuclear Exchange. June 1999.
9. INPO AP-913, *Equipment Reliability Process Description*, Revision 1. Institute of Nuclear Power Operations, Atlanta, Georgia. 2001.
10. INPO AP-931, *Verification Practices - Process Description*, Institute of Nuclear Power Operations. Atlanta, Georgia. October 2004.

17.0 REFERENCES

1. 48 CFR 970.5223-1, Federal Acquisition Regulations: Chapter 9: Department of Energy: DOE Management and Operating Contracts: *Integration of environment, safety, and health into work planning and execution*. December 2000, most recent amendment November 5, 2010.
2. 10 CFR 851, Energy: Chapter III: Department of Energy: *Worker Safety and Health Program*. February 2006, most recent amendment December 14, 2009.
3. *Work Planning and Control Program Standard*, URS Corporation. July 12, 2011.
4. *Activity Level Work Planning and Control Process - Attributes, Best Practices, and Guidance for Effective Incorporation of Integrated Safety Management and Quality Assurance*. National Nuclear Security Administration. January 2006.
5. *EM Work Planning and Control Guidelines. U.S. Department of Energy-Environmental Management.* April 2010.
6. INPO AP-928, *Work Management Process Description*, Revision 3. Institute of Nuclear Power Operations. June 2010.
7. 10 CFR 830, Energy: Chapter III: Department of Energy: *Nuclear Safety Management*. Revised. January 2001.
8. DOE O 210.2, *DOE Corporate Operating Experience Program*. U.S. Department of Energy, Washington, D.C. April 8, 2011.
9. DOE O 422.1, *Conduct of Operations*. U.S. Department of Energy, Washington, D.C. June 29, 2010.
10. DOE O 430.1B, Chg 2, *Real Property Asset Management*. U.S. Department of Energy, Washington, D.C. September 24, 2003.
11. DOE O 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*. U.S. Department of Energy, Washington, D.C. April 21, 2010.
12. DOE-STD-1029-92, Change Notice No. 1, *Writer's Guide for Technical Procedures*. U.S. Department of Energy, Washington, D.C. December 1998.
13. INPO 01-002, *Guidelines for the Conduct of Operations at Nuclear Power Stations*, Institute of Nuclear Power Operations, Atlanta, Georgia. May 2001.
14. *INPO Human Performance Fundamentals Course*.
15. Technical Report 1011903, *Maintenance Work Package Planning Guidance*. Electric Power Research Institute. December 2005.

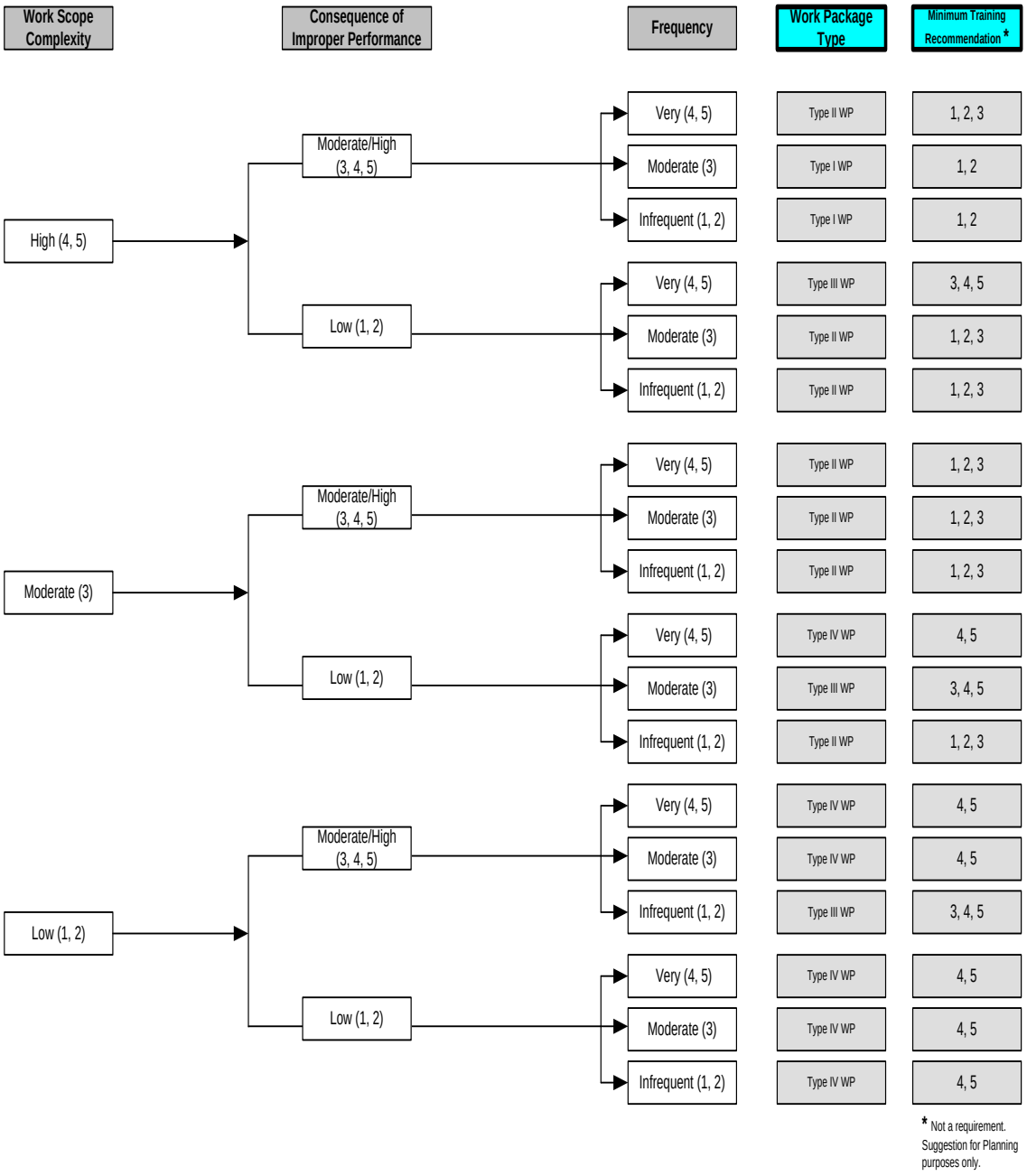
Appendix A. Examples of ALWCD Planning-rigor Levels

This Appendix presents supplemental information for Section 13.2, ALWCD Development. Organizations should consider this information while defining and developing the different types of ALWCDs it uses in the performance of its work. Inherent to determining which ALWCD type should be used for a specific application is an organizational defined screening and binning process. Factors to consider in defining this process are work scope complexity, consequence(s) of improper performance, reliance on SOTW, and frequency of ALWCD performance.

This Appendix provides an example for ALWCD screening and binning utilized at the Nevada National Security Site (NNSS), representing one method for accomplishing screening and binning.

This Appendix also provides a Detailed ALWCD template for Organizations to consider during the planning for high complexity, high hazard, and/or infrequently performed work. Along with a recommended format, the template presents information to be considered while developing each section of the ALWCD, means for incorporating hazard controls into the ALWCD, and guidance on crafting work instructions.

Figure A-1. NNSS – Screening and Binning Tool



Note: Guidance for use of this table is contained below. Numbers in parentheses correspond to gradations (1-5) in each category. Although not required, suggested training levels are provided in the last column for planning purposes. The legend for training levels is shown to the right.

Training Legend

1 = OJT/Skills Evaluation
2 = Formal Classroom w Exam
3 = Classroom Briefing No Exam
4 = Crew/Shift/Pre-Job Briefing
5 = Minor Work (No Additional Trng)

Each of the three sections is ranked from 1–5. The ranking number is assigned based upon an assessment of the entire scope of work being performed, the consequences of improper performance, and the frequency of work performance. Each section ranking number has a brief description of what the Work Planner should be thinking about when determining where a job fits. If in doubt, confer with another Work Planner, the SMEs, and affected disciplines (Industrial Hygiene, Radiological Controls, Safety, Engineering, etc.).

How **COMPLEX** is the **Scope of Work** to be performed? (i.e., Work location, types of Rad Areas, confined spaces, etc.)		What are the **CONSEQUENCES** of improper performance for this scope of work? (i.e., what specific undesired things can happen)		At what **FREQUENCY** is this **Scope of Work** performed? (Not how often any one individual performs the scope of work – that is "proficiency")	
1	***Very Easy*** - Very easy to perform: mental activity required is low, degree of work complexity is low.	1	***Negligible*** – Consequences of improper performance are negligible - Improper performance would make no difference to the health and safety of the worker or to the operation of a system or process.	1	***Rarely*** – Less than once per year.
2	***Somewhat Easy*** - Somewhat easy to perform: mental activity required is low, degree of work complexity is medium	2	***Undesirable*** – Consequences of improper performance are undesirable – Improper performance may cause minor health and safety impacts, or impair the reliability of a system or a process	2	***Seldom*** – Once every 5 to 12 months.
3	***Moderately Difficult*** – Moderately difficult to perform: mental activity required is medium, degree of work complexity is medium.	3	***Serious*** – Consequences of improper performance are serious - Improper performance may cause serious health and safety impacts, or cause serious damage to the system or process.	3	***Occasionally*** - Once every 3 weeks to 4 months.
4	***Very Difficult*** - Very difficult to perform: mental activity required is medium, degree of work complexity is high.	4	***Severe*** –Consequences of improper performance are severe – Improper performance may result in severe impact to worker health and safety, or cause severe damage to a system or process.	4	***Often*** - Once every 1 to 2 weeks.
5	***Extremely Difficult*** – Extremely difficult to perform: mental activity required is high, degree of work complexity is high.	5	***Extremely Severe*** – Consequences of improper performance are extremely severe - a serious injury or site emergency may result.	5	***Very Often*** – More frequently than once per week.

NNSS Example: Work Packages (WPs) Definition. A WP is a set of documents that contain the necessary instructions, permits, inspection checklists, and other authorizations to perform activity level work. Because of the varied nature of work performed, there are four types of work packages used that reflect the level of rigor required. Following is a summary of WP types and minimum contents:

Type I (IN-HAND USE) – A potentially large compilation of documents used for the safe performance of work. A Type I WP is used for higher complexity and is infrequently performed work, with moderate to high consequences of improper performance.

Type I WPs:

- Undergo a revision if any changes in scope and/or hazards are identified.
- Contain detailed step-by-step instructions with a defined sequence of performance.
- Require verification and/or hold points, as applicable.

Type II (GENERAL USE) – A compilation of documents used for the safe performance of work. A Type II WP is used for moderate to high complexity, and moderate to infrequently performed work, with moderate to high consequences of improper performance. Type II WPs:

- Undergo a revision if any changes in scope and/or hazards are identified.
- Contain general direction and/or step-by-step instructions, as appropriate to the SOTW and complexity of the job.
- Require verification and/or hold points, as applicable.

Type III (REFERENCE USE) – A relatively small compilation of documents used for the safe performance of work. A Type III WP is used for moderate to low complexity and frequently performed work, with moderate to low consequences of improper performance. Type III WPs:

- Undergo a revision if any changes in scope and/or hazards are identified.
- Contain SOW with general direction and/or simple instructions.

Type IV – Typically a singular document used for the safe performance of work. Type IV work is used for minor work evolutions that involve low complexity, low consequence, and frequently performed work. Type IV WPs:

- Undergo a revision if any changes in scope and/or hazards are identified.
- Contain a SOW.

Detailed ALWCD

Scope

The Scope section identifies the approved ALWCD range of activities. It states the ALWCD start point or the triggering events that make use of the ALWCD necessary, and the ALWCD end point or final condition. If necessary, the scope may also address the ALWCD limits (e.g. what the ALWCD does not cover).

Precautions and Limitations

The Precautions and Limitations section delineates provision that affect the entire ALWCD or that occur at more than one point in the ALWCD. Precautions alert worker to actions and conditions that represent potential personnel hazards, pose possible equipment damage, or could result in abnormal facility conditions. Precautions also identify the JHA identified hazard control(s) associated with those actions and conditions. Limitations define boundaries that are not to be exceeded including system or equipment capacities or conditions during ALWCD completion. Since Precautions and Limitations cannot be effectively implemented by individual specific steps, they should be identified early in the ALWCD.

Precautions and Limitations may be presented by order of occurrence, severity of consequences, or any other appropriate criteria. However, steps specified in the Precautions and Limitations section may be performed in any sequence since they generally apply to the entire ALWCD, or multiple ALWCD steps, and do not direct the performance or completion of specific actions, tasks, or conditions.

While drafting Precautions and Limitations, personnel should:

- Not include any Precautions and Limitations the worker cannot control by using the ALWCD;
- Not include worker actions in the Precautions and Limitations section;
- Limit the number of Precautions and Limitations so that the worker can remember them while performing the ALWCD;
- Avoid generic Precautions and Limitations that are part of a job description or inherent in the task;
- Inform workers of hazardous conditions, their potential effects, and associated hazard controls; and
- If the hazard is present during the entire or in multiple places within the ALWCD, place the warning or caution in the precautions and limitations section.

Prerequisites/Initial Conditions

The Prerequisites/Initial Condition section identifies actions to be completed by the worker and requirements to be met before the worker continues with the ALWCD. The ALWCD identifies which Prerequisites/Initial Conditions should be completed in a specified sequence and which may be completed in any order.

While drafting Prerequisites/Initial Conditions, personnel consider the following:

- Required facility/system configuration to be established and confirmed,
- SSCs are in a condition to preclude violation of TSR/Safety Analysis Report requirements,
- Special tools, equipment, parts, and/or supplies are available,
- Required security measures are in place,
- Required permits are in place,
- Required approvals have been granted,
- All affected personnel/organizations have been notified and available to support the activity,
- Coordination with other organizations/work groups has been established,
- Support equipment is available, and
- Minimum personnel staffing to complete the ALWCD.

Special Training/Medical Requirements

The Special Training/Medical Requirements section identifies training and/or medical requirements unique to the activity being performed and/or the work environment associated with the activity. Generic requirements should not be listed in this section.

While drafting this section, personnel consider the following:

- Mockups;
- Training on vendor provided equipment including instructions or requirements which exceed normal worker training, qualifications, and proficiencies;
- Safety training (e.g. fall protection, competent person, etc.);
- Radiological worker medical screening and surveillance;
- Beryllium worker medical screening and surveillance; and
- Respiratory protection user medical screening and surveillance.

Special Tools/Equipment

The Special Tools/Equipment section identified special tools, measuring and test equipment, parts, and supplies required to perform the ALWCD. Strict attention to the completeness and correctness of this section is extremely important. For example, failure to specify a necessary item could result in costly equipment downtime or using a substitute for a specialized tool could harm personnel or damage equipment.

While developing this section, personnel:

- Identify certified or qualified parts and equipment needed for the activities.
- Provide guidelines for selecting and assembling special tools, measuring and test equipment, parts, and supplies.
- Provide separate action steps for the different categories such as parts, supplies, or measuring and test equipment.
- Specify alternative tools and equipment if applicable.

Work Instructions

Work Instructions provide the specific information, details, and actions on how to perform the tasks and associated step(s) necessary to carry out an ALWCD.

When developing work instructions, personnel:

- Clearly define the work scope and boundaries.
- Write work instructions in a clear, concise, and worker friendly manner.
- Preclude the potential for misinterpretation or error.
- Avoid terminology such as “if applicable”, “if needed”, “as necessary”, and “as directed”.
- Write action steps using words that are easily understandable by the workers.
- Sequence the work steps in a logical flow to ensure that work is performed safely, efficiently, and effectively/successfully.
- Ensure there is only one action per work step.
- Start the basic action step with a singular present tense action verb such as “Open”.
- Avoid formatting an action step so that it continues onto the next page.
- Identify each action step and action sub-step with a special identifier to distinguish the action steps from each other and from topical headings and explanations.
- Identify equipment precisely as it is in the facility.
- Use main action steps to allow workers to quickly comprehend the purpose of the action step.

- Use action sub-steps to provide specific details for performance. Both main action steps and action sub-steps use the same basic action step form.
- Ensure there are adequate instructions regarding worker compliance with sequence of work steps and sub-steps (e.g. conditional use, non-sequential use, concurrent, continuous, repeated, etc).
- Use only acronyms and abbreviations that are included in an approved, site specific list.
- Identify the person to perform the task directly above the affected action step, if someone other than the primary worker is responsible for performing an action step.
- Identify critical work steps and controls (i.e., steps with significant importance to safety, the DSA, or are regulatory in nature).
- Integrate hold points into the work instructions.
- Incorporate all activity specific and task specific hazard controls from the JHA into the ALWCD work instruction section.
- Clearly identify task specific hazard controls in Warning and Caution statements.
- Ensure Warnings (potential personnel hazards,) Cautions (potential equipment or environmental damage,) and Notes (supplemental information) are used appropriately.
  - Do not direct actions in Warnings, Cautions, or Notes.
- Clearly identifying actions steps requiring independent verification.
- Avoid requiring workers to make conversions from one unit of measure to another whenever possible. Provide an aid for the worker if conversions are essential. Do not require mental calculations.
- Specify numbers and units in the ALWCD with the same precision than can be read from the instruments.
- Include the definition as a Note that immediately precedes the action step, where a word is used that requires a definition.
- Ensure there are adequate instructions regarding the use of “Not Applicable.
- Clearly identify those actions steps or groups of actions steps where first line supervision presence is required.
- Clearly identify when workers need to communicate with other organizations/locations (e.g. control room, workers in another location, etc).

Hold Points

Hold points are ALWCD work instruction steps at which the worker must wait for another person to do something or for some other event to occur to ensure protection of workers, facilities, and/or the environment. Examples include Radiological Protection surveys, QA inspections, and IH samples.

Action Steps with Warnings and Cautions

Warning and Caution statements are an effective way to incorporate JHA identified task/step specific hazard controls into ALWCDs. Warning statements alert workers to potential hazards to personnel. Caution statements alert workers to potential hazards to products or equipment including inadvertent activation or entry into a Limiting Conditions of Operation condition. Warnings and cautions attract attention to information that is essential to safe performance and consist of the conditions, design limitations, practices, and actions to be complied with to avoid loss of life, personal injury, health hazards, or damage to equipment.

When developing Warning and Caution Statements, personnel:

- Review potential hazards with workers and SMEs to determine warnings or cautions that need to be included.
- Determine those parts of the ALWCD where the addition of information is necessary.
- Review each action step and list the potential hazards in warning or caution format.
- Position warnings and cautions so they are complete on one page and appear immediately before and on the same page as the action step(s) to which they apply.
- Place warnings ahead of cautions whenever more than one type is used at the same point in an ALWCD.
  - Do not include action steps in warnings and cautions.
- Write warnings and cautions as short, concise statements. Write warnings and cautions as statements rather than as commands to distinguish them from action steps.
- Ensure that cautions and warnings provide (a) a description of the hazardous condition, (b) the consequences of failing to heed the warning or caution, and (c) critical time considerations.
- Present the text of warnings and cautions using appropriate techniques to ensure visual identification.
- Include only one topic in each warning or caution.
- Number each warning or caution when more than one exists.
- Place the warning or caution in the precautions and limitations section, if the hazard is present during the entire or in multiple places within the ALWCD..
- Repeat the information in precautions as separate cautions or warnings within the body of the ALWCD as it applies to individual action steps.
- Avoid overusing warnings and cautions.

Action Steps with Notes

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

When developing Notes, personnel:

- Use notes to present information that assists the worker in making decisions or improving task performance.
- Position notes so they are complete on one page and appear immediately before and on the same page as the action step(s) to which they apply.
- Place warnings and cautions ahead of notes whenever more than one type is used at the same point in an ALWCD.
- Ensure action steps are not included in notes. Embedded actions should be removed from the note and written as action steps.
- Number the notes if more than one note is entered at the same location in a section or subsection.
- Write notes as short, concise statements. Write notes as statements rather than as commands to distinguish them from action steps.
- Use appropriate emphasis techniques to distinguish notes from cautions or warnings.
- Include only one topic in each note.
- Avoid overusing notes**.**

Time-dependent Action Steps

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

When developing Time-dependent action steps, personnel:

- Place a note before the action steps to be timed in order to alert the worker.
- Begin the action steps with instructions for the worker to record critical time information and provide the worker with a place to record this information. Typically this information will be the time that “starts the clock,” and the time by which some action step or action must be completed.
- Include guidance to identify the actions to take in the event that the time-dependent action step cannot be performed within the specified time.

Conditional Action Steps

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

- IF or WHEN to present the condition to the worker,
- THEN to present the action,
- OR or AND to present more complex conditions, and
- NOT to negate the condition.

When developing conditional action steps, personnel:

- Describe the condition first and then the action to be taken if that condition applies. State the action to be taken on a new line.
- Avoid using AND and OR in the same conditional statement as the resulting logic can be ambiguous and difficult to understand.
- Emphasize conditional terms in ALWCDs. The emphasis techniques used for conditional terms should be applied uniquely to conditional terms.
- Place the conditional term AND between the conditions, if two conditions are required and both of these conditions must be met.
- Place the conditional term OR in underlined capital letters between the conditions, if two conditions are involved and one or both of these conditions must be met before the action is taken.
- Use the conditional term NOT for a negative condition. Avoid using NOT if a single word can be used and the condition can be stated in a positive manner.
- Provide a space for the worker to mark conditional action steps where a sign-off or check-off is desired.

Non-sequential Action Steps

Workers should perform the action steps in the order they are written unless they are specifically directed to perform action steps in another order. When the objectives of the action steps will be met regardless of the sequence they are performed, use non-sequential actions steps.

When developing non-sequential action steps, personnel:

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

- Identify in a consistent fashion the series of action steps which can be performed non-sequentially. Place a note before the sequence of action steps that can be performed non-sequentially, for example:
  - **NOTE:** The activities in Action Steps **[1]** through **[7]** may be performed in any order.
- Provide a check-off box or signoff line for every action in a series of non-sequential action steps to ensure that action steps are not omitted.

Concurrent Action Steps

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

When developing concurrent action steps, personnel consider the following:

- Clearly identify which action steps are to be performed concurrently.
- If concurrent action steps are to be performed by one person, place those actions in one action step that describes precisely the relationship between the action steps.
- If concurrent action steps are to be performed by more than one person, place a note before the first concurrent action step, as appropriate, identifying:
  - Concurrent action steps,
  - Personnel needed to perform each concurrent action step,
  - Locations where the action steps are performed, and
  - Means of communication between locations.

Continuous Action Steps

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

When developing continuous action steps, personnel:

- Clearly identify which action steps are to be performed continuously.
- Place continuous action steps in the ALWCD at the point at which they first apply. Repeat the action steps periodically, as appropriate, on the facing pages of the ALWCD or in the body of the ALWCD.
- Format continuous action steps as conditional action steps and state the portion of the ALWCD during which they are applicable.

Repeated Action Steps

Repeated action steps are simple action steps that are performed more than once during the execution of an ALWCD.

When developing repeated action steps, personnel consider the following:

- Clearly identifying which action steps are to be performed repeatedly.
- If an action step must be repeated an indefinite number of times to achieve an objective, specify that the action step is to be repeated until the expected results are achieved. Only a single signoff line is provided for this action step regardless of the number of times the action step is performed.
- If it is important to know the number of times the sequence is repeated, provide place keeping
- If an action must be performed repeatedly at timed intervals, place instructions in the ALWCD and provide suitable space to record the times that the action step is performed.
- If an action step is to be performed periodically throughout an ALWCD or a portion of an ALWCD (but not at specific timed intervals), place reminders as action steps in the body of the ALWCD.
- If a large group of repetitive actions is required and becomes cumbersome, address the actions in action steps that reference a table, a list, or an appendix (an example of a large group of repetitive actions is a series of valve alignments).
- Notifying the worker when repeated action steps are to be initiated and discontinued**.**

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

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

When developing action steps with Verifications, Checks, Notifications, and Data Recording, personnel:

- Provide appropriate space or tables for entering data (either in the ALWCD or in data sheets).
- Provide the appropriate actions to take if the condition to be verified or checked is not found.
- Include labeled lines in action steps as necessary for workers to record required information.

Action Steps Directing Workers Elsewhere—Branching and Referencing

To perform a task, sometimes workers need to reference another section of the ALWCD they are using (base ALWCD) or another ALWCD. Branching directs the worker to other action steps or sections within the base ALWCD or another ALWCD, but does not return the worker to the original position in the base ALWCD. Referencing directs the worker to other action steps or sections within the base ALWCD or another ALWCD, but returns the workers to the original position in the base ALWCD.

Referencing and branching may make ALWCDs more concise, enhance consistency, and simplify ALWCD maintenance. But these techniques are complex and can be confusing to workers. Confusion could increase the potential for error, with accompanying safety or performance consequences. Use referencing and branching only when it is necessary to direct the worker to information that is vital to the performance of the activity and it is not appropriate to incorporate that information into the base ALWCD. When using branching and referencing, be careful to direct the workers to the correct point elsewhere in the same or other ALWCD.

Referencing or branching may be appropriate when:

- The information is crucial to activity performance.
- It is not practical to incorporate the information into the base ALWCD because:
  - The material consists of a large group of information (e.g. multiple steps or a long table;
  - Incorporating the material into the base ALWCD would result in a needlessly long or confusing ALWCD; or
  - The material is repeated frequently.

When considering the use of referencing or branching, consider the following:

- Can action steps readily be incorporated rather than referenced or branched to?
- Will referencing or branching decrease worker comprehension and ease of use?
- Will worker be directed to small, isolated sections, rather than to whole ALWCDs or appendixes?
- Will branching and referencing cause workers to bypass prerequisites that affect the section to which they are being directed?
- Will branching and referencing cause workers to bypass precautions and limitations that affect the section to which they are being directed?
- Will branching and referencing degrade the accuracy and completeness of recording information during ALWCD performance?

If the answer to all these questions is no, then referencing or branching may be a useful technique.

Branching

A branching step identifies three specific elements:

1. Departure point,
2. Destination, and
3. Action is to be performed at the destination.

At the departure point, it should be clearly emphasized that the worker is being directed to another portion of the same ALWCD, or to another ALWCD, and that the worker is not expected to return to the sequence of steps that initiated the branch. In a branching step, the notice of departure, the destination, and the action to be performed once the destination is reached are all stated in one step.

Referencing

A referencing step identifies the following elements:

- Departure point,
- Destination,
- Action to be performed at the destination, and
- Return point.

A referencing step directs the worker to a destination or location in the base ALWCD or another ALWCD or document; specifies the action to be performed; and instructs the worker to return to the originating step in base ALWCD. When using referencing, it is important to provide unambiguous instructions to the worker.

When developing action steps directing workers elsewhere, personnel consider the following:

- If referencing or branching is appropriate, then use the following methods for referencing and branching:
  - Make it clear to the workers that they are being directed to other material. Do not expect them to know implicitly that other material is being referenced.
  - Fully specify the location the worker is to go when cross-referencing. If the worker is being sent to another ALWCD, identify the ALWCD number, title, and section of the ALWCD. If the worker is being sent to another location in the base ALWCD, identify the specific location in the ALWCD.
  - Use a consistent format for presenting cross-references. Emphasize key words consistently so that workers can identify a cross-referenced action step.

- Ensure that a reference or branch directs the worker to all material needed as a prerequisite to the identified material. For example, ensure that in executing a reference or branch, the worker does not bypass an applicable precaution, limitation or prerequisite/initial condition.
- Data sheets are used exclusively for recording information, not prescribing how action steps are to be completed. Therefore, the referencing and branching techniques of this section are not applicable to data sheets.

Action Steps with Acceptance Criteria

Acceptance criteria provide a basis for determining the success or failure of an activity. Acceptance criteria may be qualitative or quantitative.

When developing action steps with Acceptance Criteria, personnel:

- Determine where specific acceptance criteria are to be presented in the ALWCD.
- State the location of acceptance criteria, whether located at:
  - Individual action steps (used when criteria are satisfied at the time of performance), or
  - Status logs, data sheets or other ALWCDs.
    - When acceptance criteria are located in other ALWCDs, link ALWCDs using referencing techniques if the information cannot be included in the ALWCD.
- Provide a summary of the acceptance criteria in a table or a list as an appendix.
- Include instructions for notifications to be made or actions to be taken immediately by the worker, in the event that specified acceptance criteria are not met.
- Place these instructions or actions in the body of the ALWCD.
- Ensure that these actions are consistent with administrative instructions.
- Include subsequent notifications and actions, such as those to be taken by reviewers, with the acceptance criteria.

Action Steps with Sign Offs

Written responses for action steps that require independent verification, inspection, data recording, or documentation of completion can also be place keeping devices. The use of signatures, initials, check marks, and "N/A" should be defined in Organizational WP&C processes/procedures.

When developing sign offs for action steps, personnel consider the following:

- QA requirements for independent inspection (QA Hold Points);
- A blank line for verification, notification, or inspection signatures or initials;

- A blank line for sign off by a person other than the worker;
- Blanks for recording data and the initials or signatures of persons recording the data;
- If the ALWCD requires that action steps be signed off, provide space for the sign off of the action step;
- Provide a space for the date and/or time of a signoff where such information is determined to be useful;
- Position a blank signature or initial line (for entering initials that identify the persons signing off the action step) immediately following the affected action step, or on a separate data sheet or checklist, if necessary; and
- If the signoff is located in one ALWCD and the action to be signed off is located in a referenced ALWCD, indicate in the base ALWCD action step that documentation occurs in the referenced ALWCD signoff space**.**

Action Steps with Place keeping

Place keeping helps workers to keep track of their progress in an ALWCD and reduces the probability of omitting or duplicating action steps.

When developing place keeping for action steps, personnel consider the following:

- If initials or signatures are not required, place keeping typically consists of check-off boxes.
- Provide a place keeping check-off box near the right margin of the page or the right side of a table.

Post Work Activities

The Post Work Activities section identifies actions that should be performed once the work is complete as described in Section 15.2.

While drafting this section, personnel consider the following:

- Post Maintenance and Functional Testing;
- SME review and concurrence;
- System Engineer (as applicable) review and concurrence on all modifications, temporary modifications, and SSC functional testing including performance criteria and functional requirement verification;
- Operations acceptance;
- System return to service and desired operational status;
- Post-job Review;

- WS review for completeness; and
- Return of the ALWCD to Work Control Management for Close Out and lessons learned.

Close Out

The Close Out section identifies actions that should be performed once Post Work Activities are completed.

While drafting this section, personnel consider the following:

- ALWCD archiving,
- Record retention, and
- Revising associated documentation (e.g. system drawings, system descriptions, training materials, etc.).

Status Logs/Data Sheets

The Status Log/Data Sheet section provides for recording information associated with completing the ALWCD such as WS turnover; work pause/stoppage and resumption; ALWCD changes including reason for the change, where the change was made, and change approval; and any other information that may be helpful to personnel using the ALWCD. This section also provides for the retention of any Data Sheets generated during ALWCD performance.

Miscellaneous

The Miscellaneous section provides for including any drawings, sketches, illustrations, vendor/manufacture information, Material Safety Data Sheets, Waste Stream Disposition information, and field generated paperwork that may be useful to personnel using the ALWCD and/or record retention.

Appendix B. Skill of the Worker Program

This section describes a graded approach for work-task complexity and expectations for defining SOTW as a level of knowledge, skills, and abilities required for individuals to qualify to perform a scope of work safely and effectively based on their training, qualifications, experience, and judgment.

SOTW scope of work should be graded based on a defined set of tasks that may be performed based on their knowledge, skills, and abilities, the qualification considerations, the qualification process, and the documentation. The determination that task hazards may be mitigated by SOTW is documented in a hazard analysis that clearly documents the basis for that determination, defines the bounding conditions associated with that determination, and identifies the set of controls and procedures that workers are expected to implement during the performance of the task. That set of controls is used to determine subsequent qualification, training, requalification, and experience. The hazard analysis is available to workers and supervisors to review as necessary to ensure proposed work falls within the scope of that analysis.

Qualification considerations for each of the workers should be delineated and include tool/instrument qualification, industry, engineering/science discipline, and trade qualifications (e.g., journey level, special licenses or professional certifications, familiarity with appropriate codes, and formal class room training), site/institutional training required to perform work, and specific required training to perform specific task work in specific location/area.

Considerations for qualifications include minimum year experience, such as on-the-job experience or journey-level certification through an approved apprenticeship program or formal classroom training to qualify as a journey level craft/worker. Formal related training from a college or trade school should be evaluated for equivalence. Each craft/worker should be evaluated against the delineated qualifications (commensurate with responsibility) by their line supervisor to determine whether they qualify at the journey level. Supervisors who determine a person qualifies, documents this on a Supervisor Evaluation of Technical Competencies form certifying the person's qualification. It is recommended that the next level of management reviews the supervisor's determination and needs to concur for the person to be authorized to perform work based on SOTW. New employees should be hired at the journey level whenever possible and be evaluated at 6 months and again at approximately 11 months to determine if they are eligible to qualify as journey-level SOTW. The scope of work and the qualification considerations for each type/discipline of the craft/worker should be documented with a clear description of their work tasks. The signed Craft Supervisor Evaluation of Technical Competencies should be entered into the individual's personnel file or training record and a SOTW qualification card should be issued. Individuals need to be certified at the journey level only once for a particular craft/worker qualification.

Annually, individuals' qualifications should be reviewed by their supervisors to verify the determination remains accurate and the employees clearly understand their work tasks, the hazards associated with the work tasks, and the appropriate controls. This should be documented,

and the Supervisor is responsible for ensuring that individual workers review and sign the documentation.

Individuals who are not current in their qualifications for a task need to work under the direct supervision of a person certified as journey-level qualified.

The following is guidance related to SOTW:

- The employees are qualified and may be authorized to perform SOTW tasks based on their levels of knowledge, skill, and ability to recognize the hazards, understand the appropriate controls, and perform work safely and effectively.
- Employees are responsible for carefully reviewing their work environment prior to starting work to ensure that all hazards have been identified and controls are in place.
- SOTW does not exempt the Job-Area Hazard Analysis process if the supervisor or the worker determines the work activity falls outside the scope of the documented hazard analysis. Workers and supervisors are mutually responsible for ensuring workers assigned to perform SOTW tasks are current in their qualifications and training.

Organizational directives outlining SOTW/Summary of Changes processes include criteria for which activities and/or tasks SOTW/Summary Of Changes may be used, approval authority for these activities/tasks, and evaluation prior to first time use to ensure the activities/tasks and associated controls/work instructions are within the Worker knowledge, skill, and ability set.

Appendix C. HPI and QA

NOTE: Important concepts in this Appendix are preceded by text notes called "Key Human Performance Points."

Human Performance Issues and Error-Prevention Techniques

When developing work instructions, Work Planners are responsible for specifying the steps that require verifications or documented peer checks in work packages. The Work Planner is also typically responsible for outlining the methodology and sequencing the work to enable personnel implementing the job to keep track of the process described in the work package.

A human-performance trap can arise when multiple actions are imbedded in a single step. A particular challenge occurs when there are bulleted sub-steps and the worker tries to perform them together rather than individually. The preferred method is to have only one action per step of the procedure or work instructions.

Place-Keeping Practices

Place keeping is a recommended tool for work packages with significant consequence of error. Place keeping is particularly important for system status and configuration control as well as reassembly of equipment after maintenance or any situation when the consequences of skipping, repeating, or partially completing a step would result in adverse consequences.

Place keeping is a technique of clearly marking instructional steps in a document being used to control a work activity to indicate the completion status of a particular step. Steps that are not applicable are typically marked "N/A" (per the provisions of the specific procedure).

Some generic but useful place-keeping guidance from INPO 01-002, *Guidelines for the Conduct of Operations at Nuclear Power Stations*[13] includes the following:

- Integrate appropriate place-keeping techniques in the overall structure of the procedure/work instruction. These should be limited to simple, straightforward methods to support completing the procedure/work instruction in the proper sequence.
- Establish the sequence of steps to conform to the normal or expected work sequence.
- When developing procedures/work instructions, consider the human factors aspects of their intended use. For example, references to components exactly match drawings and label plate identifiers, units are the same as those marked on applicable instrumentation, and charts and graphs can be easily read and interpreted.

Place-keeping tools, such as checkboxes and signoff blanks, should be provided by the Work Planner where appropriate. Copies of applicable technical manual pages should be included in the work packages.

Error Prevention Techniques

Remembering and Asking Four Key Questions

Asking the following four questions is often a good way to think through the activity with the goal of minimizing human error:

1. What are the critical steps or phases of this task? (Important parts of the task that must go correctly.)
2. How could we make a mistake at that point? (Identify error precursors.)
3. What is the worst thing that can go wrong? (Review potential consequences and contingencies.)
4. What barriers or defenses are needed? (Use the HPI tools.)

Based on these questions, the Work Planner should consider the use of the error-prevention tools listed below, as appropriate for the work instructions being prepared.

Self-Check: Stop, Think, Act, Review should be performed for component identification and equipment manipulations as follows:

1. **Stop**: The individual pauses before performing a task to enhance the attention to detail in an attempt to eliminate distractions.
2. **Think**: Prior to performing any actions, the individual should verify that the action to be taken is correct by questioning the intended actions and understanding the expected responses. The individual should also point at or touch the component to identify the correct unit, train, and compare to the controlling document.
3. **Act**: The individual will, without losing physical or visual contact, perform the intended action.
4. **Review**: The individual will verify that the actual response is the expected response. If an unexpected response is obtained, then action should be taken as previously determined. The individual should ensure that the system/component is in a safe condition.

Peer Check: Pre-job briefings should discuss and determine the need for peer checks warranted by any of the following:

- Departure from routine,
- Time pressure,
- Something is not right (doubt),
- Apparent conflict between indications,
- Unfamiliarity/first time, and

- Tired/fatigued.

Peer checking can be performed as follows:

1. The performer references the controlling document, locates the component, and verbally identifies each unique identifier on the component label to the peer. The person can point to or touch the equipment to be manipulated during the explanation.
2. The performer references the controlling document and verbalizes the position in which they intend to place (or check) the component.
3. The peer verbalizes the correct component identification and the intended action is correct and people or systems are ready for the action. Note that both individuals should be aware of and understand the status of plant equipment that could be affected by the action.
4. The performer places (or checks) the component in the intended position.
5. The peer witnesses the positioning (or check) of the component and physically verifies the component position or condition, when applicable.
6. When required, the appropriate individual(s) should document completion of the peer check in the controlling document.

Three-Way Communications

The Work Planner should ensure that communications are clear, concise, and free of ambiguity. For non-face-to-face verbal communication, the sender and receiver should identify themselves by stating their name or title. Use of the phonetic alphabet is often required to ensure proper component identification. Three-way communications should be used for all information exchanges that will result in decision making, direction being given, or actions being taken. Words should be avoided during verbal communication that could be mistaken for some other word, such as “increase” and “decrease.” Communication of indicator readings should be provided in the format of parameter - value - trend, (for example: pressure is 100 psig [689.76 kPAg] and going down). The use of sign language should be avoided. The appropriate unit designator, system designator, or noun name and appropriate phonetic alphabet component or train designator should be used when communicating equipment nomenclature, (for example: 1MS029A should be verbalized as “one Mike Sierra zero two nine Alpha”).

First Check

Prior to the performance of the first manipulation of in-field evolutions, as determined by the pre-job brief (typically excluding operator rounds), the proper step intended to be performed, proper unit, proper train, and component should be checked using self-check techniques. Often the worker will also need to contact the control room or dispatching facility to validate component label information.

The work package should reference or establish a method within the dispatching facility to verify each proper step intended to be performed. These checks and communications should then be

repeated for subsequent field actions after any of the following as determined by the pre-job brief:

- Initiation of a new section of the procedure with different effects or major components (for example: proceeding to a second feed pump);
- Significant change of location (for example: moving to a different building);
- Significant elapsed time between steps; and
- Change of assigned personnel.

Flagging/Robust Operational Barriers

This process does not substitute for proper self-check using equipment labeling as the indication that the correct component is being manipulated or monitored, nor does it substitute for proper verification requirements determined by plant procedures. It is intended to provide an additional barrier so that when an individual is met with a distraction, they return to the right component prior to continuing work.

Key Human Performance Point: Flagging is best applied for components that will be worked on and manipulated multiple times. Flagging/robust operational barriers are also useful if multiple similar components exist within close proximity and/or will be manipulated multiple times.

Typically, the method needed for flagging/robust operational barriers should be determined at the pre-job brief. The Work Planner can include the method of flagging/robust operational barriers as part of any job, but should also ensure that they will not interfere with plant equipment, including indications for operations. Care should be taken not to create an additional hazard by use of a robust operational barrier device.

General Guidance: There are a number of techniques, many of which are already outlined by INPO, that minimize the occurrence of errors. Some common practices to avoid:

- Using check marks instead of initials or signatures for continuous-use procedures, unless the procedure specifically allows it.
- Using ditto marks (").
- Signing one set of initials followed with a vertical line through the remaining sign off blanks.
- Signing off a step as complete before it is actually completed.

Critical Work Package Attributes for Ensuring Quality

As stated in the *INPO Human Performance Fundamentals Course*[14] Reference:

> "*Work is planned to anticipate error-likely situations and to incorporate controls that effectively prevent, catch, or mitigate error during the performance of a specific task by specific individuals.*"

The course reference also suggests the following regarding work planning:

> "*Identifying the opportunities for error and eliminating them is one of the key responsibilities of those developing procedures and planning work packages. The planning stage of work management is an opportunity to identify critical steps of an activity. The structure of the task can be planned in light of single-error vulnerabilities to reduce possible consequences should people err. Additional controls or barriers can be built into the procedure to prevent or catch errors. Feedback from previous occasions and industry operating experience relevant to the task can be factored into the work plan.*"

Key Human Performance Point: One key attribute to consistently developing a quality work package is to perform a critical-task analysis.

A critical task analysis basically consists of the following four steps:

1. Develop a task list.
2. Identify and prioritize critical tasks.
3. Identify critical steps of each particular task, considering the following:
   a) Pinpoint error-likely situations at each critical step.
   b) Characterize the consequences if error(s) occurs at the critical step.
   c) Identify weaknesses in or missing defenses.
4. Identify and incorporate needed controls or safeguards.

Other key (or critical) attributes when developing a quality work package may include ensuring the following:

- Content is consistent with the knowledge, skills, and experience of the work force as well as with management expectations.
- WPs are developed with site instructions/procedures, which may include, in some cases, the aid of a writer's guide.
- WPs are reviewed and verified to check for technical accuracy and consistency with the writer's guide, if applicable.

- WPs are validated by qualified users (can the procedure/work instruction be used as written?).
- WPs are current and revised appropriately.
- WPs include relevant operating experience and lessons learned, as appropriate.
- A feedback process is used as a means to continuously improve the quality of the work packages.

Key Human Performance Point: The planner should include contingency plans when deemed appropriate and should recognize that they may not be required with every WP.

When warranted, the Work Planner should include actions to be taken for emergent conditions such as discovery of equipment degradation, additional tools/equipment needed, or increases in the scope of the task. If the potential consequences are significant, job-specific contingency plans should be developed with the WP. Work Planners should consider the following when determining the need and scope of contingency plans:

- What is the worst thing that could happen?
- What defenses/contingencies are in place to address the worst case?

The Work Planner may include actions for coping with potential hazards such as fire, radioactive spills, or exposure to radiation and predictable undesirable events like failures and errors. Contingency plans may be integrated with the appropriate action in the work detail section, if it is more appropriate than keeping them separate. The level of effort and resource used for contingency planning should be commensurate with the significance of the work activity.

Planning for contingency parts should also be considered, and if contingency parts are requested, the appropriate supply chain organization(s) should be notified. Specifically, the supply chain should be made aware of their priority, whether the parts need to be staged on-site, and/or whether the maintenance organization needs to know the availability and lead time so alternative procurement arrangements can be explored. The Work Planner should recognize that contingent material might not be needed to support the planned work activities. However, the material request should still flag the request as “contingent,” and the supply chain organization should provide work management with the material availability and lead time so as to allow a cost-effective decision as to whether to procure and/or expedite the material.

Appendix D. Maintenance/Construction – Additional Consideration for WP&C

NOTE: Content within this Appendix includes discussion on scheduling concepts, types of schedules and their related processes, and protocols to be used during scheduling meetings. This appendix also includes other useful information that should be considered/applied to maintenance WP&C processes such as: parts, special tools and equipment, work instructions, HPI, and definitions of maintenance terms. The information included in this attachment was edited to support DOE practices and extracted from INPO and Technical Report 1011903, *Maintenance Work Package Planning Guidance*[15] documents as cited in Section 16.0 and Section 17.0.

Scheduling

Many sites believe that they already plan and schedule. In fact, very few have fully implemented these processes, but they may have selected portions of them to implement. This accounts for the varying degrees of success that operations have in this area. This section provides descriptions of typical states from nearly completely reactive maintenance to a fully planned and scheduled system.

Reactive Scheduling

In this state, virtually no planning or scheduling is done. When work is identified, it is generally requested on an immediate basis. There is no faith that work which is placed in the backlog will be done later because more urgent requests are continually being made. Workers are given work documents and sent to the job site without materials or expectations for how long the job will take.

When they decide what materials they need, they go to the Warehouse to get the parts from stock. Naturally, the parts required may or may not be there, depending on what is in stock and inventory accuracy. In these days of inventory reduction, it is less likely that a person can go to the stores window and expect to find all the parts they need to complete a job. Cost benefits from decreased inventory can easily be frittered away by needless parts expedition charges.

Day-Ahead Planning and Scheduling

In this scenario, personnel are looking ahead one day. They decide what jobs they want to get done the next day by looking at the backlog or from requests they have received from work initiators. They may make a list of jobs that they want to accomplish, but it is unlikely that this list is agreed upon with the appropriate personnel (e.g., Operations or the Principal Investigator) or communicated in advance. Certain pre-planned activities may be accomplished, such as clearances, but this is not done consistently. They may or may not look into materials requirements. In essence, sites in this state may avoid some of the pitfalls of a completely reactive system, but they are still inconsistent enough that the benefits of their limited planning and scheduling are not readily apparent.

The Weekly Wish List

Many DOE Site's Maintenance Departments have progressed to this next level of planning and scheduling. They likely believe that their planning and scheduling is effective because they put a lot of effort into it and have some limited success in the beginning stages. Some level of planning is done on most jobs. A labor estimate is placed on many ALWCDs and some coordination with internal and external groups is done. The salient quality of this stage is the weekly schedule. Many sites believe they have implemented long-range scheduling because they have a schedule that looks one week ahead. Typically, though this schedule still includes jobs that have not been planned to the point that they are truly ready to be done. Generally, a Work Planner has still prepared the schedule without the formal input of affected organizations such as Operations and Engineering. In addition, these schedules rarely look beyond one week into the future.

Most salient though, is that labor estimates are not usually balanced against available resources. Jobs are placed on the schedule without a notion of the true labor availability for the following week. Without this labor balancing, the schedule is truly a "wish list" of items that the maintenance department would like to get done but not a firm schedule. Crews are either under scheduled or overscheduled. Regardless, Maintenance, Operations and R&D do not have any real faith that the scheduled jobs will get done. Unfortunately, these are the organizations that are the most difficult to change, as they believe they are already performing at accelerated level.

Best Practices Planning and Scheduling

In a site or facility where the work management process is functioning well, work is identified in a timely way and sent to the Work Planner with all required information already on the ALWCD. The Work Planner prepares detailed job plans that include all elements that could possibly help the work performer execute the work better and more quickly. Job plans include estimated labor hours, estimated materials requirements, detailed job steps, equipment prints, and any other helpful information.

Work is not scheduled until it is clear that it will be ready to be worked when the scheduled day arrives. On weekly and daily schedules, crews and craftspeople are given no more work than they can accomplish and no less. The most important work is placed on scheduled first and that includes a large percentage of preventive and predictive maintenance.

Technicians and scientists are not given work until the job is ready to be done. The equipment has been cleared and prepared. The materials are available to do the job. Crews and contractors have coordinated. Workers will not be pulled off the job because Operations has agreed to the work on the schedule through joint prioritization in the scheduling meeting.

Ultimately, more work gets done, of higher quality, in less time, with less stress on employees when obstacles that impede them are removed from the process. They are allowed to perform at the high level they have wanted to achieve all along.

The following sections provide in detail, the procedures and activities that are recommended in order to fully implement planning and scheduling.

Multi-Week Scheduling Management

The purpose of multi-week scheduling is to ensure that the highest plant priority work is being completed on a weekly basis and that clarity, consensus, and commitment regarding work to be done is achieved through joint prioritization. Work is selected based on what is important to the operation of the plant in order to maximize availability and minimize cost. Preventive and predictive maintenance are essential to accomplishing these goals. Effective long-range scheduling will aid in ensuring that these activities are accomplished consistently.

The multi-week scheduling process is a system used to plan and execute all on-line and off-line maintenance. It is a well-integrated, interdepartmental plan that will promote employees to work safely without challenging operations or power generation, and, ultimately, reduces the cost.

The process is designed to ensure that the work identified at the initial stage equals the work completed at the end of the cycle. The facility would be able to track every job that enters the system from start to finish, whether it is a modification that is a project with a due date, or maintenance work that is scheduled in a Multi Week cycle.

While the Supervisor reporting to the Area Manager is the primary owner of the Planning and Scheduling Processes, there is a need for support from all other groups on site to complete the jobs as scheduled in the Planning and Scheduling Process.

Schedules are prepared for each crew for the multi-weeks following the current week, henceforth referred to as Week T4, T3, T2, T1, and T0. Various multi-week scenarios can exist depending on the unique situation at the plant. Which work will be scheduled first is a matter of plant policy and joint prioritization; however, it is recommended that PM and predictive maintenance be the first items included in each of the multi-weeks, followed by higher priority corrective work and capital projects or modifications. Each week the available labor is scheduled up to the following approximate amounts:

- Week T4: 30%,
- Week T3: 50%,
- Week T2: 70%,
- Week T1: 70%, and
- Week T0: 100% (this is the week work is executed).

Work is scheduled against available labor resources, but only as man-hours available versus man-hours estimated for jobs for the entire week. Individuals can be matched up with jobs before the workweek or during the daily scheduling process depending on a person’s special skills and on coordination with other groups. Specific start dates within the week are not identified unless they are required for coordination of resources.

The intended outcome of multi-week scheduling is published schedules for all Maintenance, R&D, Operations and Engineering personnel.

Then, each day during work week T0, weekly scheduled work plus sponsored work are combined in a daily schedule that reflects 100% of the available labor for each crew. It is at this time that matching jobs up with individual craftspeople is finalized.

As work week T0 comes to a close, all work incomplete or not started will be "rolled over into subsequent work weeks."

The following section describes the significant steps in the workweek-management processes. For all online work that will be contracted to vendors or worked by site resources, a due date will drive the planning and scheduling and be incorporated by ALWCD into the multi-week work cycle. Offline work scopes will be updated and maintained for unscheduled maintenance.

The workweek process should consist of a rolling multi-week schedule, such as a four-week schedule, developed by the plant schedulers with input from joint prioritization between System Owners, Work Planners, Maintenance, Operations and Engineering. These workweeks will be updated weekly at a Weekly Scheduling meeting.

Activity by Week

Week T4—Work to be Performed 4 Weeks Away

Labor availability information is submitted each week for the upcoming multi-weeks. First Line Supervisors discuss availability with team members.

During this week, the R&D and Operations submit their priorities on work driven by condition. Additionally, the system owner will review system equipment indicators for impending problems and review and prioritize the outstanding work on the system. The system owner identifies a recommended job list for the window four weeks away.

During this week, the Schedulers make sure a joint prioritization takes place for work to be placed on the T4 workweek. At the weekly scheduling meeting, joint prioritization can be agreed to in relation to all work assigned to the various workweeks.

Work Planners will begin planning on jobs identified for week T4 as required.

Week T3—Work to be Performed 3 Weeks Away

Labor availability information is submitted each week for the above mentioned crews for the upcoming multi-weeks. Gather the information required to complete the labor availability portion of the standard Planning and Scheduling Form. First-Line Supervisors discuss availability with crew members.

Operations and R&D review and inputs on the prioritization of work.

Work Planners will continue planning on jobs identified during week 4 as required.

Week T2—Work to be Performed 2 Weeks Away

Labor availability information is submitted each week, for the above mentioned crews, for the upcoming multi-weeks.

Ensure that all man-hour estimates are correct and that all planning holds removed from jobs in workweek by the end of business on Friday.

Perform materials management to ensure all parts are available for the jobs in workweek by the end of business on Friday. Staging of parts may be started at this point.

Supervisors review their available man-hours for the workweek and compare to the scope of the window and **commits** to the schedule.

Perform a final evaluation of the workweek. At this time, the Work Planner will remove from the window any work where parts will not be ready. Pending clearances required.

After this week, any work added to the work week receives management approval in accordance with an approved schedule addition process.

Week T1—Work to be Performed Next Week

Labor availability information is submitted each week for the above mentioned crews for the upcoming Multi Weeks. First Line Supervisors discuss availability with crew members.

On Monday of Week 1, all work is incorporated into a master work-week schedule.

On Friday, work that will roll over from T0 into T1 is identified and entered into the schedule.

Supervisors review their available man-hours for the workweek and compare to the scope of the workweek and commits to accomplishing all work. Notify Supervisor of Planning and Scheduling of any discrepancies by the end of business on Friday.

Supervisors can begin to assign the work to specific personnel and obtain buy-in to the schedule. The Supervisor walks down the jobs in the week as necessary to identify possible conflicts.

The Rev 0 schedule, reflecting >70% of net available resources, is issued on Friday.

Week T0—Work Execution Week

This is the execution week. All added work goes through the Sponsored work process and obtain Supervisor-level approval.

Operations will prioritize sponsored work.

Daily meetings are held to discuss new priorities of emergent work.

Week T1—Last Week in Review

Work week critique. Review schedule compliance, what went well, what did not go well during the week and set appropriate compliance goals.

Daily Scheduling

The purpose of daily scheduling is to ensure that the highest plant priority work is being completed on daily basis, that clarity, consensus and commitment regarding work to be done is achieved through joint prioritization, and that clear expectations are communicated to crews for daily work assignments.

Daily Scheduling Meeting/POD

Purpose

- Ensure regular communication, cooperation, and coordination between Operations, Maintenance and other groups.
- Review recently completed work to ensure the customers are aware of critical jobs that have been performed.
- Review issues or concerns that impacted work accomplishment.
- Provide recognition for good communication, cooperation, and coordination.
- Review current jobs to ensure understanding of status.
- Review tentative schedules for the next working day, including potential carry-over work.
- Establish a contract between the Operations and Maintenance departments for tomorrow's schedule.
- Discuss preparation requirements (clearances and equipment preparation) required of Operations.

Responsibilities

Preparation Prior to the Meeting

First-Line Supervisors:

- Review yesterday's important jobs to be sure they were completed.
- Review today's updated daily work schedules to assess current work progress and identify potential carry-over work.
- Review the work-order backlog to identify urgent work that may require scheduling.

- Develop tentative daily work schedules for the next working day.
- Collect prepared clearances from planned work packages.
- Develop tentative clearance requests for urgent jobs that may not have clearances already prepared.
- Make copies of tentative daily schedules.

All Participants are prepared to discuss issues that impacted yesterday's schedules.

During the Meeting

- Operations follow the standard daily meeting agenda.
- All Participants provide necessary information per agenda item.
- First-line Supervisors capture changes to daily schedules.
- First-line Supervisors finalize clearance requests and give to Duty-Shift Supervisor.

After the Meeting

First-line Supervisors complete preparation of the daily work schedules for the following working day.

POD Standing Agenda

- Review yesterday's work.
- Ensure important jobs have been completed.
- Discuss issues and concerns that impacted schedule compliance and work accomplishment.
- Give positive recognition for good communication, cooperation, and coordination.
- Review today's work.
- Discuss issues and concerns that have/are impacting work accomplishment.
- Identify potential carry-over work for tomorrow's schedule.
- Give positive recognition for good performance.

Prepare for Tomorrow's Scheduled Work

- Schedule carry-over work.
- Review priorities from the three-week schedules and the planned ALWCD backlog.
- Discuss and agree upon tomorrow's scheduled work.
- Identify and discuss timing and coordination of jobs for start of shift, requiring clearances, and requiring multi-craft involvement.

Graded Approach to Scheduling

A fundamental shift in schedule adherence rigidity and expectations is necessary to provide a distinction between activities that require strict compliance (for logic and performance reasons) and those that do not. To address this need, a formal approach to flexible scheduling and implementation of expectations was developed. While this approach can result in many gains in work productivity and schedule ownership by the implementing craft, higher levels of work group accountability to accomplish the required tasks accompany this additional flexibility. The wrong emphasis on the graded approach to scheduling could increase human-performance-related issues and could negatively impact plant performance. Processes are in place, established, and employed to ensure that line ownership and safety is maintained as integral parts of the work management scheduling tool.

A graded approach to scheduling improves both accountability and ownership of the schedule. It also provides the appropriate management involvement with the required emphasis on the appropriate SSCs to properly manage the maintenance of a facility.

The approach has four levels of work scheduling (Levels A, B, C, and D.) Each level has specific criteria.

Several attributes are necessary for a graded approach to scheduling. These attributes include management commitment, craft ownership, a high focus on critical work, and flexibility on noncritical work, as well as an organization that understands and supports the work management process and the graded approach to scheduling.

Ownership

Ownership of the graded approach to scheduling is a tiered approach. The highest level of scheduling (Level A) has management through work-performer ownership and oversight, whereas the lowest level of schedule control (Level C) has supervision through work performer ownership. Table D-1 illustrates the involvement and ownership matrix provided by a graded approach to scheduling.

Table D-1. Graded Approach Involvement and Ownership Matrix

	Level A	Level B	Level C	Level D
Senior Management Team/Managers	X			
Superintendents/Supervisors	X	X		
Supervisors	X	X	X	
Technicians/Scientists/Craft	X	X	X	X

Graded Approach:

Several different levels (four are recommended) of scheduling details are described below that, if used correctly, will allow compliance, flexibility, and efficiency, as well as the means to segregate more important schedule issues from less important issues. Each level offers its own advantage in managing daily work activities. Not all sites will be ready to use all four; it may be

desirable to use only one or two initially and phase in the third and fourth levels. Each level of scheduling results in a different level of monitoring or schedule compliance, with the highest level (Level A) requiring the highest degree of schedule compliance or schedule control and the lowest level (Level D) requires the lowest degree of scheduling compliance or schedule control.

Level A

A Level A schedule is used when the highest level of schedule control and adherence and the highest level of management oversight are necessary because of work complexity, degree of hazards or other significant concerns. This type of schedule is reserved for work activities that warrant management attention because of their importance to the safe operation of the facility, whether it be entry into a TSR or other work activities that require additional management attention. This attention should be accomplished through briefings of the major work activities at management meetings or management involvement in schedule development and execution. For example, system outage directors who are typically managers may be assigned to coordinate scheduled work windows. The Level A schedule is logic-driven, and updates should be provided at least daily (generally several times throughout the day).

Types of activities to consider for a Level A schedule are as follows:

- Major TSRs with significant percentages of available time,
- High-complexity/hazard-significant work activities, and
- Work activities that require degradation of facility operations.

Schedule Adherence: Level A scheduled activities provide the structure to establish hourly schedule adherence. Activities are closely monitored during implementation to ensure that the sequence and timing of the work are as scheduled. Schedule development takes into account the level of detail and logic ties necessary to maintain acceptable reliability levels. For these activities, hourly adherence to the schedule should be expected and monitored.

Level B

Level B scheduled activities are the second highest level, requiring moderate oversight to ensure schedule control and adherence. Oversight is normally provided by the next lower level of the management staff (superintendent). This type of schedule activity would be logic-driven and significant only to the point that it must be completed in one shift or one day so as not to impact other planned work on subsequent shifts or days. Work is coordinated and owned at the work team level. This type of schedule is also logic-driven, and updates are provided daily**.**

Types of activities include the following:

- Work that requires a significant tag-out,
- Modifications not deemed significant,
- Multidiscipline work,

- Potential high-dose activities,
- Work that involves area coordination, and
- Significant work.

Schedule Adherence: Level B scheduled activities will provide the structure and update frequency to allow daily schedule adherence. The activities in a Level B schedule are those that require significant tag-outs, modifications, multidiscipline work activities, work that involves potentially higher dose, and significant work that is important to plant reliability. Monitoring Level B adherence ensures that the sequence and timing of the work are scheduled and executed to maintain acceptable reliability levels. For work on a Level B schedule, daily adherence to the schedule should be expected and monitored.

Level C

Level C scheduled activities are the lowest level. Schedule control and adherence do not require management oversight and can be managed at the supervisor and technician level. Level C activities should have no Probabilistic Safety Assessment (PSA)/Probabilistic Risk Assessment (PRA) results and are expected to be completed any time within the workweek. Any work to be performed on SSCs with PSA implications should be evaluated as acceptable to be worked in combination with any other planned task for the entire week. This type of schedule should be reserved for work that is routine and does not require the details of a logic-driven schedule. Work on this type of schedule is coordinated and managed, and the foreman/technician level is accountable for its completion. This type of work does not have to be depicted on a logic-type schedule and could be communicated as a list of items with target dates by which the activities are expected to be completed. This work will cause minimal increase in plant upset and does not require significant support from other station work groups. Standing radiation work permits are acceptable to control radiological aspects of Level C work.

Types of activities include the following:

- Stand-alone surveillance test,
- Predictive/preventive maintenance (PM),
- Minor tag-out work, and
- Nonintrusive inspections (thermography).

Schedule Adherence: Level C scheduled activities are of lesser significance (bulk work) and are scheduled for completion during the week because of window availability, manpower availability, or current plant conditions. This work can be shown on the schedule on the day or shift it is targeted to be completed, or it may be carried as a list attached to the schedule. The work is expected to progress as shown, but it may move within the workweek at the discretion of the owning organization. Monitoring bulk work at this level helps ensure that the schedule matches workload and resources and that support is available as needed to complete the work.

For work on a Level C schedule, weekly adherence to the schedule should be expected and monitored.

Level D

Level D work is normally managed at the foreman/technician level. This work would not be included in the weekly man-loading of the responsible sections. It is typically classified as support work or work that does not impact the plant and it can be completed any time on any day. This work has no PSA/PRA impact and does not require support from other organizations.

Types of activities include the following:

- Facilities work,
- Housekeeping,
- Tool pouch maintenance,
- Prefabrication work, and
- Scaffold construction (if no plant impact).

Schedule Adherence: In addition to scheduled work discussed in the previous three levels, some fill-in work could be listed and attached with the schedule. It could be used to compensate for jobs that are cancelled at the last minute or that are delayed or to make up for differences between job estimates and actual performance times. Fill-in work should not be selected in lieu of higher-priority scheduled or emergent work (Level A, B, or C). Listing the fill-in work with the schedule may improve the likelihood that it will be completed, as preparations could be made in advance. Level D work would not be measured for schedule adherence.

Scheduling Metrics

The most important planning and scheduling metrics should be used at all plants irrespective of operating mode or effectiveness of the planning and scheduling process. These indicators are typically reported monthly. Once a month, management should review these metrics. The actual numbers don't matter as much as the trends from month to month, and the questioning and actions that occur in the meeting. Other metrics are suggested later, these could be used to address temporary problems or special conditions at a particular plant (see Table D-2).

Table D-2. Planning and Schedule Metric

Metric	Level D	Level C	Level B	Level A
PM Compliance	15%	40%	70%	100%
Emergent Work	20%	10%	5%	1%
Labor Planning Effectiveness	0%	20%	40%	100%
Schedule Compliance	0%	30%	50%	90%

Identification of Necessary Parts, Special Tools, and Equipment

As noted in the preceding section, the Work Planner should also identify/flag contingency parts and communicate to the supply chain organization(s) whether the part will be needed on-site to support the work. It is typically necessary for the Work Planner to ensure that the correct parts/replacement items are installed in the plant for the work being prescribed and planned. Care should also be taken to ensure that replacement parts are consistent with plant-design documentation.

The Work Planners should also reserve or initiate procurement of the needed parts or services and identify the date that staging is required. Typically, staging represents material that is picked and segregated into kits by work management personnel for each job and placed in a separate and secure location in the warehouse. In most cases, the staged material is still controlled as if remaining in inventory. Staging facilitates a more level workload in the warehouse as well as assisting the craft labor with expeditious issuance of the needed parts.

In some cases, it might be beneficial to walkdown staged material for certain work activities well in advance of the work, to further ensure efficient delivery of material when warehouse facilities are remote from the plant.

The Work Planner should notify appropriate organizations when engineering evaluations or reviews are required to support issue and use of required parts/services, as necessary. If the Work Planner has reason to believe the needed parts will not be available by the preparation milestone, then he or she should identify the restraint.

Obsolete Parts and Material

The Work Planner should also be made aware of potential obsolescence issues that could adversely impact the procurement and availability of necessary parts. Obsolescence is a term commonly used in the nuclear industry to refer to one of the following conditions:

1. The condition of being out of date due to development of better or more economical products, methods, processes, machinery, or facilities resulting in a loss of value or competitive advantage. Items might be available in the market but are no longer needed in a specific application, or
2. The condition of no longer being available in the market due to lack of manufacturer support. Items are needed in a specific application but are no longer available or supported by the original manufacturer and are difficult to otherwise procure and qualify.

Although the Work Planner is typically not responsible for resolving part obsolescence issues and procuring alternative items, they should be aware that obsolescence could result from any of the following scenarios:

Part Obsolescence:

- The supplier/manufacturer no longer makes the part.
- The site no longer uses the part due to modifications.
- Obsolete Equipment—Items in plant service that are no longer manufactured or supported by the original manufacturer or are otherwise difficult to procure and qualify.

In summary, accurate and timely planning of work should allow the procurement process to optimize the cost of materials and inventory. The Work Planner should have an appreciation for the criticality of the part(s), and planning of work should take into consideration lead times for obtaining parts when stock is not maintained in inventory.

In some cases, the work package may identify and contain guidance regarding the proper application and use of special tools and equipment. Typically, the Work Planner should identify these items and include guidance when there is reason to believe the craft labor may benefit from additional instructions or when the improper use of the special tools/equipment could have an adverse effect on the maintenance work activities or the equipment being serviced.

Prerequisites

Prerequisites provide the actions to be completed (or verified) and signed off before proceeding with the performance of the next or main task. The Work Planner should arrange the actions in the proper sequence for the performance, and they should include any required field preparations or notifications, such as:

- Establishing the appropriate system or equipment alignment and power supply,
- Confirming operability of systems and components before removal from service,
- Installing portable communications equipment,
- Preparing special test equipment,
- Identifying needed support services, and
- Verifying completion of other tasks that must be performed before proceeding with the current task.

Another prerequisite that may be included in the work package is an attachment providing information necessary to support the pre-job briefing. The attachment, or traveler, should identify the following:

- Critical job steps,
- Potential adverse outcomes,
- Contingency or compensatory actions, and
- Error-likely situations and defenses.

Maintenance Tag-out Information

The Work Planner should record clearance/tagging information as necessary. In some cases, the Work Planner may be required per site procedures to prepare and submit a detailed clearance request. In other cases, the Work Planner may be required to simply provide a summary of the clearance needs.

If a clearance request is required, it should contain sufficient details that will allow the clearance developer to prepare the clearance order. In some cases, the Work Planner may be required to provide specific scope of work and reference drawings to enable the clearance order to provide safety to the worker and equipment. Typically, the Work Planner should include the following information:

- Clearance boundary scope (electrical, fluid, air, and the like);
- Specific tagging order (if important to the maintenance/work activity);
- Components that should not be tagged (for example: the component must be manipulated or removed);
- Components that will need position verification following the maintenance activity (due to work instructions that manipulate the component);
- Boundary extension needs, if known; and
- Special precautions or instructions for the clearance developer, such as "hang when requested".

The user of this report should note that at some sites, the operations organization builds clearances and defines clearance boundaries based on work scope, present plant conditions, and past work experience.

Special Instructions

The Work Planner should record useful supporting information in the special instructions section, including the following items, as applicable:

- Special tools,
- Component location,
- Other special instructions such as engineering contacts, and

NOTE**:** At some sites, this information is contained in the RWP provided by radiation protection personnel.

- Health physics/ALARA instructions.

Task/Discipline Work Instructions

In developing the task/discipline work instructions, the Work Planner should consider the factors shown in Appendix A. The level of detail of both the work package and the task/discipline work instructions should be an output after considering the factors shown in Figure A-1 and properly categorizing the level of the WP.

Key Human Performance Point

Work instructions should be written in sentence case; that is, the first word of a sentence should be the action verb and should be upper case, and the rest of the letters in the sentence should be lower case. Studies show fewer human performance errors occur when sentence case structure is used.

Key Human Performance Point

When writing work instructions, there should only be one action per step, and steps should be written as imperative statements. Titles and individual words may be capitalized, bolded, and/or italicized for emphasis.

Critical steps should be uniquely identified and verbally read prior to execution. Each step should be peer checked to ensure that it is the proper step and that the intended action is correct. Each step should be signed off upon completion. Steps are considered "critical" if consequences of incorrect execution are significant.

Notes should be used as information to clarify the step(s) and should specify only administrative actions. Physical actions to be accomplished by the worker should be in a work step. Notes should immediately precede the step that is being clarified. Notes should be written as sentence case in a box, and the note heading should typically be centered and capitalized.

Cautions should be used to describe conditions that may be hazardous to equipment or personnel, may impact unit operations, or may challenge plant systems. Cautions should immediately precede the action statement for which they are intended. Cautions should also be written in sentence case, bold type, in a box, and the caution heading should be centered, typed in all capital letters, and bolded. Numbering conventions and Arabic numerals should be used.

Definitions:

Corrective Maintenance: Represents a level of deficiency of a facility component that has failed or is significantly deficient such that failure is imminent (within its operating cycle/PM interval), and it no longer conforms to or cannot perform its design function.

Facility Equipment: Includes components as critical, noncritical, or run-to-failure. Facility equipment required to maintain federal or state regulatory compliance, security systems, emergency preparedness systems, environmental compliance, or site chemistry will be included in this grouping. Equipment located in site buildings, such as warehouses, offices, or the training buildings, that is not required to support facility equipment or systems should be excluded from

this definition. For example, an electrical distribution panel or breaker located in a warehouse that supports warehouse lighting would not be included, while an electrical distribution panel or breaker in the warehouse that provides power to a water treatment panel would be included. As another example, a permanent space heater in the warehouse that heats only the warehouse would not be included, while a permanent heater in a site building that provides freeze protection for facility equipment or systems would be included.

Fix-it-Now (FIN) Teams: Optional special cross-functional work teams assembled as a self-sufficient work group capable of performing work without outside support. These teams accomplish work outside the normal schedule on a real-time and immediate basis. Sites establish work limitation guidance for the FIN Teams to ensure that high-hazard and complex work activities are subject to the full planning, preparation, and review process. The FIN Team's primary responsibility is to address emergent work activities such that the scheduled and planned work is protected, and the normal shop resources are not distracted from their assigned tasks.

Minor Maintenance: A methodology for implementing work that is minor in scope and does not require formal work-order planning and that does not affect nuclear safety functions or increase the probability of a facility transient. Normally, work implemented and processed under minor maintenance would not require significant site support for tools and consumables identification, site clearances, and RWPs or controls.

Tool Pouch: A methodology by which work is accomplished that does not require work documents to be initiated.

Work Management: The process by which maintenance, modifications, surveillances, testing, engineering support, and any work activities that require facility coordination or schedule integration are implemented—It is generally divided into seven phases: (INPO Definition)

1. **Screening:** Appropriate facility personnel review all new deficiencies to assign priority, classification, and appropriate facility conditions to perform the work.
2. **Scoping:** Multiple sources are reviewed to determine what work should be performed in a given period, usually a workweek for on-line work or for a system or unit outage period.
3. **Planning:** Scoped work gets detailed planning as appropriate for the nature of the work.
4. **Scheduling:** Detailed schedules are developed that integrate scoped jobs into a workweek or outage period.
5. **Preparation:** Stakeholders review scoped work to ensure it can be supported and performed as scheduled.
6. **Execution:** Work is performed and, after testing, facility equipment is returned to service.
7. **Critique:** Work is reviewed individually and in the aggregate to establish needed improvements to the work and the phases noted above.

Preventive Maintenance (PM): Includes predictive (condition-based) and periodic/planned (time-based) actions taken to maintain a piece of equipment within design operating conditions

and to extend its life. Do not use a PM task to address corrective/deficient/other maintenance without identifying it as one of those categories.

Grace Period for Preventive Maintenance: Any PM task that is to be performed beyond its original due date but prior to the late date for that activity. Normally, this period (due date to late date) is an additional 25% of the original schedule interval for the PM task. No engineering evaluation is required. The grace period is provided as reasonable flexibility to allow for alignment with surveillance activities and functional equipment group bundling and to better manage site resource use. PM tasks are expected to be scheduled based on their due dates.

- A **deferred PM task** is a PM task that exceeds its original late date with an approved engineering evaluation that determines the acceptability for extension to a new due date before the original late date is exceeded.
- A **deep-in-grace task** is a PM task whose scheduled date has or will exceed 50 of the **grace period**.
- A **delinquent (overdue) PM task** is a PM task that exceeds its late date (grace period) without sufficient technical basis. In addition, the applicable system/component or program engineer should be knowledgeable of all PMs that have been deferred, including understanding the aggregate risk associated with multiple PM deferrals, on a given system or component. Delinquent/overdue PMs are tracked separately from PM deferrals that have a sufficient technical basis, so that site management is informed of the risk associated with multiple late/delinquent PMs.

Emergent Work: Any non-FIN Team work added after schedule freeze.

Work Priority: A site-specific predefined set of criteria to denote the level of urgency and importance of work deficiencies.

Certified Schedule: The schedule used as the target for survival, weekly, and daily adherence metrics.

Contingency Material: A part that is not needed to complete the defined scope of work but may be needed if the defined work scope increases or changes. The material request should be flagged as contingent, and the Supply Chain organization needs to provide Work Management with the material availability, cost, and lead time to make a decision on whether to procure the material.

Rolling Quarterly Schedule: A predefined shell of work activities that repeat each quarter based on their frequency of quarterly or less. These work activities occur each quarter in the same time frame and are captured in a rolling schedule that forms the shell to which less frequent PMs, Corrective Maintenances, Deficient Maintenances, Other Maintenances, and projects are added to create a workweek schedule.

Scope Freeze: a predefined point in the process at which the scope is locked/frozen. Changes to the locked/frozen scope undergo a process that includes documentation and the required signatures needed to control the addition and deletion of scope from a given workweek.

Schedule Freeze: a predefined point in the process at which the schedule is locked/frozen. Changes to the locked/frozen schedule undergo a process that includes documentation and the required signatures needed to control the changes to the schedule for the workweek.

Compensatory Action: any additional actions taken that would not be performed if the equipment deficiency did not exist.

Contingency Action: an action required only if an initiating event occurs. Example: If an oil pump is supposed to start automatically but a deficiency exists that would disable the auto-start capability and require operator action to start the pump at the proper setpoint, the manual action to start the pump would be a contingency action.

Appendix E. D&D – Additional Consideration for WP&C

This appendix is a placeholder for WP&C additional considerations related to Operations. As this Guideline matures during future revisions, this appendix will be populated or eliminated.

This page is intentionally blank.

Appendix F. R&D – Additional consideration for WP&C

Acceptance Criteria

Where the customer has provided specific acceptance criteria, these need to be clearly understood as considered as part of the work planning process. Acceptance criteria may not be applicable for some R&D work. This is often the case for exploratory research, where the outcomes of the work cannot, and need not be precisely determined in advance. Some development projects are conducted as “best efforts” with prior understanding and agreement of the customer. On the other hand, large-scale R&D programs typically have project milestones that include specific acceptance criteria.

Planning Roundtable

Roundtables are often an efficient way to prepare the Planning Team for a hazards identification walk down. Examination of pictures, drawings, specifications, calculations, and the like can be a useful adjunct to a field walk down. However, roundtables are not a substitute for, and should not be used to circumvent the need for a walkdown when one is warranted. It may also be appropriate to combine a roundtable meeting with a walk down to ensure that the work plan is consistent with the work environment.

The R&D RM, in discussion with the SMEs, decides when to conduct roundtables to facilitate communication between WS/PIC, Work Planner, operations/facility personnel, system engineer (if one is assigned), SMEs, and the workers. The RM or Work Planner may determine that a roundtable review is not necessary, but this decision should be made in consultation with appropriate experts. For new or complex operations, or when significant changes in the scope of work or tasks have occurred, a roundtable should be considered essential. Especially when there are a large number of diverse hazards, or hazards that combine or interact, the roundtable review can help assure that all hazards have adequate controls and that the controls are compatible.

Work Instructions for R&D Operations

The term "work instructions" is not frequently encountered in R&D work environments. However, documents that prescribe specific details of how a task is to be accomplished are often used, and are sometimes required to be used by the customer or government agency sponsoring the work. While safety considerations may appear in such documents, the purpose of these documented work controls in many cases is not motivated by worker safety. The primary drivers may include other quality factors such as: product reliability, data integrity and reproducibility, comparability of experimental results, protection of expensive research equipment, and ensuring ethical research practices. Examples of these documents include:

- Protocols for experiments involving animal or human subjects;
- Contamination control protocols for clean rooms, analytical laboratories, or environmental sampling activities;

- Protocols for managing laboratory samples (collection, storage, archiving, etc.);
- Cleaning and packaging protocols for sensitive parts and components;
- Standard experimental methods to ensure reproducibility of experimental results and ability to compare results between different labs;
- Decontamination and sterilization protocols for biological labs (safety);
- Energy isolation procedures for complex equipment maintenance (safety);
- Laser alignment procedures (safety); and
- Instrument calibration procedures or use of internal calibration standards.

In some type of R&D work, it is adequate to adhere to commonly accepted work practices that are not documented. This is not to imply that the quality of results is unimportant for these R&D activities, but it recognizes that allowing variability between work evolutions is not expected to detrimentally affect the results or products in all situations. As described in other portions of this document, the ALWCD always identify when a written procedure is necessary, or is being relied upon to ensure safety. Procedures that include safety information should indicate precautions, pre-requisites, hold points, and verification steps in appropriate locations within the procedure. RMs should apply a graded approach to safety and quality to determine the level of documentation required.

Scheduling and Coordinating R&D Operations

The methods of scheduling work in R&D operations should be chosen to match the objectives to be achieved. Typically, the objectives of scheduling R&D work fall into three broad categories:

1. Allocating shared R&D resources,
2. Coordinating workflow between different R&D work groups, and
3. Coordinating R&D operations with service and maintenance activity.

Allocating Shared R&D Resources

When the cost of an R&D asset or facility exceeds the ability of an individual or single workgroup to “own” it outright, it is common in R&D activities for multiple researchers to request shared access to the resource. Therefore, analytical instruments, fume hoods or glove boxes, accelerator beam lines, large laser systems, and the like are typically allocated to users through a defined scheduling process. In the accelerator community, for example, this is commonly known as “applying for beam time.”

The objective of this scheduling category is equitable allocation of access to the resource by qualified users, based on defined criteria. The criteria applied to allocation decisions should consider:

- Importance of the work to accomplishing the overall mission of the organization,

- Availability of the requested resource,
- Availability of required staffing,
- Difficulty of set-up/tear down for requested equipment configurations,
- Impacts to personnel safety, and
- Impacts to equipment or facility safety or security.

Depending on the level of competition for the shared resource, the scheduling process may be informally decided among the users, or may use a highly formalized process decided by a committee. For example, a technician who shares a bead-blasting machine with several other technicians may simply call or email the others to secure a mutually agreed upon time slot that will be non-interfering. This informal method succeeds as long as the demand for the resource does not exceed the available shifts to use it. If the demand increases, it may then be necessary to change the process so that a supervisor or manager adjudicates the requests, considering some or all of the factors listed above.

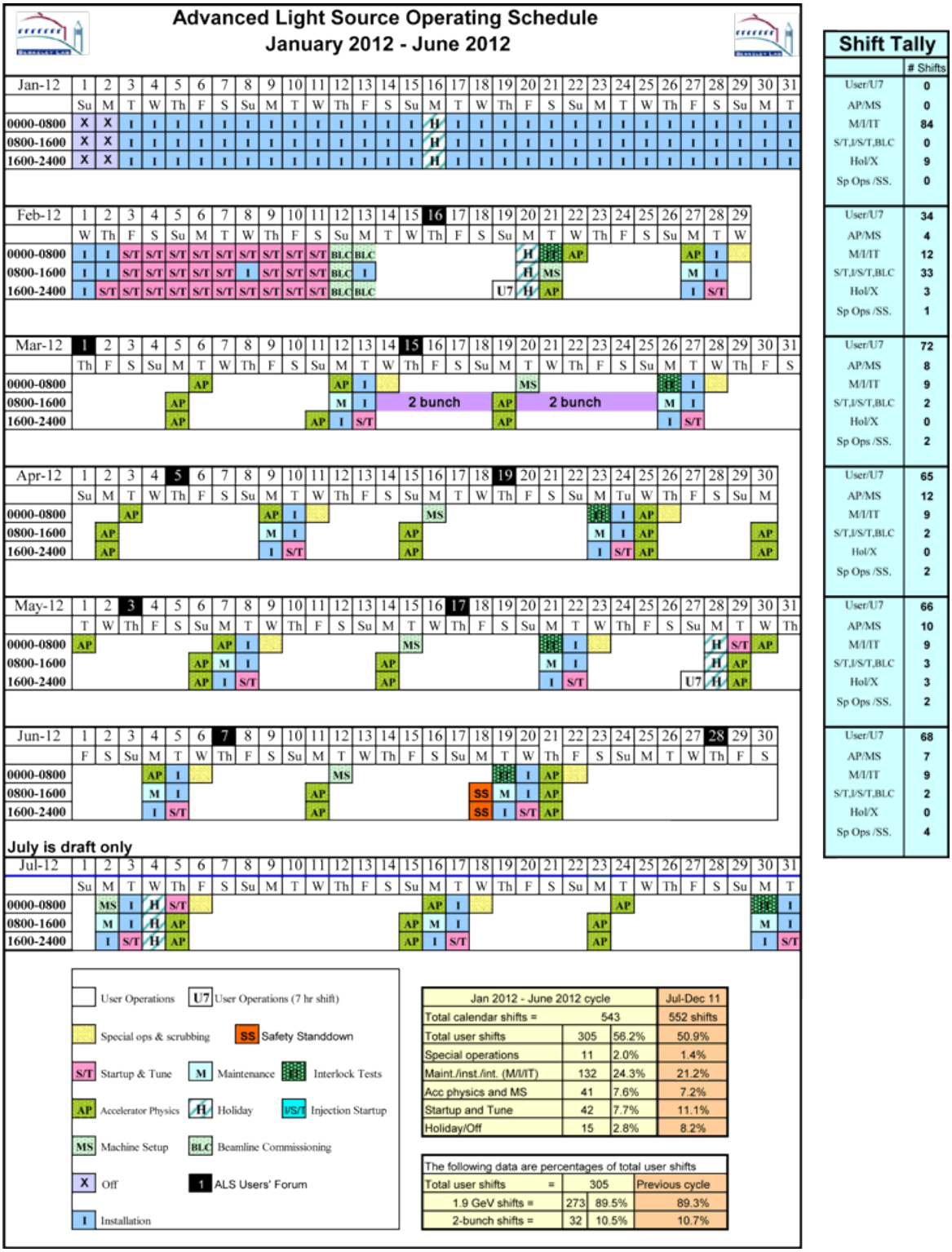
Accelerator beam time allocations are probably one of the most formal examples of this scheduling category (see Figure F-1). Formal experiment review boards typically decide beam time allocations, according to documented review criteria, and only the most technically sound proposals are accepted for scheduling. User schedules may be developed years in advance, sometimes even including experimental systems that do not yet physically exist. User schedules typically cover round-the-clock shift operations, and may require significant preparation on the users' part before arriving at the facility. Schedule delays introduced by the researchers often result in their forfeiting the allocated beam time.

The method used to schedule shared resources should be designed to optimize the utilization of the resource, and should be documented as necessary to ensure that all potential requestors understand the criteria applied to decide the resource allocations.

Coordinating Workflow between Different R&D Work Groups

In this category of scheduling, the objective is either to coordinate and sequence the efforts of dependent activities, or to coordinate independent activities so they do not interfere with each other. An example of a dependent R&D activity is sample preparation, which must be accomplished prior to sample analysis. Preparing samples for analysis is a separate and distinct activity, often performed by a specialized workgroup, which may take considerable time to accomplish depending on the materials, methods, and number of samples to be analyzed. Another example is the flow of parts through a machine shop operation. Various processing steps (such as machining, cleaning, heat treating, plating) are dependent on the preceding step, and each processing step needs to be performed in a particular sequence, often by different work groups in different work areas, to produce the desired product.

Figure F-1. Six-month operating schedule for the Lawrence Berkeley National Laboratory Advanced Light Source



A weekly POW meeting is the recommended method for gathering necessary input from representatives of each workgroup that will participate in achieving the end result. The scheduling process includes defined hand-off points, methods to indicate completion of the upstream workgroup's activity to the dependent workgroup, and methods to communicate schedule delays to any workgroup that may be impacted. A POD meeting or a daily pre-job brief (see Section 14.1) covers updates and changes made to the weekly schedule.

When different work groups conduct independent R&D activities within the same physical space, their activities may need to be coordinated and scheduled to avoid or minimize conflicts. Independent activities with little or no potential for conflicts do not require formal scheduling or coordination. The rigor and formality of the scheduling process used will depend on the potential for conflicts or incompatibilities between the independent activities. For example, a small chemistry or biology laboratory could be authorized for the use of flammable solvents, and also for operations involving open flames. These activities are obviously incompatible, and the ALWCD for the lab would be expected to contain mutually exclusive restrictions on the two operations. Small-scale activities conducted by independent workgroups within a single room, or within adjacent connecting rooms, can usually be a coordinated through the daily pre-job brief. The pre-job brief is an adequate method to communicate to workers the types and durations of task restrictions to be applied for the day, so they can minimize the impacts to their planned work. Supervisors should determine how to prioritize and schedule potentially conflicting tasks, how to positively determine when the potential conflict is eliminated, and how to communicate that task restrictions are no longer in force.

On a much larger scale, multiple independent activities could be conducted within a specialized facility, or at a large test site. Examples include Lawrence Livermore National Laboratory (LLNL's) High Explosives Application Facility or the National Nuclear Security Administration's NNSS. Facility-wide or site-wide formal scheduling and work release should be employed when individual activities have the potential to affect or disrupt a large number of other work activities. R&D operations at this scale typically have a medium range "look-ahead" schedule, a weekly (POW) schedule, a daily (POD) schedule, and mechanisms for timely communication of updates and status changes to released work. At this scale, it is usually advantageous to establish and staff a dedicated Work Control Center or Work Control Office to serve as a central coordination point for reviewing proposed activities and releasing them to be performed.

The excerpt included below is from LLNL's Site 300 Work Control Manual. It exemplifies a robust method for achieving large-scale integrated scheduling objectives. **Figure F-2 is from LLNL Site 300 Work Control Manual, Appendix A.**

> ***2.3 Operations Release***
>
> *Work is released by the WCO. The WCO verifies the following prior to releasing the work to be performed:*
>
> - *Scheduled work is consistent with the facility condition and safety basis configuration,*

- *Work is compatible with other scheduled work, and*
- *Emergent conditions or unexpected operations have not occurred that could potentially impact or are impacted by the scheduled work.*

If the verification indicates no conflicts, the RI is informed that work is released to proceed. If the verification finds a potential conflict, the WCO notifies the RI and the work is rescheduled or temporary restrictions, limits, or boundaries are put in effect. Work at Site 300 is identified and scheduled on the Site 300 Plan of the Day/Week (POD/POW) (Appendix A). Work in the General Services Area (GSA) that does not require an IWS will not be on the POD/POW, however, there may be special circumstances where support from Livermore needs to be on the POD (example – Computer Support doing work in the server room or working on switches).

Areas outside the GSA have special access requirements and safety considerations unique to Site 300. Therefore, all work outside of the GSA, including WAL A work (self-authorized and approved), must be scheduled and placed on the POD for release. When WAL A work is conducted outside the GSA, the work package must include controls for facility hazards and environmental aspects. This can be accomplished by developing an IWS, developing a work permit that discusses facility specific hazards, or conducting the WAL A work under escort of a Site 300 person covered by an IWS that address facility hazards.

2.3.1 Work Control Center

The Site 300 Work Control Center (WCC), where work packages are submitted for release, documentation of released work is retained, and service and support personnel may go to obtain status information on released work, is in Building 871. The Site 300 WCC is staffed continuously during normal hours of operation (7:00 a.m. to 5:30 p.m. Monday through Thursday). The following information will be posted in the hallway of Building 871:

- *The current POD/POW*
- *Emergent work*
- *WCC hours of operation*
- *Work release instructions*
- *List of Work Control Officers*

2.3.2 Scheduling Work

Developing a schedule for performing work is negotiated between the RI and the WCO during the work authorization and approval phase.

2.3.3 Plan of the Week Meeting

Typically, routine, authorized and approved work will be discussed at the POW meeting, held on Thursday mornings the week prior to the scheduled start of the work. At the POW meeting all work for the following week is reviewed and potential conflicts resolved. Following this meeting the Work Control Coordinator collects electronic input from each program and compiles the information into a spreadsheet that

ultimately becomes the Plan of the Day/Week for the following work week. This spreadsheet lists each activity as a separate entry, the work package identifier (IWS, PWS, etc.), RI, title of work, any restrictions, limits or boundaries, and scheduled work days for that activity. The POD/POW spreadsheet for the following work week is distributed via email before close of business each Thursday.

The POW meeting includes all Site 300 program facility managers, program and project RIs, other program leads and supervisors, ES&H Team 1, Site 300 Manager's administration staff, and other interested individuals.

2.3.4 WCO Evaluation for Work Release

The WCO verifies the following conditions prior to the release of a work package:

- *The work is consistent with the anticipated facility condition during the scheduled work window*
- *The work is consistent with the anticipated facility safety basis configuration during the scheduled work window*
- *Potential conflicts with previously released work have been resolved*
- *Any emergent conditions which have developed since the work was originally scheduled are acceptable*

If these conditions cannot be verified, the WCO contacts the RI to develop a new schedule or modify the restrictions, limits, or boundaries. If necessary, the scope of the work package will have to be modified and resubmitted for release.

Most work is released daily, however, some work that is routinely scheduled may be released on Monday for the entire week. Routine work approved to be released for the week includes:

- *Routine off-shift maintenance*
- *Routine operation of the water system*
- *Routine Protective Force patrols*
- *Routine Fire Department patrols and inspections*
- *Routine work in the GSA*

Some work packages are so complex that release of the entire package may not be possible. In such cases, the work package may be broken down by tasks or phases which will be released separately.

2.3.5 Documentation of Release

Documentation of work released is made with a signed, posted POD/POW spreadsheet releasing work for that day. The signed original spreadsheet is retained by the Work Control Coordinator as the Site 300 WCC logbook and is retained for a period of 12 months. Electronic copies are retained indefinitely on the Site 300 administrative server.

Each separately released activity has a separate entry in and contain the following information:

- *Unique work package identifier (IWS #, PWS #, Work Order Number, etc)*
- *Title of work*
- *Name of the RI*
- *Scheduled work days, including authorized, approved and released Friday and weekend work*

2.3.6 Plan of the Day (POD) Meetings - Notification to RI of Work Release

The notification of work release is made to the RI prior to or at the beginning of the first day of the work activity. This notification is made at the POD meeting. All RIs, or designees, and any other involved individuals attend the POD meeting, held each morning at 07:10 a.m. in Building 871 Fiddleneck Room. The notification includes the RI release verification method, schedule limits, and any other restrictions, limits, or boundaries imposed on the work activity not already documented in the work package.

At the POD meeting the spreadsheet is displayed on a projection screen and the Work Control Coordinator makes real-time changes. Work that is scheduled is marked with an "X" for each day and each scheduled activity is discussed and color-coded using a predetermined color-coding system:

- *Green - work that has been released*
- *Blue - previously released work that did not occur as planned or was postponed following release*
- *Purple - planned work that was either completed early or deferred prior to release*

In some instances work scheduled for a given day will require additional permit(s) (e.g., hot work permit, hazardous work permit, roof access permit, confined space permit, etc.) before work can commence. In these cases, the permit(s) required should indicate in the Restrictions/Boundaries, Limitations, Comments column of the Plan of Day in red font. The work itself will not be released at the POD meeting, and it's color-code will remain unchanged (white). Once the permit has been issued, the RI or designee contacts the Work Control Coordinator for emergent work release (see Section 2.3.7).

Any changes or corrections discussed in the POD meeting are captured and added to the spreadsheet. At the conclusion of the POD meeting, the Work Control Coordinator prints the WCC copy of the POD/POW spreadsheet and obtains signatures from the appropriate work release authorities. A signed copy is posted in Building 871 and electronic copies are distributed via email.

2.3.7 Emergent Work

Once the POD/POW has been issued, new work, identified as immediately necessary for that day, can be requested by the RI or designee as "emergent work." Emergent

work requests are submitted to the WCC by email (s300-wcc@llnl.gov) in the following format:

1. *Functional Area:*
2. *Building(s):*
3. *IWS/Responsible Individual:*
4. *Work Title/Description:*
5. *Additional Comments (if applicable):*

The Work Control Coordinator coordinates communications between the FPOC and the person requesting the emergent work. An appropriate work package, authorized and approved, is necessary prior to releasing emergent work. When emergent work packages and IWSs have been released, the WCO adds the activities to the appropriate daily release schedules.

Once the appropriate work package review and notifications have been made, the work is released and the Work Control Coordinator will add the new work to the POD/POW and distribute it as described above.

2.3.8 Daily Work Schedule Verification

The schedule of all work that has been authorized to be performed on a given day, is reviewed and the release status of each activity verified daily (excluding Fridays, weekends and holidays) by the WCO to ensure that emergent conditions or unexpected operations since the previous review have not altered the assumptions used to release the work activities. This review is completed by 07:30 a.m. each day. Review of work schedules for activities scheduled on weekends or on holidays may be performed in advance by the WCO.

If the daily schedule verification identifies a condition of work release for a particular activity to be modified or suspended, the WCO indicates in the daily verification documentation the modified conditions of release and the reason for the modification. Additionally, the WCO ascertains if the affected work activities are already in progress and notify the workers of the modified conditions. The WCO should also notify the RI of the affected work via email, phone, alpha page, room, equipment or facility postings, etc.

Documentation of the daily release status should be distributed by 08:00 a.m. by the Work Control Coordinator to all FPOCs and made available to RIs and workers by any of several methods including:

- *Electronic mail of the POD/POW to all site residents and other interested persons*
- *Obtained from the WCC staff during normal work hours*
- *Posted outside of the WCC and FPOC offices*
- *Contacting the FPOC*

Figure F-2. LLNL Site 300 Work Control Manual, Appendix A

Plan of the Week/Plan of the Day 6/1 to 6/5 2009

Functional Area	*Building*	*Authorized IWS/RI*	*Work Title/Description*	*Restrictions/Boundaries/Limitations/Comments*	*6/2*	*6/3*	*6/4*	*6/5*	*Weekend*
West Firing Area									
B-Program	851		Shot Schedule -Shot setup Mon. & Tues. Local Muster Wed. & Thurs.	See B-Program Plan of Week/Plan of Day for this facility. B Division will stand down shot if controlled burn is possible.	X	X	X	X	
Controlled Materials	854								
Physics & Life Sciences	855		Machining Explosives, on Contact	Work released by PLS (Hugh Gregg or Wally Klatt)	X	X	X	X	
East Firing Area									
B-Program	801		Shot Setup	See B-Program Plan of Week/Plan of Day for this facility.	X	X	X	X	
B-Program	812			See B-Program Plan of Week/Plan of Day for this facility.					
IFM	865		Berkeley Project		X				
Rifle/Pistol Range									
Security	899		Pistol Range Active		X	X	X	X	
EPD	899		Weekly Air Particulate Sampling	Range will be active, notify range master, contact S300 Manager Office that access has been granted and when work is completed.			X		
EPD	899		Bi-Weekly Air Tritium Sampling	Range will be active, notify range master, contact S300 Manager Office that access has been granted.					
Chemistry Area									
Physics & Life Sciences	825		HE Pressing	Work released by PLS (Hugh Gregg or Wally Klatt).	X				
MUSD - Water	Area								
NNSA/LSO	823		Radiological Assessment						
RHWM	816 (EWSF)		Inventory of Magazine						
Engineering Test Area									
Controlled Materials	832		Shipment B191	None	X	X	X	X	
DTED	836		Routine Electronics and Mechanical		X	X	X	X	
ERD	830,832,834		Daily Treatment Facility Inspections	B830, B832, B834, approx. 10 minutes each site.	X	X	X	X	
General Support Area									
Site Management	871		WIB Meeting Reinstated on Monday's at 8:30 (Bi-Weekly)		X				
RHWM	879		Pick Up/Drop Off Waste Drum		X				
ERD	GSA		Sampling and Water Level Team	GSA Area , Ballfields	X	X	X	X	

Coordinating R&D operations with service and maintenance activity

R&D lab operations occasionally need to interface and coordinate with service provider organizations. Service providers include both on-site resources, such as facility and infrastructure craft workers, and external vendors and suppliers for maintenance, repair, and calibration of programmatic instrumentation and equipment. All facility and infrastructure maintenance programs have among their primary objectives, ensuring continuously safe and compliant facility operations while minimizing facility outages and unavailability. Just as importantly, the safety of craft workers and facility residents must be assured through coordination and scheduling to manage the potential safety impacts of their respective activities.

For hazard-categorized facilities that have specified TSRs, permissible facility operations and facility operating modes are formally defined in the DSA. For such facilities, or in lower hazard facilities where excessive facility downtime represents an unacceptable impact to the organization's mission, a rigorous, risk-based approach to scheduling facility maintenance should be followed (refer to Appendix D.)

In other facilities however, where R&D operations do not involve hazards that have the potential to impact public health and safety, a graded approach to coordinating, scheduling, and releasing work can be applied. In these situations, formal facility operating modes need not be defined, and normal authorized R&D activities are scheduled as "ongoing". FMs plan and coordinate maintenance activities as exceptions to the normal R&D activity, and the day-to-day R&D work is defined as "released unless otherwise directed." The status of released work, and the schedule of upcoming maintenance activities, should be posted in a conspicuous location that is easily accessible to facility workers. A positive notification process should be developed to assure that any impacts to ongoing R&D operations are communicated with sufficient lead time so that impacts to the R&D work can be minimized. An actively maintained facility status board is an efficient method to achieve the necessary level of communication with facility residents

Pre-Job Brief

Typical R&D labs often involve individual workers performing routine tasks. In these situations, it is acceptable for the pre-job brief to be performed as a self-readiness check to verify:

- The task(s) to be performed.
- The hazards and the controls are as expected.
- The materials or equipment needed is available.
- No unanticipated conditions or operations that will conflict with the task(s).

If there is an unanticipated condition or conflict, the individual must advise the supervisor of the situation prior to starting the work to determine whether and how to proceed. A self-check should be conducted even where the work is repetitive or routine.

This page is intentionally blank.

Appendix G. Operations – Additional Consideration for WP&C

This appendix is a placeholder for WP&C additional considerations related to Operations. As the Guideline document matures during future revisions, this appendix will be populated or eliminated.

This page is intentionally blank.

Appendix H. Hazard Screening/SME Identification

This Appendix contains Tables H-1 and H-2 that are embedded into the document. To view or print entire documents you must double click on the respective table.

This page is intentionally blank.

Table H-1. Hazard Profile Screening Checklist (example from Idaho Cleanup Project)

This document is 24 pages. To access the full document double click on table below.

BLOCK A – ACTIVITY INFORMATION	
Activity Title:	Sequence of Job Steps (number each step):
Specific Work Location(s):	
Quality Level* (QL) ☐ QL-1 ☐ QL-2 ☐ QL-3 ☐ QL-4	
Safety Category: ☐ Safety Class ☐ Safety Significant ☐ Less Than Hazard Category 3 (LTHC3)	
Safety Category Designation / SSC Boundaries Comments: * MCP-540 provides directions for Quality Level Determinations.	

Table H-2. Activity/Hazard Inventory Checklist (example from Nevada Nuclear Security Site)

This document is 10 pages. To access the full document double click on table below. For an MSExcel writable version of this document contact the Nevada National Security Site Work Management Subgroup representative, Steele Coddington, at 702-295-6972.

NSTec Form FRM-2159

ACTIVITY/HAZARD INVENTORY CHECKLIST

09/27/11 Rev. 07 Page 1 of 10

Activity Level Work Document:		Revision No.:		Date:	
Team Member Names (please print)	Discipline	Employee Number	Indentify team member participation by entering walkdown (WD), table top (TT) or both (B)		
	Planner				
A. Planner must print the names of all SME's that participated in the tabletop/walkdown on the final AHIC or FRM-2163. B. Place an "X" in column B applicable to the scope of work. If more than one form is available, place an X in each row to include that form D. Grayed area marked "X" requires SME input and signature on work package (FRM-2163), electronically signed notation via the CMMS or documentation of review within Case History File for technical procedure	Hazardous Activity Applies to Work Scope	Applicable Company Documents (Click N Go)	Phone No.	Applicable Permits and Forms (Click N Go)	Comments
GENERAL INDUSTRIAL SAFETY					
Sampling work - by SME, Environmental, Rad, etc.			295-7400		
Falling Objects- overhead work or low overhead clearances		CD-P280.035	295-2743		
Activity generates flying chips, particles, dust that create eye hazards		CD-P280.034	295-0119		
Work on uneven surfaces or slip/trip hazards		CD-P280.001	295-0119		
Potential for items falling/rolling onto foot/legs (foot protection required)		CD-P280.001	295-1162		
Handling sharp, abrasive, hot objects requiring hand protection		CD-P280.034	295-1162		
Use of PPE or clothing (eye, head, foot protection, protective gloves, respirators, Anti-Cs, Tyvek suits)		CD-P280.034	295-4780		
Requires use of emergency showers or eyewash stations		CD-P280.001	295-6403		
Exposure to high winds or sudden thunderstorms		CD-P280.024	295-0119		
Work near or above protruding reinforcing steel, piping, or other materials that could result in impalement		CD-P280.035			
Using, handling, or storing compressed gases or compressed gas cylinders		CD-P280.044	295-6403		
Work over or near water where potential for drowning exists		CD-P280.001			
Hazards may be involved when the structures, systems, or components require documented post-maintenance testing before acceptance		CD-P280.001			
Repair or alteration of ASME-certified or non-standard pressure vessels		CD-2110.002	295-3833		
Work with cryogenic materials/gases		CD-P280.037	295-5111		
Work around flammable liquids		CD-P280.029			
Work with pyrophoric material		OP-2120.066			
Demolition work		CD-P280.032	295-7833		

(Reference: CCD-QA06.001-003)

Appendix I. Program Assessment Criteria Review and Approach Document

Criteria Review and Approach Document (CRAD) for Performing Assessments for the Activity Level Work Planning and Control (WP&C) Program

1. Process and Documentation

Objective: WP&C1-1

The Organization has developed and approved an effective WP&C process to enable safe and effective performance of work.

Criteria:

1. The WP&C manual/procedure(s) for (1) initiating, analyzing, planning, developing, and approving Activity-Level Work Control Documents (ALWCDs) and (2) authorizing, releasing, performing and completing level work activities are effectively developed with a clear logic driven basis. These manuals/procedures are approved and implemented.
2. The WP&C process effectively ensures different work management programs/processes used by different organizations at the site are designed for coordination with other site organizations, as appropriate.
3. The WP&C process establishes the level of review and approval for different types of work activities. The work type category and resultant documentation chosen is based upon the degree of risk determined by the frequency and complexity of the work activity and the hazards of the work and the environment.
4. The WP&C process effectively provides for identification, prioritization, and approval of work.
5. The WP&C process effectively provides for scheduling of work, planning of work, and approval of the resultant work document. Provisions require that workers are involved in job planning. Requirements for walkdowns and team approaches utilizing Work Planners, WSs, workers, and appropriate SMEs to participate in the development of the work control document are defined. Provisions require screening of the requested work against the existing safety envelope and/or permits.
6. The WP&C process effectively provides for assuring readiness for and performing work. Requirements for the use of effective pre-job briefings, post-job briefings, and the Stop Work process are defined. Provisions are included for turnover requirements when line management and/or first line supervisor responsibilities are transferred.
7. The WP&C process effectively ensures first line supervisors and workers follow work control document instructions as written. Provisions are established such that if they cannot perform the work as written, or if unexpected conditions arise, workers and supervisors take conservative actions to stop the work and follow the approved change control process to modify the work instructions. The bias is set on proving work activities are safe before proceeding, rather than proving them unsafe before halting.

8. The WP&C process effectively provides for ALWCD review and closeout.
9. The WP&C process includes provisions for active worker involvement in identification, planning and improvement of work and work practices and incorporation of lessons learned into active and in-development work control documents and/or the WP&C procedure.

Approach

Record Review:

- Review and evaluate organizational WP&C procedures for the implementation of all WP&C1-1 Criteria.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., Responsible Managers (RMs), project managers, Facility Managers (FMs), work control managers, etc.); and
- Work Planners.

Observations:

None

Objective: WP&C1-2

The Organization has developed and approved an effective WP&C process that adequately establishes and integrates hazard identification and analysis and control selection with the WP&C process.

Criteria:

1. The WP&C process describes the hazard identification and analysis process and its interface with the WP&C process.
2. The WP&C process effectively ensures appropriate personnel are involved in the hazard identification and analysis.
3. The WP&C process provides for the identification of job/task specific hazards and their associated controls. (Generic hazards that are already addressed by other programs dilute the effectiveness of the hazard analysis).
4. The WP&C process effectively ensures controls for each separate hazard are identified individually (i.e., the format of the hazard analysis provides the crosswalk of all controls to their respective hazards; a column of hazards and a column of controls is unsatisfactory).
5. The WP&C process effectively ensures hazards and controls from other safety program analyses (Documented Safety Analysis, As Low As Reasonably Achievable (ALARA) Job Review, Radiation Work Permit, Industrial Hygiene (IH) Exposure Assessment, etc.) have been considered and integrated into the hazard analysis, if appropriate.
6. The WP&C process effectively ensures “what if” scenarios are considered during the hazard identification and analysis process (e.g. walkdowns, roundtable, etc).
7. The WP&C process effectively ensures the chosen method of implementing the hazard control from the hazard identification and analysis into the work documents is appropriate. The stated hazard control in the hazard analysis may have several ways to implement the control into the work document, but the intent of the control is maintained.
8. The WP&C process effectively ensures that hazard control selection is based upon the following hierarchy: (1) hazard elimination or reduction, (2) engineered controls, (3) administrative controls, (4) personal protective equipment (PPE).
9. The WP&C process effectively ensures the control or level of control established for a hazard is maintained throughout the activity or until the hazard has been eliminated or reduced (controls can be graded to level of hazard reduction).
10. The WP&C process effectively ensures evaluation of the possibility of creating additional hazards due to selected controls (i.e., excessive PPE causing heat exhaustion) and the potential for negative synergistic effects of selected controls.

Approach

Record Review:

- Review organizational WP&C and hazard analysis procedures for the implementation of all WP&C1-2 Criteria:

Interviews:

Interview personnel responsible for implementing the WP&C and hazard identification and analysis process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., RMs, project managers, FMs, work control managers, etc.);
- Work Planners; and
- Subject Matter Experts (SMEs) (e.g., safety professionals, system engineers, etc.).

Observations:

None

Objective: WP&C1- 3

The Organization has developed and approved an effective WP&C process that enables safe and efficient completion of work activities by providing adequate and executable work documents:

Criteria:

1. The WP&C process effectively ensures the work scope and associated boundaries are clearly defined in work documents.
2. The WP&C process effectively ensures work control documents are written in a clear, concise, and worker friendly manner with properly sequenced work steps for tasks/activities.
3. The WP&C process effectively ensures work control documents incorporate technical and administrative requirements adequately (e.g., DSA, regulatory, consensus codes, etc.)
4. The WP&C process effectively ensures hazard controls identified in the Job Hazards Analysis (JHA) and other permits/analysis (e.g. Documented Safety Analysis, ALARA Job Review, Radiation Work Permit, IH Exposure Assessments, etc.) are incorporated into work control documents. Generic references to work permits, procedures, vendor manuals, etc. are not used unless the work instruction specifies how the next work step is to be performed in accordance with the stated document(i.e., in its entirety or a specified part of the referenced document.)
5. The WP&C process effectively ensures work document development procedures/processes require the following provisions:
    a) Warning (potential personnel hazards,) Caution (potential equipment or environmental damage,) and Note (supplemental information) statements for task specific hazards/controls are delineated immediately before the work control document step where the hazard is encountered and are highlighted (e.g. bolded, boxed, etc.) to emphasize their importance;
    b) Warnings, Cautions, and Notes statements do not direct actions;
    c) Hazards and controls associated with the entire activity are included in a Precautions and Limitations section;
    d) Hold Points and controls significant to safety are integrated into the work instructions;
    e) Adequate criteria regarding the use of “Not Applicable”;
    f) Adequate documentation regarding work status (i.e., work status log) including the nature of and response to unexpected conditions; and
    g) Adequate criteria regarding equipment restoration, Return to Service and Post Maintenance Testing so that there is confidence that design and safety functions will be adequately performed.

Approach

Record Review:

- Review organizational WP&C procedures for the implementation of all WP&C1-3 Criteria.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., RMs, project managers, FMs, work control managers, etc.) and
- Work Planners.

Observations:

None

2. Management and Organization, Roles, Responsibilities, Authorities, and Accountabilities **and Training and Qualification**

Objective: WP&C1-4

The Organization has established an effective management and organizational framework for (1) initiating, analyzing, planning, developing, and approving ALWCDs and (2) authorizing, releasing, and safely performing activity level work.

Criteria:

1. The WP&C process establishes line management responsibility for effective planning and safe performance of activity level work with clear unambiguous lines and levels of authority; clear roles, responsibilities, authorities, and accountabilities; and effective integration and coordination of organizational interfaces
2. The WP&C process requires other service providers (subcontractors, vendors, and tenants) to perform their work exclusively in accordance with the Organization's WP&C implementing procedures
3. The WP&C process effectively ensures Senior Management Review is established and designated for advisory review of selected work packages. Selection criteria for Senior Management Review are delineated.
4. The WP&C process effectively ensures Operations work control authorities are designated to review, authorize, and release all work control documents prior to commencement of work. The responsibilities and work release criteria are defined.
5. The WP&C process has established work planning/control requirements for all personnel performing, planning, and authorizing work at their site, including sub-contractors.
6. The WP&C process effectively identifies training and qualification requirements for first line supervisors, workers, SMEs, work control managers and work planners, and personnel who authorize and release activity level work. The WP&C process effectively ensures records that document the successful completion of the training and qualification of first line supervisors, workers, SMEs, work control managers and work planners, and personnel who authorize and release activity level work are retained and auditable.

Approach

Record Review:

Review organizational WP&C procedures for the implementation of all WP&C1-4 Criteria.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., RMs, project managers, FMs, training manager, work control managers, etc.).

Observations:

None

3. Feedback and Improvement

Objective: WP&C1-5

The Organization has an effective feedback and improvement process that fosters learning from both internal and external operating experience and continuous improvement for activity level work.

Criteria:

1. The WP&C process includes provisions for obtaining feedback during the execution of WP&C activities and incorporating associated improvement opportunities into active and in-development work control documents and/or the WP&C manual/procedure(s).
2. The contractor assurance system includes provisions for timely and effective management and independent assessment of the WP&C process, and of specific activity implementation of the process on a periodic basis by line and functional area. These include:
   a) Scheduled periodic reviews of active and in-development work control documents that are of sufficient scope, detail, and quantity that the Organization can ascertain the status of their WP&C process.
   b) Periodic surveillance by line managers, which include the observations of job walkdowns and JHA walkdowns/meetings, pre-evolution briefings, and work, performed to work documents.
   c) Periodic review by line managers of in-development and approved work control documents.
3. The WP&C process effectively ensures tracking and trending the results of assessment and oversight activities performed on their WP&C process against a set of performance measures and takes appropriate actions.
4. The WP&C process effectively ensures identifying, categorizing, prioritizing, tracking, correcting, and closing deficiencies identified during activity-level work activities and assessment of those.
5. The WP&C process effectively ensures learning from both internal and external operating experience sources.

Approach

Record Review:

Review organizational WP&C and feedback/lessons learned procedures for the implementation of all WP&C1-5 Criteria.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., RMs, project managers, FMs, work control managers, etc.);
- Work Planners; and
- SMEs (e.g., safety professionals, systems engineers, etc.).

Observations:

None

Appendix J. Implementation Assessment CRADS

Criteria Review and Approach Document (CRAD) for Performing Assessments of Activity Level Work Planning and Control (WP&C) Implementation Activities

1. Define Scope of Work

Objective: WP&C2-1

The scope of work is described in sufficient detail to allow the work planning process to identify hazards associated with the work and to develop necessary schedules, priorities, and work instructions.

Criteria:

1. The work to be accomplished, condition to be achieved, problem being corrected, and/or expected outcome is clearly documented.
2. The specific tasks necessary to accomplish the scope of work are identified and discernible.
3. Work scope boundaries/limits are clearly identified.
4. Conditions under which the work must be performed are clearly identified.
5. Systems, equipment, structures, components, and documents impacted/affected by the work are identified.
6. Applicable standards and requirements, DSA information (including Technical Safety Requirements [TSRs]), and design basis information (including manufacturer's recommendations) are identified and used during work planning.
7. Applicable prior work history information, including feedback and lessons learned information from previous or similar work is used during work planning.
8. Acceptance criteria are established for conclusively determining whether the work is accomplished successfully, and has not caused other problems or deficiencies.
9. Work planners understand and appreciate the need to define the work scope completely and accurately so that subsequent planning activities are effective in ensuring worker safety.

Approach

Record Review:

Review a sample of recent approved Activity-Level Work Control Documents (ALWCDs) for the implementation of all WP&C2-1 Criteria. The sample set should include a wide variety of ALWCDs representing the work performed by the organization being assessed.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., Responsible Managers (RMs), Project Managers, Facility Manager (FMs), Shift Operations Managers (SOMs), Shift Supervisors, Work Control Managers, etc.);
- Field Work Supervisors (WSs);
- Workers;
- Work Planners; and
- Subject Matter Experts (SMEs) involved in the process (e.g., safety professionals, radiological controls personnel, system engineers, etc.).

Observations:

Observe meetings and activities that demonstrate implementation of WP&C processes and evaluate adequacy of implementation. Meetings and activities to observe include:

- Work screening, validation, and prioritization;
- Plan of the Week (POW)/Plan of the Day (POD) meetings;
- Work Planner/Requestor scoping walkdown; and
- Planning Team meetings and walkdowns.

2. Identify and Analyze Hazards

Objective: WP&C2-2

All hazards that could potentially adversely impact workers, the public, the environment, the facility and its equipment are documented and analyzed for severity/significance.

Criteria:

1. Personnel involved in work planning activities have the appropriate technical and operational backgrounds and expertise given the work to be performed and the hazards associated with the work. SMEs and system engineers are used where appropriate.
2. Personnel involved in work planning activities have been trained in Integrated Safety Management (ISM) and the WP&C process, including the systematic identification and analysis of hazards, and understand how their roles and responsibilities contribute to ensuring the safe and reliable accomplishment of work.
3. The synergy/interaction of a team approach is used where appropriate to systematically identify and analyze the work hazards and their significance.
4. Workers are involved in hazard identification where possible.
5. Walkdowns are used where appropriate to identify hazards associated with both the work tasks and the work environment.
6. Over-reliance on automated Job Hazard Analysis (JHA) tools, permits, generic work documents, etc. is not used as a substitute for thorough hazard evaluation and analysis.
7. Hazard analysis considers "what if' scenarios and error-likely situations to determine if additional protective measures are appropriate.
8. The hazards, and their potential consequences to workers, the public, and the environment, for the scope of work being assessed have been adequately identified, quantified, and documented.
9. Work planning effectively coordinates work activities with those who may impact or be impacted by the work so that the combined effect of ongoing work activities is understood, and adverse or undesirable impacts from work activities are avoided.

Approach

Record Review:

Review a sample of recent approved ALWCDs for the implementation of all WP&C2-2 Criteria. The sample set should include a wide variety of ALWCDs representing the work performed by the organization being assessed.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Work Control Manager,
- Maintenance Manager,
- Field WSs,
- Workers,
- Work Planners, and
- SMEs involved in the process (e.g., safety professionals, radiological controls personnel, system engineers, etc.).

Observations:

Observe meetings and activities that demonstrate implementation of WP&C processes and evaluate adequacy of implementation. Meetings and activities to observe include Planning Team meetings and walkdowns/roundtables.

3. Implement Controls

Objective: WP&C2-3

Controls are implemented that effectively protect against identified hazards.

Criteria:

1. A hierarchy of controls methodology is employed that first seeks to eliminate the hazards, then to reduce the level of hazards, and finally to control the hazards - first through the use of engineered controls, then through administrative controls, and lastly through Personal Protective Equipment (PPE).
2. Appropriate controls are identified for all hazards associated with the work activity. Unnecessary controls are avoided.
3. Hazard controls are analyzed collectively to ensure selection of an optimum set that do not conflict with each other or introduce additional hazards.
4. The hazards and controls are clearly identified in the ALWCD.
5. Potential unwanted/undesirable impacts from the conduct of work activities (e.g., anticipated alarms, planned entry into TSR Required Actions, need for additional support, degraded or diminished safety or mission capability) are identified and addressed in the work document.
6. Hazard controls are adequately designed, implemented, and remain in effect as long as the hazards pose a health or safety threat.
7. Senior Management Review is effective in reviews of selected work.
8. Written work instructions include necessary prerequisites, precautions, limitations, features, controls, warnings, cautions, notes, hold points, independent verifications, notifications, announcements, etc. to ensure worker safety, protection of critical equipment, and continuity of operations.
9. Work instructions clearly define the work scope and boundaries, and are written in a clear, concise, and worker friendly manner with properly sequenced work steps and clearly identified hazard controls.

Approach

Record Review:

- Review a sample of recent approved ALWCDs for the implementation of all WP&C2-3 Criteria. The sample set should include a wide variety of ALWCDs representing the work performed by the organization being assessed.
- Senior Management Review Board charter/procedure and meeting minutes.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Work Control Manager,
- Maintenance Manager,
- Field WSs,
- Workers,
- Work Planners,
- SMEs involved in the process (e.g., safety professionals, radiological controls personnel, system engineers, etc.), and
- Senior Management Review Board members.

Observations:

Observe meetings and activities that demonstrate implementation of WP&C processes and evaluate adequacy of implementation. Meetings and activities to observe include:

- Planning Team meetings, walkdowns, and/or roundtables and
- Senior Management Review Board Meetings.

4. Perform Work Safely Within Controls

Objective: WP&C2-4

Work is conducted diligently in accordance with approved work instructions and within established controls.

Criteria:

1. Work is formally scheduled and integrated (e.g., POD/POW meetings) with a rigor that is consistent with the complexity and hazards of the work and other ongoing work activities, and is formally authorized and released to proceed by the responsible line manager.
2. Readiness to conduct work is confirmed, including verification that field conditions are as expected (i.e., have not changed since planning and hazards analysis activities, de-conflicting other work activities), and that tools, materials, parts, and support is ready and available.
3. Pre-job briefings are conducted to ensure that workers and first line supervisors adequately understand responsibilities, work procedures and instructions, hazards, controls, stop work authority and with opportunity for questions and feedback.
4. Workers are trained and qualified.
5. Workers and WSs understand ISM requirements and expectations, and their associated responsibilities, for ensuring that work is performed safely in the field/on the floor. Workers understand what to do if unexpected, unusual/abnormal or threatening conditions are encountered, and how to stop or pause work if necessary.
6. Workers strictly adhere to procedures, take appropriate actions in response to unexpected circumstances or conditions, and adequately document and record observations and actions, including as-found and as-left conditions, unexpected circumstances or conditions encountered (e.g., unplanned alarms, abnormal or unplanned equipment behavior or response, unexpected data or indications/display values, or other discrepancies) and actions taken, opportunities for improvement, and other feedback and lessons-learned information.
7. The acceptability of work products and outcomes is adequately documented and verified (e.g., post-work tests and inspections), and the work is formally accepted by the requestor/owner/user.
8. Work documents are closed out in a timely manner, including updates of affected documents (e.g., Master Equipment Lists, training materials, procedures, drawings, load lists, DSA and design basis documents).

Approach

Record Review:

Review a sample of recent approved ALWCDs for the implementation of all WP&C2-4 Criteria. The sample set should include a wide variety of ALWCDs representing the work performed by the organization being assessed.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Work Release Authority;
- Field WSs;
- Workers;
- SMEs involved in the process (e.g., safety professionals, radiological controls personnel, system engineers, etc.);
- Subcontractor Technical Representatives, if applicable; and
- Subcontractor management, first line supervisors, and workers, if applicable.

Observations:

Observe meetings and activities that demonstrate implementation of WP&C processes and evaluate adequacy of implementation. Meetings and activities to observe include:

- POW/POD meetings,
- Workability walkdowns,
- Selected work activities utilizing different types of ALWCDs,
- Pre-job briefings,
- Post-job Reviews, and
- Scheduling/integration meetings.

5. Feedback and Improvement

Objective: WP&C2-5

The WP&C process is routinely critiqued as part of doing work, and opportunities for improvement are adequately documented to allow for effective disposition by the feedback and improvement process.

Criteria:

1. Post-job reviews are conducted to obtain feedback, both good and bad, in order to make process improvements.
2. Feedback and lessons learned information is adequately documented (recorded in logs, databases, etc.), and forwarded to the Organization designated individuals and/or organizations for analysis and disposition.
3. Appropriate action is taken in response to feedback and lessons learned information, the rationale for the action taken is documented, and the action is discussed with the individuals that provided the information for closure.
4. The contractor has established and effectively implemented processes to identify issues, concerns and opportunities for improvement in the WP&C process.
5. The contractor has implemented comprehensive, structured processes to analyze, track, and trend issues/concerns, and to provide for timely and effective resolution of identified issues/concerns in the WP&C process.

Approach

Record Review:

- Review a sample of recent approved ALWCDs for the implementation of all WP&C2-5 Criteria. The sample set should include a wide variety of ALWCDs representing the work performed by the organization being assessed.
- Review documents associated with evaluating the WP&C process (e.g., assessment schedules, assessment and surveillance reports, performance metric summaries, corrective action tracking and closure documentation, issue tracking system entries, etc.) for the implementation of all WP&C2-5 Criteria
- Review the actions taken in response to feedback and lessons learned information for effectiveness in improving activity level WP&C processes and/or work performance, and if the rationale for the actions is documented and discussed with the individual(s) who provided the information for the implementation of all WP&C2-5 Criteria.

Interviews:

Interview personnel responsible for implementing the WP&C process to assess their understanding of the procedures and the underlying principles and requirements associated with this Objective. Personnel to interview include:

- Line management (e.g., RMs, project managers, FMs, SOMs, shift supervisors, work control managers, etc.);
- Field WSs;
- Workers;
- Work Planners;
- SMEs involved in the process (e.g., safety professionals, radiological controls personnel, system engineers, etc.); and
- Assurance System program owners (i.e., Assessment Director, Issues Management Lead, Environment, Safety, and Health (ES&H) Manager, Lessons Learned Lead, etc.)

Observations:

Observe meetings and activities that demonstrate implementation and assessment of WP&C processes. Meetings and activities to observe include:

- POW/POD meetings,
- Planning Team meetings and walkdowns,
- Selected work activities utilizing different types of ALWCDs,
- Pre-job briefings,
- Post-job reviews, and
- WP&C process assessment activities.