

Energy Facility Contractors Group (EFCOG) Task Subgroup Integrated Safety Management (ISM) Work Planning and Control Community of Practice

A Best Practice Guide to Establishing a Consistent Approach to Improve the First Pass Workability of Technical Work Documents (TWDs)

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Summary

This white paper identifies key areas of improvement, described as Implementation Areas in the Narrative section below. An organization can use these Implementation Areas to improve the workability of their technical work documents (TWDs). In development of this paper, focus was placed on ensuring the TWDs remain compliant to their respective requirements. This approach supports the Integrated Safety Management (ISM) process and strengthens organizations' use of feedback and improvement processes. The goal of this document was not only to improve the workability of TWDs but also to improve the first-pass success of using the documents by fully utilizing Department of Energy (DOE) DOE-HDBK-1211-2014, *Activity-Level Work Planning and Control Implementation*, and best-practice experience from around the complex. Multiple sites and labs participated in a team approach to find where possible areas of improvement could be realized. Details of the Implementation Areas follow in this report; each area can be used alone or in conjunction with other areas to make improvements across an institution or at an individual facility.

Purpose

The purpose of this document was, through collaboration across the complex, to produce solutions to an efficiency problem with the execution of work documents, primarily for corrective maintenance (on both programmatic and real property) and modification work (often in construction or projects).

Scope/Background

The need to improve efficiency and workability of TWDs was identified by Energy Facility Contractors Group (EFCOG) leadership based on feedback from multiple sites experiencing delays to execution once the work had been authorized and often released. The recommendation herein includes removal of non-value-added documents; duplicates and layers of requirements; and instructions and information that are not needed for either audit purposes, hazard mitigation, or other purposes, because these elements decrease readability of TWDs and make it less likely for them to be executed successfully the first time they are performed. The scope of this effort was confined to TWDs; however, by employing these recommendations, further efficiencies can be realized with intentional prioritization, scheduling/integration, work grouping, and overall Integrated Work Management.

Definitions

<u>Risk</u>: 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 this white paper, risk is determined by the frequency and complexity of the work activity as well as the hazards of the work and the environment.

<u>Skill of the Worker (SOW)</u>: The basic discipline-specific competencies defined by the contractor organization for each worker, which includes required proficiency, experience, knowledge, skill, and ability. Competencies are obtained through approved methods such as accepted training, qualification, certification, education, and experience. Encompasses skill of the craft (SOC).



<u>Technical Work Document (TWD)</u>: A generic term used to identify formally approved documents that direct work, such as procedures, work packages, or job or research plans.

<u>Workable</u>: Capable of being worked. Capable of producing the desired effect or result; practicable; feasible.

<u>Workability</u>: The ease with which something can be worked or fashioned. The quality of being workable; having practical capacity to succeed.

Narrative

Nuclear Facilities

TWDs that direct work in a nuclear facility should include reviews for Operational and Technical Safety Requirement (TSR) impacts as well as impacts to items contained in the Safety Analysis Report (SAR). This information should be obtained during the work planning phase and is typically provided by Nuclear Safety, Operations, and Engineering. The impacts should be validated during the work window/work management process with a final validation at the point of work authorization. TWDs should provide specific instructions, not simply instructing the worker to "contact Shift Operations Manager (SOM) for necessary information." This helps to prevent the work from being delayed due to operational impacts or causing a reportable event. It also protects the SOM from being a single point of failure.

Training and Qualification

Work control overview training should be considered by all sites/labs for their entire operations and maintenance staff to familiarize personnel of the process. As part of an overall qualification program, work control planners should be trained on technical procedure writing to ensure consistent, clear, and concise work instructions are written with adequate detail to accomplish the work and without room for interpretation errors that could lead or allow workers to deviate from the scope of the reviewed and approved work.

- Consider requiring planners to attend technical writing training.
- Consider having planners complete Procedure Professionals Association (PPA) or equivalent training/certification.
 - NOTE: DOE-STD-1029-92 Chg Notice 1, <u>Writer's Guide for Technical</u> <u>Procedures</u>, has been archived. Based on discussions with DOE field element personnel and contractors, the Office of Nuclear Safety concluded that the purpose of DOE-STD-1029-1992 is adequately fulfilled by the PPA Voluntary Consensus Standards <u>PPA AP-907-005, Revision 2</u>, *Procedure Writers' Manual*, (June 2016) and <u>PPA AP-907-001, Revision 2</u>, *Procedure Process Description*, (June 2016). These consensus standards were developed with DOE participation, and several field elements currently use them.
- Consider requiring planners to have training on hazard analysis (HA), in both its practical application and in the use of a site/laboratory HA tool.
- Consider having planners and workers attend Human Performance Improvement (HPI) Factors training.
- Consider including Conduct of Operations overview training tailored to the planning and execution functions.



- Consider including facility systems training tailored for the planning and execution functions.
- Consider (particularly in hiring practices) that hands-on experience is difficult to train but is invaluable when selecting planners, whereas, work control procedures and necessary computer skills are more easily trained. A planning staff should include personnel from the spectrum of craft disciplines served.

Work control planner qualification should include a period of ghost-writing under the instruction of an experienced and fully-qualified peer. Planner qualification should also include a manager's review of completed work and conduct of a final interview.

Management

Management should periodically review work to ensure the standards are being met. Management should also observe work package development, using this time to set expectations and provide coaching. Management should develop Performance Indicators to trend work package quality and workability. For instance, the number of work packages that are returned after approval or required field revisions could be used.

Managers of work control planners should consider:

- Developing standard activity planning and scoping checklists to assist planners as they develop TWDs.
- Periodic review, assessment, and feedback to work control planners on the quality and workability of completed TWDs.
- Fundamentally the user is the customer. The customer will determine the workability of a TWD. Does the TWD provide enough information in a manner that results in successfully performing the task?

Technology

The use of emerging technology, such as artificial intelligence (AI) used at Argonne and soon to be at Fermi and Los Alamos National Laboratories, should be considered for mining the operating experience (OPEX) database for relevant lessons learned. Technological advances should be utilized to bring uniformity to work control products. Information gathered from sources such as AI can be incorporated into the work documents and the work authorization processes to identify potentially unworkable conditions before they occur.

Electronic work packages can drive consistency, protect work records and provide multiple benefits, such as the ability to obtain references easily by using hyperlinks, and the ability to embed videos and pictures. Illustrations, photos, drawings, reference material and other job aids can be incorporated (as allowed) to provide necessary references, using a graded approach based on complexity of the task.

Difficulty with connectivity and reading screen outdoors or use within controlled areas must be considered when employing new technology. Generational diversity should also be considered, with to goal of making tools more efficient and user friendly and improve receptivity to their use.

Video capture of the performance of an activity or YouTube[™] (demonstrating how to do this task) can be used during the planning or linked to the document when/if possible. Organizations should consider producing videos of work performance that can be used as training, pre-job



briefing material, and/or for reference for similar activities. This is particularly beneficial for training newer technicians and craft performing the evolutions and for infrequent evolutions, providing evidence of how the job was accomplished. These videos should become part of a video library for future work.

Professional Development and Continuous Improvement

Coaching and mentoring employees from independent and experienced people should be implemented by each group's division office and may be part of evaluations during internal assessments. A focus on the First Line Managers (FLMs) and Persons in Charge (PICs) is prudent. FLMs and PICs are the interface between the hands-on worker and management and often receive training but seldom the coaching/mentoring during the actual implementation of leadership principles. Independent coaches/mentors with actual leadership experience in the nuclear field can be invaluable, providing perspectives that are not biased by institutional knowledge and day-to-day facility demands. They can also provide guidance to workers, planners, and mid-level management at the same time. Coaching and mentoring while work is being performed can identify other areas that a particular Work Planning and Control organization can use to make improvements to first pass success of TWDs.

Work control procedures and planner guides should consider employing peer verification of TWDs based upon the graded approach to ensure quality and consistency.

Workers should be encouraged to provide feedback for improving TWDs. Work Control Planners should review work package execution and speak with Workers to get feedback on use of their products. Processes should be implemented to provide a user-friendly means of providing and dispositioning worker feedback. Managers should assess these processes and the results of the feedback provided.

TWD reviewers should be identified based on their respective value added to the activity. Hazard mitigation and the associated controls, quality, facility operations and meeting various technical requirements are all necessary and should be considered for each activity. Reviewers must remember that the worker is the user and primary customer of the document. Adequate time must be allowed for value-added reviews.

HPI tools are described throughout this paper. HPI guidance documents should be used during the TWD development and use of the tools should be directed by written instructions. Use of HPI tools not only will improve protection of the worker but also will help protect the facility operational status from human error.

Conclusion

The following Implementation Areas (Attachments 1-7) constitute focus areas that should be tailored to a site/labs implementing procedures to make improvements, with the Narrative information employed as a predecessor to these activities. The Implementation Areas contain significant additional information that can be used in their entirety or individually after being tailored to the tools available and facility conditions. Senior management must show their support for efficient work and set the expectation for safe performance of work.



Attachments

- 1. Implementation Area 1 Eliminating excessive information
- 2. Implementation Area 2 Defining the Scope
- 3. Implementation Area 3 Effective Use of the Graded Approach
- 4. Implementation Area 4 Hazard Analysis
- 5. Implementation Area 5 Workability Walkdown
- 6. Implementation Area 6 Feedback and Improvement
- 7. Implementation Area 7 Design Document Quality

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Attachment 1, Implementation Area 1 – Eliminating Excessive Information

Work control documents should include the information necessary to perform the work safely and produce an auditable record. Additional information added by planners and subject matter experts (SMEs) should be avoided when it does not add value for the performer of the work document. Concise work documents are preferred.

The level of detail provided in the work instructions should result in a high probability that the job will be successfully completed. The preparer shall consider the significance of the work, personnel and nuclear safety risk, skill of the worker, experience of the work performers, complexity of the work, then adjust the instruction level of detail accordingly, ensuring that instructions fully and accurately address the scope of the work to be performed, identify the hazards associated with the job, and define the controls necessary to prevent accidents, injuries, and property damage. (See also Attachment 3, Graded Approach)

The precautions and limitations (P&L) section of work instructions should not contain generic or boilerplate statements that are included in most packages of a facility. Work instructions should also not contain P&L that pertain only to a specific section or step of the work instructions. When there are P&L that apply only to a section or step of the work instructions, the text should be placed as Notes, Cautions, or Warnings preceding the applicable section or step. Precautions should not repeat general "conditions of employment" type requirements, such as "follow the safety manual" or "ensure lockouts are performed per procedure" or statements such as "be careful," etc.

When ancillary information is added to a document to facilitate SME reviews, the process should support that the additional information be segregated or removed if it does not add value to the execution of the document.

General reference to procedures and vendor manuals should not be used unless the work instruction specifies how the next work step is to be performed in accordance with the stated document (i.e., the specific steps of the document or in its entirety). Excessive forms, procedures, vendor manuals, etc. through which the performer must sift should be avoided. Workers should not be expected to find this information elsewhere or to obtain necessary information from other sources.

Two sites (Central Plateau Cleanup Company and Savanna River Site) have focused, with success, on efforts to remove excess/non-value-added information from their TWDs to increase efficiency. This effort requires forming a team to review the current template(s) for TWDs line by line and determine the value of each line. This information can be used to show where potentially boilerplate-type material is described and, therefore, why it is not needed in every document. Efficiency gains and improved ease of use have been realized.

Issue management and/or contractor assurance programs should not default to adding controls to work packages/TWDs to correct performers' behaviors or noncompliance issues in place of worker/program accountability. The root cause of TWD performance failure should be determined and corrected, instead of adding controls to a TWD that may not have been originally insufficient. When controls are added to a TWD, they should be identified as such to ensure they apply to a specific work scope and are not removed if deemed appropriate.



Sites/labs should consider as part of their continuing training program a yearly review of work instructions (including P&L) to maintain this standard and provide documentation of the expectation of what is and what is not to be included in work instructions.



Attachment 2, Implementation Area 2 – Defining Scope

The scope section of work packages provides space for the planner to write a description of the job, including a statement of who, what, where, and why. It should include sufficient detail to enable the worker performing the job and the reviewers analyzing the hazards and determining technical requirements to perform their functions and understand their respective requirements. Consider including, if they add value in the work instructions:

- The symptoms of the problem to be corrected, as applicable.
- The boundaries/limitations of the work to be performed.
- Unique numbers or identifiers to ensure that the work is clearly identified, including building, room, location, and equipment numbers where applicable.
- Systems or processes affected by the work.
- A picture of the work area, if available and permissible.
- An expected outcome of the TWD completion.

A job scoping and a hazard evaluation walkdown utilizing a graded approach should be performed as defined by facility risk evaluations. For example, if repetitive work is to be performed and the work history does not indicate any delays or upsets with the previous performance, a walkdown may add little value while consuming the planner's time. Conversely, for first-time or infrequently performed activities, higher-hazard activities, and when changing condition(s) warrant, a walkdown should be performed to ensure thorough planning and review is accomplished, including verification that the as-found conditions in the field match the design documentation.

Walkdown checklists should be considered to ensure consistency in review of the worksite and hazards. Checklists should stimulate critical thinking and not be a substitute for it. Team walkdowns and planning should always be used for critical, complex, and high hazard work. Teams should include workers of the job or equivalent peers as well as the applicable SMEs. It has proven beneficial to schedule walkdowns early to ensure participation or resources for these types of evolutions. A team approach should be used whenever necessary and possible to gain the benefit of thought-provoking dialogue.

When writing work instructions, planners should ensure they do not contain ambiguous words that could be construed to allow exceeding the scope of work. For instance, words and phrases such as "as needed" or "associated" are often subjectively viewed as allowances to exceed scope. Content of work instructions is critical; instructions should be written in a manner that each step has a particular deliverable that is satisfied by the place keeping method used. Scope of work, identification of hazards, and the expected outcome of the TWD should be definitive so that the workers are not expected to assume risk beyond their functions.

Wherever less detail is included in TWD instructions, the scope of work statement must be increasingly more definitive to establish appropriate boundaries. Special effort should be made to avoid the phrase "troubleshoot and repair." Model work orders that are bounding in scope with a clear end state can be planned and sent to the field quickly. Troubleshooting procedures prohibiting unauthorized modifications are also an option. At no time should the field workers be assumed to define the boundaries and limitations themselves to remove responsibility of the preparer in defining in the work.



Attachment 3, Implementation Area 3 – Effective Use of the Graded Approach

Skill of the worker (SOW) competencies should be considered in determining the level of detail in work documents to appropriately control work activities and ensure expected results. Work that has any complexity or could impact structures, systems or components (SSCs) if it potentially fails should not rely solely of the SOW. However, for simple work, an overuse of planning resources places undue demand on them and may create complex work documents not needed for the task.

Fully utilizing a "quick fix," "minor maintenance," or "fix-it-now" protocol will free up planning and reviewing resources to concentrate on complex, less frequently performed and higher hazard work and streamline the production schedule. One successful approach consists of a dedicated team staffed with a mix of resources that can effectively assemble the minor permitting and parts and execute the work activities in the field. This method has been used with success at the Savannah River Mission Completion site. However, a process that allows all work groups to perform minor maintenance within their scope of responsibility can be successful too.

Another approach used successfully is to clearly identify the tasks that can be done under SOW after ISM principles are applied to the identified tasks. A qualification card and training module of the defined tasks could then be used to enable workers to perform without work instructions for the clear, defined scope of work tasks.



Attachment 4, Implementation Area 4 – Hazard Analysis

All sites/labs will define the hazard analysis (HA) process for identifying and analyzing hazards and specifying the controls for hazards. The HA process should differentiate between general facility/site, activity-level, and job-specific hazards. The process provides a methodology to document the identified hazards and integrate permit requirements. The necessary controls should be arranged in a manner to precede the workers exposure and be specific to the respective, identified hazards. Each identified hazard must be controlled or mitigated. This approach should be easily discernable to the worker, so they have a clear understanding and can better comply with the controls.

Planners, supervisors, and workers/craft should be trained on HA and any HA tools of the site/lab. For example, Savannah River Site uses an Individual Hazard Analysis (IHA) tool that includes training on basic hazard controls. Planners, supervisors, and workers/craft should also be trained in hazard identification and in leading/participating in HA walkdowns and determinations as defined by each site/lab.

Tools should be in place to account for co-located hazards or any hazards that could arise between the workability walkdown and field execution. For example, Argonne uses a tool call a Memory Card to prompt this review.

Practices of using boilerplate hazard controls not tailored to the work must be avoided. These often add confusing text with no value to a document through which the worker must sift to find task-specific hazard information and controls. This creates a mindset that TWDs are generic and, subsequently, the performance may become generic as well.



Attachment 5, Implementation Area 5 – Workability Walkdown

For complex, infrequently performed, or high-hazard work where errors cannot be tolerated, a workability walkdown should be performed. The implementing group reviews the approved TWD (including permits, where possible), verifying it can be worked as planned, parts are available, and the work site can accommodate the planned activity. This is sometimes called a "task ready" walkdown. This is not to be considered a re-planning meeting, but rather a final verification that readiness to work has been achieved. Any changes in scope or methodology would proceed through the applicable revision process. This approach has been used successfully at the Los Alamos National Laboratory for critical work where work is not allowed on the "locked in" schedule without concurrence that it can be worked as-written with the parts available.

During this workability walkdown, a focus should be placed on verifying facility, equipment, and process risk will not be assumed by the workers. Decisions made at the time of work execution should be solely discipline-dependent, with the graded approach being utilized prior to this point, not applied by the performer of the document.



Attachment 6, Implementation Area 6 – Feedback and Improvement

Feedback on TWDs should be obtained via multiple avenues. A thorough work week assessment should be performed to find out what jobs were performed as planned and what work documents were not completed during the week. Corrective actions should be developed for any areas of improvement in the site/labs Issue Management program.

Feedback should also be obtained on individual work packages. During the closeout process, improvement recommendations should be solicited from all participants. Completed TWDs should be reviewed, including worklog/logbook entries and work instruction revisions, to ensure corrections are captured on any repeatable activities and for applicability to impending work. This review should be performed using a graded approach, where complex/high-hazard work is reviewed every time. Post-job reviews are a good tool for capturing lessons learned. Although complex or high-hazard work may yield more lessons learned because of their infrequent nature, routine work activities may also be included.

Some examples of good feedback loops include:

- Savannah River Site, where workers are encouraged to provide feedback directly to the planner via the Computerized Maintenance Management System (CMMS). Planner disposition of the comment is sent directly back to the worker via email.
- Nevada Test Site, where each work order is reviewed upon completion for changes. A performance indicator is formed to track and trend then to act upon issues as they are identified.
- Oak Ridge High Flux Isotope Reactor (HFIR), where each work package contains a feedback form for capturing improvement ideas as well as the names of personnel performing the work activity. During closeout, feedback is verified captured in CMMS, and an email is sent to the team informing them their feedback was received and is being evaluated.

For repetitive maintenance activities, it is recommended the planner review the past performance of the TWD during the planning phase to ensure captured feedback is implemented.

Work package quality should be built into a facility's annual assessment plan. A cross-functional assessment team should review a variety of documents with a focus on quality and compliance. This review should include completed and in-process work packages. Corrective actions should be developed for any areas of improvement in the site/labs Issue Management program.



Attachment 7, Implementation Area 7 – Design Document Quality

The quality of design documents (both existing baseline drawings and new design documents) is often cited as a source of delays. The following areas should be assessed and corrected for each facility.

- The amount of time it takes to incorporate changes into baseline technical drawings should not be excessive. Time spent reviewing unincorporated drawing changes that are field-installed creates a latent organizational weakness.
- Special attention should be given to aged facilities where baseline documents may not be legible or current. Compensatory measures should be implemented, such as additional engineering support during walkdowns, with an effort to update inaccurate drawings.
- Documenting changes that exist that were not incorporated via design change process (nonconformance reports).
- Quality of the design documents to be implemented often do not contain sufficient information on account of changes made during project execution. This slows the execution phase by requiring additional design work, work package revision, and procurements. Time spent on validating existing field conditions, as-built drawings, and workability/maintainability reviews should be thoroughly utilized.
- Planning "at risk" with incomplete (not-yet-approved) design documents for project schedule benefits brings planning delays, risk, and human performance challenges. When this is done for business needs, time needs to be scheduled for the planning group to validate final design documents and procurements against the planned work. At no time should the implementing document be approved without approved design documents.

