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# TAILORING FOR INTEGRATED SAFETY MANAGEMENT APPLICATIONS

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# CONTENTS



**ATTACHMENTS**



## List of Figures



## List of Tables

# TAILORING FOR INTEGRATED SAFETY MANAGEMENT APPLICATIONS

## I. INTRODUCTION

The Department of Energy (DOE) Integrated Safety Management (ISM) system must support many different kinds of work, from the operation of nuclear and non-nuclear facilities to laboratory experimentation to environmental restoration activities. To accomplish the work safely, and to protect workers, the public, and the environment, the system must function to identify and control all types of hazards, from commonly encountered workplace hazards to rare or one-of-a kind process hazards, in existing, newly designed, and old, nonoperating facilities. The system must also function to deal flexibly with the uncertainties associated with natural phenomena, uncharacterized wastes, and experiments involving emergent technologies as well as those associated with new missions and new designs. Further, the system must be able to accommodate existing methods, processes, and infrastructures from a variety of domains within and outside of DOE, including standards/requirements identification documents (SRIDs), nuclear safety Authorization Bases (based on safety analysis reports, technical safety requirements, and unreviewed safety questions), Occupational Safety and Health Administration (OSHA) process safety management programs, and Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA/Superfund) requirements.

Within safety mandates, and considering budget and resource limitations, the management system must also function cost effectively. It must enable tailoring of levels of effort so that hazards are identified and controlled, yet work is not burdened with inflexible, prescriptive management that needlessly inflates costs, does not enhance safety, but constrains work performance. Thus, tailoring within work management functions (planning work, analyzing hazards, establishing controls, performing work, assessing work and providing feedback) should enable work to be managed at the appropriate levels, so that operational design and systems' requirements imposed at each level will not unnecessarily constrain management decisions at lower levels where more detailed information on work and hazards is available. In effect, work management systems function to optimize work planning and work performance to enable those closest to the work—those who perform the work and those who manage or supervise it—to actually plan it, and to take responsibility for it, as well.

The purposes of this report are to illustrate how tailoring work management functions facilitate the safe and effective accomplishment of work (including design), and to demonstrate that tailoring is integral to the ISM system.

Within the five work management functions of the ISM system, standards play a vital role. Likewise, the proper application of tailoring is directly linked to the use of standards within the context of this report. The term "standards" is intended to have broad meaning.

*"Standards are the expressed expectation for performance of work. Standards may be reference points against which to measure excellence or may become enforceable requirements (either under law or under Department contract). Standards include: Federal, state, and local laws and regulations; Department Orders; nationally and internationally recognized standards; and other documents (such as industrial standards) that protect the environment and the safety and health of our workers and the public. Documented standards are an accepted way of communicating to our workers and the public the performance we expect in our daily operations. They are supportive of work, not barriers or extra burdens." (Criteria for the Department's Standards Program, [DOE/EH/-0416], Office of Environment, Safety and Health, United States Department of Energy, August 1994)*

## II. TAILORING

Tailoring is planning and applying work management functions to accomplish the work at hand within the established contract and project agreements. It ensures adequate protection for workers, the public, and the environment and optimizes the use of available resources.

Tailoring means arriving at a proper fit. Applied to the five work management functions (see Figure 1), it creates a work management system that handles all types of work and that runs efficiently, effectively, and seamlessly. Applied to hazards analysis, it includes selecting hazards analysis teams that are familiar with the work and the hazards, selecting appropriate hazards analysis methods (see Attachment A), and assuring a robust analysis. Applied to controls, it is selecting controls that fit the work and the hazards. Thus, tailoring implies attaining defined expectations and needs.

Tailoring allows choices to be made from among a variety of engineering and administrative controls that provide reasonable assurance that workers, the public, and the environment are adequately protected during the performance of work. Moreover, tailoring can work both "top-down" and "bottom-up." As a flow-down approach, tailoring of higher-level agreements, contractual and project agreements between DOE and its contractors, enables contractors to establish general standards for work that encompass pertinent statutory and regulatory requirements and reflect DOE missions and resources. As a flow-up approach, individual tasks are tailored so that each task has controls that fit the specific work and the hazards associated with it and that are consistent with higher-level performance expectations. Many work controls are derived from regulatory requirements; some have no regulatory basis but can be derived from consensus standards or industry best practices; and some must be developed *ad hoc* to fit the work.

Thus, tailoring is essentially a systems adaptation that operates at all levels and on all functions of work planning and performance. It encompasses the three functions of work planning (design work, analyze hazards, establish controls) and the two functions of work implementation (perform work, assess and feedback) shown in Figure 1, and occurs at all levels of work management, as shown in Figure 2. Tailoring is dynamic and continuous and presumes that work functions are continuously monitored and adjusted to meet changing mission, socio-political, regulatory requirements, and changing work conditions.

Work planning and work management operate within, across, and at the interfaces of management levels. Detailed work planning is done and specific work controls are developed at levels where detailed information on the work and the hazards is available. Managers at higher levels are careful to impose standards that guide the work but do not overly constrain the work at the levels where it is done. So, for example, "generic" requirements for personal protective equipment (PPE) or other worker protection flow down from a project manager to a supervisor or activity manager, based on the presence of radiological or industrial hygiene hazards in the work. The worker(s) and their supervisor, assisted by an occupational safety and health (OSH) professional or a multi-disciplinary team, as needed, together determine what particular PPE the workers will wear, and/or what other protection will be needed, to satisfy both safety requirements and safety needs, during the various steps of the work where hazards are extant. Thus, standards flow down, without inappropriate constraints on implementation or performance, to the lowest appropriate level. Responsibility for compliance also resides at that level. Similarly, needs defined by workers flow up to supervisors and then to managers to help them identify and assign resources and manage interfaces with other activities and programs.

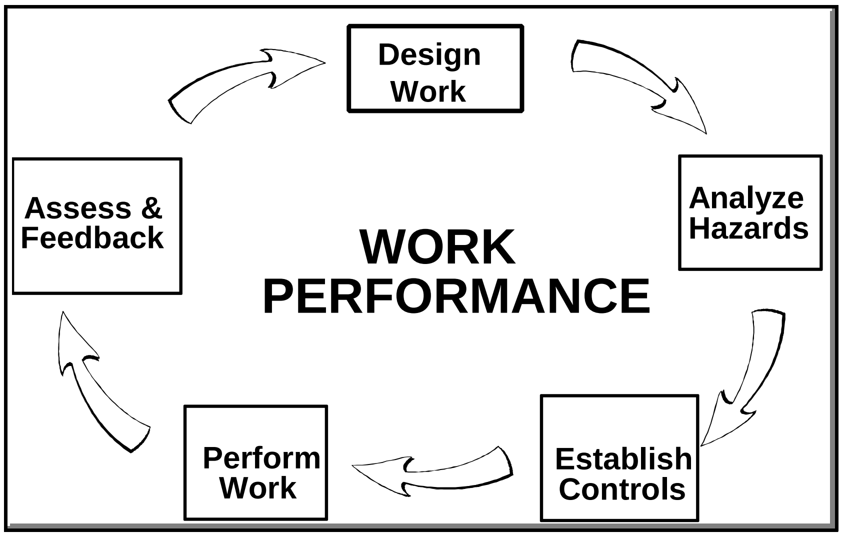


**Figure 1. The Five Work Management Functions**

Different types of work are performed at the different work management levels shown in Figure 2. Table 1 provides examples of the types of work managers and workers do, from DOE headquarters personnel, who define missions, to DOE contractor employees, who perform tasks to meet specific work objectives. Tailoring occurs within, across, and at the interfaces of these levels.

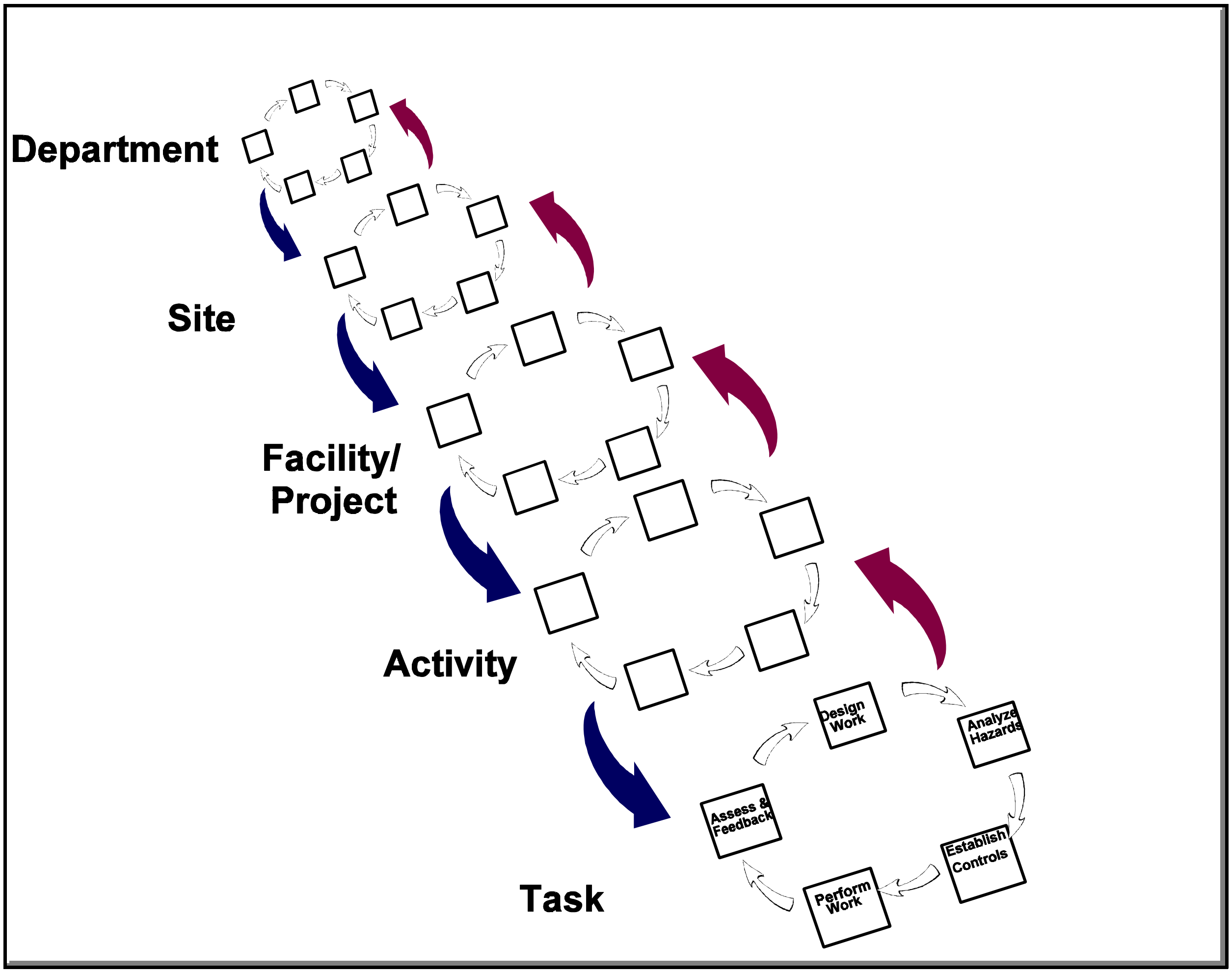


**Figure 2. Levels of Work Management**

## III. EXPECTATIONS FOR TAILORING

To accomplish work safely, a work management system must function to ensure that work hazards are identified and controlled, and that workers, the public, and the environment are adequately protected. To accomplish work efficiently, the system should not prescribe controls that needlessly inflate costs, do not enhance safety, or unnecessarily constrain work performance. Tailoring through work management functions enables work to be managed at the appropriate levels, so that operational design and systems requirements imposed at each level do not unnecessarily constrain management decisions at lower levels, where more detailed information on work and hazards is available. Hazards analyses are performed by those having the best knowledge of the work. Decisions and responsibilities for work products flow down to the level at which the work is performed so that "how" to do the work can be determined primarily by those doing the work.

## Table 1. Types of Work Performed at Different Management Levels

| Functions | Department Mission Planning | Establish Work Agreements | | Perform Contract Work | | |
|---|---|---|---|---|---|---|
| | | DOE | Contractor | Manager | Supervisor | Worker |
| Design Work | Establish mission objectives; allocate resources | Establish mission-to-work objectives and funding priorities; negotiate contract and project agreements | Negotiate contract and project agreements; plan capital upgrades; plan, schedule, and budget projects | Plan, schedule, and budget projects; lead work planning teams; design and schedule work; coordinate interfaces with other projects | Lead work planning teams; develop work packages; assess worker training, qualifications, and needs; develop job descriptions | Participate in work planning and work package development; assess training qualification needs; develop job descriptions |
| Analyze Hazards | Identify, evaluate socio-political mission hazards | Establish analysis expectations | Maintain analysis capabilities; examine site and sitewide interface hazards; examine hazards elimination/reduction potentials | Participate in hazards reviews and engineer-ing hazards analyses; examine project interface hazards; examine hazards elimination potential | Participate in job, activity, and process hazards analyses; examine job interface hazards | Walkdown job; identify potential problems; participate in job and activity hazards analyses |
| Establish Controls | Issue DOE policies; participate in national and inter-national standards development | Establish process to identify agreed-upon standards; establish processes to ensure work outcomes | Agree upon standards; establish work management system; establish training programs; participate in national, state, and local standards development | Approve project controls and work authorizations; maintain staff capabilities and training; address hazards analysis results; examine hazards elimination/ reduction potentials | Coordinate procedure development; establish work controls and authorizations; sponsor worker training and education | Obtain, maintain skills, training, and qualifications; participate in developing procedures |
| Perform Work | Oversee mission progress | Establish work performance measures; monitor work progress | Establish work performance measures; schedule projects; monitor project milestones | Schedule and manage work | Oversee and direct work; report work status | Perform work |
| Assess and Feedback | Review and evaluate mission objectives, resource allocations, and policies | Review and evaluate existing agreements, standards, and protocols | Review contract/project agreements; evaluate work plans, schedules, budgets; evaluate assessment protocols; evaluate training/ qualification programs | Review work packages; evaluate work authoriz-ations; evaluate staff qualifications and training; evaluate assessment protocols | Review activities; evaluate adequacy of work controls; evaluate staff training; advise manager of needed improvements | Review conduct of work and evaluate work controls; advise supervisor of status and needed improvements |

DOE Headquarters and Field Offices have two primary roles in the tailoring process. They are, (1) defining mission goals and desired work outcomes, and (2) working with contractors to establish resource parameters and technical approaches for work to safely and effectively carry out mission goals, to identify statutory, regulatory, and contractual requirements that apply to the work, and to evaluate the progress and success of the work. These roles are realized, in part, through contract negotiations and through DOE approval of contractors' safety management systems, as required by the Department of Energy Acquisition Regulation (DEAR) environment, safety, and health clause. Contractors, in addition to working with DOE, have the added roles in tailoring of (1) determining "how" work is actually conducted at all levels (site, project, activity, task); (2) selecting and implementing work controls to fit the work; (3) meeting requirements; and (4) optimizing the use of their resources. Both DOE and site contractor staff at all levels are expected to tailor their work management functions.

Given effective tailoring of work management, DOE can expect site operators and contractors to have work management systems that ensure safe and effective management of work in fulfillment of the Department's missions. Meeting this expectation entails removing roadblocks and eliminating activities that provide no benefit or that have a negative impact on safety or performance, especially at the contractors' project and activity levels.

Likewise, given effective tailoring of work management, contractors can expect that, so long as they meet statutory, regulatory, and contractual requirements, DOE Headquarters and field personnel will allow them flexibility to manage the accomplishment of work to fulfill DOE missions. Fulfilling this expectation also entails removing roadblocks, especially at higher levels, and eliminating activities with no benefit or with negative impacts.

## IV. STANDARDS, REQUIREMENTS, AND WORK CONTROLS

Within DOE, missions are turned into work designs and objectives at the highest agreement levels between DOE and site contractors. At this level of work, management work designs and objectives are defined and hazards are identified in broad terms. The nature of the work and the hazards determine which statutes and regulations apply.

Performance expectations can be defined as required conditions or required outcomes. Regulatory requirements often prescribe performance expectations but are silent on the processes used to meet the expectations. Such performance- or outcome-based regulations allow greater flexibility of response, so that the most efficient method of compliance can be implemented. Tailoring includes selecting and implementing effective methods for compliance with performance-based regulations. Providing flexibility to contractors in complying with requirements allows them to select cost-effective methods for compliance.

Trade organizations and professional societies often issue consensus standards or recommended practices to control hazards associated with their work. These standards can provide a useful basis for demonstrating compliance with statutory, regulatory, and contractual requirements.

However, the way in which standards are implemented to provide adequate protection may need to be tailored. To ensure that this tailoring can be readily accomplished, an agreement is needed between DOE and the site contractor about the process and criteria that the contractor will use to determine when and how consensus standards will be used to control work. Adherence to this agreement forms the basis for assuring the sufficiency of controls (see Attachment C).

Because part of DOE's mission is to challenge the frontiers of energy research and technology, there may be cases where the development of work controls needs to go beyond existing standards and practices. Especially in development of cutting-edge technologies, it is important that the workers, supervisors, and technical experts who will be most intimately involved in the work derive the standards for their performance.

Many DOE contractors currently have sitewide performance standards specific to the work done at their sites. These standards ensure adherence to appropriate regulatory and contractual requirements and adequate protection of workers, the public, and the environment. They also reflect expectations for the performance of work consistent with the identification and management of hazards specific to site facilities, projects, activities, and tasks. In addition, sitewide performance standards are generally supported by institutional systems and procedures that help identify hazards, select and implement controls, and provide feedback.

For site contractors, tailoring is most effective at the task level and in the management of tasks as activities. The effectiveness of tailoring at this level is evidenced when the workers who perform the tasks and the supervisors who provide the resources to those workers actually plan the performance of the work to meet higher-level expectations. All five work management functions are applied at this level, and real hazards identification and application of controls occur here. It is the responsibility of the workers and their supervisors to provide assurance that the performance of the work meets the work controls.

## V. TAILORING WORK MANAGEMENT FUNCTIONS

Tailoring work management functions is an exercise in applying common sense at all management and performance levels based on the knowledge of the work to be accomplished and the barriers that may prevent achieving the objectives of the work. Figure 1 shows the five functions of a safe work management system. These five functions are not independent, sequential functions. Rather, they are an integrated whole. That is, the individual functions cannot be tailored readily without affecting other functions and, potentially, the whole system. Work design, for example, is a function that allows for excursions into the other functions of work planning several times before a plan is implemented. If, for instance, hazards are identified during work planning stages, then opportunities may arise at this stage to redesign the work to eliminate the hazards or to reduce the potential for accidents arising from them. Further, during work performance, assessment and feedback at any time can and should affect future execution of work plans.

Thus, for tailoring, the five safe work management functions are considered as an integrated whole. Nonetheless, for ease of presentation, we discuss tailoring within each function separately.

## A. DESIGN WORK

Work design is, inherently, a tailoring function. Designing work entails making decisions about a continuous variety of options and tradeoffs. It is the balance of these options and tradeoffs that determine if a work design will be successful. Many of these tradeoffs are integrally related to tailoring the other elements. They include developing and resolving the work scope, establishing a technical approach, adjusting resources, adapting personnel (experience and expertise), adjusting schedule, and performing tasks sequentially or in parallel to minimize hazards or to optimize the critical work path.

For example, work design considers the life cycle of the work and the ultimate fate of the systems, processes, and/or facilities used to accomplish the work. Thus, the use or addition of any feature, function, or structure is weighed not just against its safety benefits and implementation costs, but also in terms of the hazards it may pose in decontamination and disassembly.

Tailoring can also be applied to the formality and documentation associated with a work plan. Too often, formality and documentation are associated, or equated, with budget or cost, even when the work and the hazards are of a routine nature. A better gauge of the need for formal documentation is the complexity of the work, the hazards associated with it, and, in some cases, the regulatory requirements for documentation. Thus, if the hazards are of such type and magnitude that multiple layers of controls or complex systems are required, then greater formality within the planning process can help ensure completeness of hazards identification and implementation of controls.

Tailoring at any level under this function may include—

- adjusting work scope and schedule to higher-level constraints;
- resolving budgets and resources to work scope and schedule;
- identifying and selecting personnel according to experience, expertise, and training;
- adapting formality of documentation of work plan and work performance to complexity of work and types and magnitude of hazards;
- considering alternative technical approaches to performing work;
- planning/replanning work to eliminate or reduce hazards; and
- redesigning work based on assessment and feedback.

## B. ANALYZE HAZARDS

Work hazards are addressed at all stages of work planning and work performance. For example, in the early stages of work planning, or during design, hazards are often identified and evaluated using only a checklist of hazard types. That is, hazards are identified as nuclear, chemical, thermal, electrical, kinetic (movement), etc. At this time the hazards may also be assessed as to the magnitude of the harm that accidents involving them could cause. For example, the consequences or impacts of accidents could be evaluated as harm to immediate worker only, harm to workers on adjacent processes or activities, or harm to the public or to public resources. Thus, at this stage, the identification and assessment of hazards is a tool for design evaluation and design improvement. Later, to manage work performance, more detailed hazards analyses are needed to select appropriate types and numbers of controls to prevent accidents or to mitigate their consequences. Even later, as a cyclic part of routine work performance, these analyses are reviewed and updated to ensure that a process or facility that has been in operation for a long time continues to maintain adequate controls to prevent accidents or to mitigate their consequences. At this stage, the analysis of hazards is a tool for evaluating whether safe operations are being maintained as the process or facility deviates from original design or purpose.

Just as work hazards are addressed at all stages of work design and work performance, work hazards are also addressed at all levels of work. For example, at the task or job level, job hazards analyses are performed to identify hazards to the worker or workers performing a job. For simple, routine jobs, these analyses can be simple checklists, and can often be proceduralized. For jobs in which hazards are not well understood, they can be thorough, systematic examinations by multidisciplinary teams that include workers and their supervisors, and engineering and safety staff.

For existing facilities and projects, all types and levels of hazards evaluations, analyses, and assessments should begin with a walkdown of the work, equipment, and facilities; interviews with staff; and reviews of existing information/documents about the work. This review encompasses more than just safety documents. For example, engineering drawings, work or process flow diagrams, materials inventory lists, operating and emergency procedures, and accident/incident reports all should be reviewed. See Attachment A for a discussion of new facilities/new work.

Tailoring analysis of hazards encompasses selection of appropriate levels of hazards evaluations, selection of appropriate hazards evaluation methods, and selection of appropriate teams of individuals to accomplish the hazards evaluations. Because hazards evaluations are a keystone to safe work management, they are discussed further in Attachment A.

## C. ELIMINATE HAZARDS

Elimination of hazards is an integral part of work design and work planning processes. That is, where practical and effective, it is preferable to eliminate hazards rather than to control them. For example, the first step in decommissioning a chemical laboratory is usually to remove any jars or bottles of left-over chemicals.

The place in the life-cycle of a project or process where hazards elimination can be most effective is in the work design stage. In fact, all project or process design work should consider not only elimination of hazards, but also larger, life-cycle issues, such as waste minimization and decontamination and decommissioning (D&D).

Substitution of materials can eliminate hazards in some cases such as substituting non-flammable solvents for kerosene for metal parts cleaning. When the potential consequences of accidents are sufficiently serious that controls and mitigators do not provide adequate protection, elimination of hazards is important. Accidents, analyses, and tests showed that exposing nuclear weapons to high velocity impacts caused detonation of their high explosives leading to dispersal of radioactive material. New high explosives were developed which are very difficult to detonate by impact.

However, "inherently safer" work does not always mean "safer" work, and early elimination of hazards does not always make work safer. For example, asbestos is a hazardous material, and many old DOE buildings have asbestos insulated piping. As part of D&D operations, this piping must be removed. However, removal of asbestos early in the D&D process can actually lead to greater disruption of work and greater exposure potential. If examination of the piping shows that outer coatings are intact, that is, that the asbestos is sealed and not friable, then it may be safer to leave the asbestos in place, and routinely inspect it, than to remove it early. In this example, it is better to initially manage hazards in place, and to sequence work to minimize exposures, than to remove the asbestos early. Thus, although early elimination of hazards may be a practical and effective way to make work safer, controlling hazards in place is sometimes equally or more practical and effective.

## D. EXAMINE THE INTERFACES

There is a faded management adage that "systems break down at the interfaces." So, too, do the benefits of hazards analyses, if no attention is paid to how workers' jobs can affect one another to cause accidents; how juxtaposed (either directly connected or nearby) activities or processes can influence one another; how multiple activities or projects within a single facility can adversely affect or be affected by the shared support systems provided by that facility; or how external events can affect multiple projects or facilities. For example, researchers working in adjacent laboratories within a single laboratory building each positioned a liquid waste container safely in an unused central hallway. The waste containers, which were of a single standard design, were of proper size and composition to handle the wastes and were well anchored to prevent spills. Examination of laboratory "interface" hazards, however, showed that one waste container was labeled "cyanide waste" and the other was labeled "acid waste." A small human error, an arm's reach in the wrong direction, could have had fatal results.

Thus, it is important that a hazards analysis of a particular job, activity, or process consider all of the circumstances that could cause an accident, and that various hazards analyses be coordinated to jointly consider these circumstances. Such interface analyses are particularly important for aging facilities within the DOE complex, because these facilities are often used for purposes other than those for which they were designed and, often, engineering modifications or upgrades have not been made to ensure the adequacy of their support systems. These facilities are also often shared and used for multiple purposes without the benefit of any unifying analysis.

Systems lock outs and tag outs, the conduct of radiographic operations, and the transport of radioactive materials across DOE sites are other examples of parallel activities where interfaces may need careful examination.

Tailoring at any level under the hazards analysis function may include—

- performing hazards evaluations or assessments (preliminary hazards analyses) before proceeding with detailed analyses;
- selecting hazards evaluation methods commensurate with the level of work—task, activity, project, site, DOE;
- evaluating and refining work designs for safety and for inherent safety;
- identifying hazards elimination potentials; and
- identifying and resolving hazards interface problems.

Tailoring at the project level or lower may include—

- selecting hazards analysis methods commensurate with the level of work
- selecting hazards analysis methods commensurate with the life-cycle of the process or facility
- selecting hazards analysis methods commensurate with the complexity of the work and the types and magnitude of the hazards (see Attachment A for further criteria);
- identifying hazards analysis teams considering staff experience and expertise with the work and the hazards;
- adapting analysis processes to ensure interface reviews;
- identifying multiple uses of hazards analysis information; and
- coordinating multiple analyses for quality and efficiency.

## E. ESTABLISH CONTROLS

Work hazards can be controlled by either engineering or administrative methods. For example, pressure vessels, relief valves, contamination containment equipment, high efficiency particulate air (HEPA) filters, and spill dikes are types of engineering controls. Operating procedures and hazardous materials limits are types of administrative controls. Both types of controls can be voluntary or mandated by regulation. Inherent in the tailoring process, however, is the selection of controls to adequately protect against the types and severity of potential accident consequences, without over-constraining the work process, and potentially even making it less safe. For example, for high-hazard processes and activities, establishing and working within well-defined and controlled operating limits may be necessary to ensure that safe process parameters are maintained. For low-hazard processes and activities, only general operating parameters may be needed.

Tailoring work with engineering controls assumes that the controls are practical and readily available, thus enabling work to proceed in a safe and timely manner. For example, using contamination control equipment, such as glove bags, may enable work to be completed safely without hindering workers with individual respiratory protection equipment. Similarly, containment tents and portable HEPA filter units may allow radiological decontamination work to be conducted in isolation from uncontrolled areas. In addition, controls should be evaluated for their simplicity. Complex controls that require special skills or training for use or maintenance may be less desirable than more simple controls, especially for short-term operations.

Tailoring work with administrative controls includes maintaining clear and effective operating procedures for equipment and processes, an effective work authorization process, and a work control process that ensures timely and effective training. For example, skilled craftsmen, such as electricians, who have been apprenticed, trained, and/or certified in their crafts, do not need written procedures to perform the work for which they have been trained. However, the work of all craftsmen is controlled by work authorization processes. In addition, if craftsmen perform their work in environments whose hazards are unfamiliar to them, the authorizations and training specific to the work environment apply to ensure safe performance. Thus, administrative controls, including procedures, work authorizations, and training, may be tailored to fit the work, the work environment, and the workers. Conversely, assuring that workers are qualified to perform work requires maintaining a balance of training, experience, and written procedures tailored to the work and the hazards.

Most training programs can be tailored so that workers whose tasks are more difficult and workers whose tasks are more important to successful operations receive more extensive or intensive training. Likewise, safety training should be provided specific to the task and the work. Workers engaged in low-hazard tasks may receive only general or site occupational safety and health training.

Establishing effective controls for hazards involves interactions between management levels. For example, a hazards analysis team can recommend that particular hazards have enhanced protection. Experienced teams may even suggest specific control measures. However, it is a management decision as to what or even whether controls are implemented. That is, management must use a variety of criteria to select and prioritize corrective actions and safety improvements. They include costs, other competing priorities, implementation schedules, the effectiveness of risk reduction, and technical feasibility.

In terms of reliability, engineering controls are usually preferred over administrative controls. Also, process controls are usually preferred over personal protective equipment (PPE). However, for short-duration, non-routine processes and activities, management may opt for administrative instead of engineering controls, or PPE instead of process controls, because of cost, schedule, or other priorities.

## F. SUFFICIENCY OF CONTROLS

Management makes decisions and accepts responsibility for the sufficiency of work controls. They also approve controls as sufficient to perform work. However, the expectations for sufficiency of controls should be defined early, during work design and work planning, and agreed to by all responsible parties. In some cases, an operational safety management system may suffice to ensure adequacy of controls. When work deals with highly hazardous materials for work environments, however, further objective evidence may be expected. In all cases, sufficiency expectations should be defined up front. Attachment C provides a list of attributes for sufficiency of work controls.

Tailoring at any level under this function may include—

- adjusting work controls to lower or higher level constraints;
- resolving budgets and resource allocations to meet work control needs;
- selecting the level of experience, expertise, or training of personnel; and
- adapting formality of work control documentation to complexity of work and types and magnitudes of hazards.

Tailoring at the project level or lower may include—

- resolving the detail of operating procedures to the training and skill of the workforce;
- adjusting employee training and refresher training programs to work and hazards;
- selecting standard industrial practices consistent with work and hazards;
- selecting engineering and/or administrative controls to prevent, protect against, or mitigate accidents; and
- adjusting change-control programs to the needs of the work and significance of the hazards.

## G. PERFORM WORK

Aspects of work performance that can be tailored include readiness or “pre-startup” reviews; mechanical integrity and maintenance programs; work authorizations; and surveillance, inspection, and testing program. For example, readiness or “pre-startup” review, usually performed at the project level, can be made more or less rigorous, depending upon the hazards of the work. Testing and maintenance, usually performed at the task or activity level, can vary in frequency as well as procedural rigor, again, usually depending upon knowledge of the hazards and the reliability needs for the equipment examined.

For example, for equally important processes, operation and maintenance of high-hazard processes are usually governed by more formal conduct of operations than operation and maintenance of low-hazard processes.

Surveillance and maintenance programs are particularly important for aging facilities within the DOE complex because these facilities often have not been refurbished and continue to operate using outdated and fatigued equipment. Past surveillance and maintenance may be inadequate to ensure the safe operation of the facilities. Increase surveillance and maintenance activities are examples of tailoring for aged equipment that continues to operate.

For example, an overhead crane that was originally specified for occasional use in an active facility may, during D&D, encounter far more frequent use. The inspection and maintenance of the crane should be tailored to the new operations and conditions.

Tailoring at any level under this function may include—

- adjusting work performance schedules to lower or higher level constraints, including budgets and resources;
- adjusting the depth and rigor of operational readiness or pre-startup reviews to the significance of the work and hazards;
- resolving the level of comprehensiveness of mechanical integrity programs; and
- selecting the level of experience, expertise, or training of personnel.

Tailoring at the project level or lower may include—

- resolving the detail of maintenance procedures to the training and skill of the workforce;
- adjusting the level of proceduralization of work authorizations to the level of the workforce;
- adapting preventive maintenance frequency to needed equipment reliability;
- adjusting surveillance and maintenance programs to the age of the process/ facility/equipment; and
- adapting inspection and testing programs to equipment reliability.

## H. ASSESS AND FEEDBACK

Self assessments and management assessments are done to determine whether work controls and work performance adequately meet agreed-upon standards (see Attachment C for attributes of sufficiency). The criteria, indicators, and measures used in assessments are best developed at the time the work and the environment, safety, and health expectations are agreed upon. Such up-front work ensures that the criteria, indicators, and measures are developed using the same factors that were used to develop the work expectations.

Contractors should develop assessment programs and protocols that are tailored to the details of their safety management systems to meet agreed-upon expectations. DOE assessment programs and protocols should be aimed at ensuring that contractors' self-assessment programs are effective and produce valid results. A history of effective self assessment and continuous performance improvement by contractors can be a basis for decreased assessment efforts by DOE.

Conducting good assessments requires knowledge of the work, the work environment, and the agreed-upon expectations for performance of the work. It also requires inquisitive minds and an understanding of the assessment methods that are effective. Thus, workers must be trained in self assessment, and outside assessors must be trained or informed about the work, the work environment, and the agreed-upon expectations pertinent to the facility, activity, or operation being assessed.

DOE and contractor assessments improve when their respective methods and results are shared openly and constructively. Open and constructive sharing requires a DOE-contractor relationship based on trust. Such trust should be fostered by focusing on the use of assessment results for continuous improvement, rather than for punitive actions.

Tailoring of assessments means—

- developing performance criteria, indicators, and measures that are specific to the work, the work environment, and the agreed-upon expectations;
- using methods that are keyed to each contractor's safety management system; and
- providing feedback of assessment results into the safety management system where it will be most useful.

## VI. TAILORING BY CONTRACT AND PROJECT AGREEMENTS

As shown in Figure 2, tailoring of work management occurs at all management levels. Just so, contracts and project agreements between DOE and contractors can be thought of as tailored, or at least as providing the basis for tailoring. Agreements that are developed to direct work under a specific contract or for a specific project effectively "translate" DOE mission goals into work contracts. Figure 3 shows the elements of these "higher order" agreements in relation to the work planning and work performance functions.

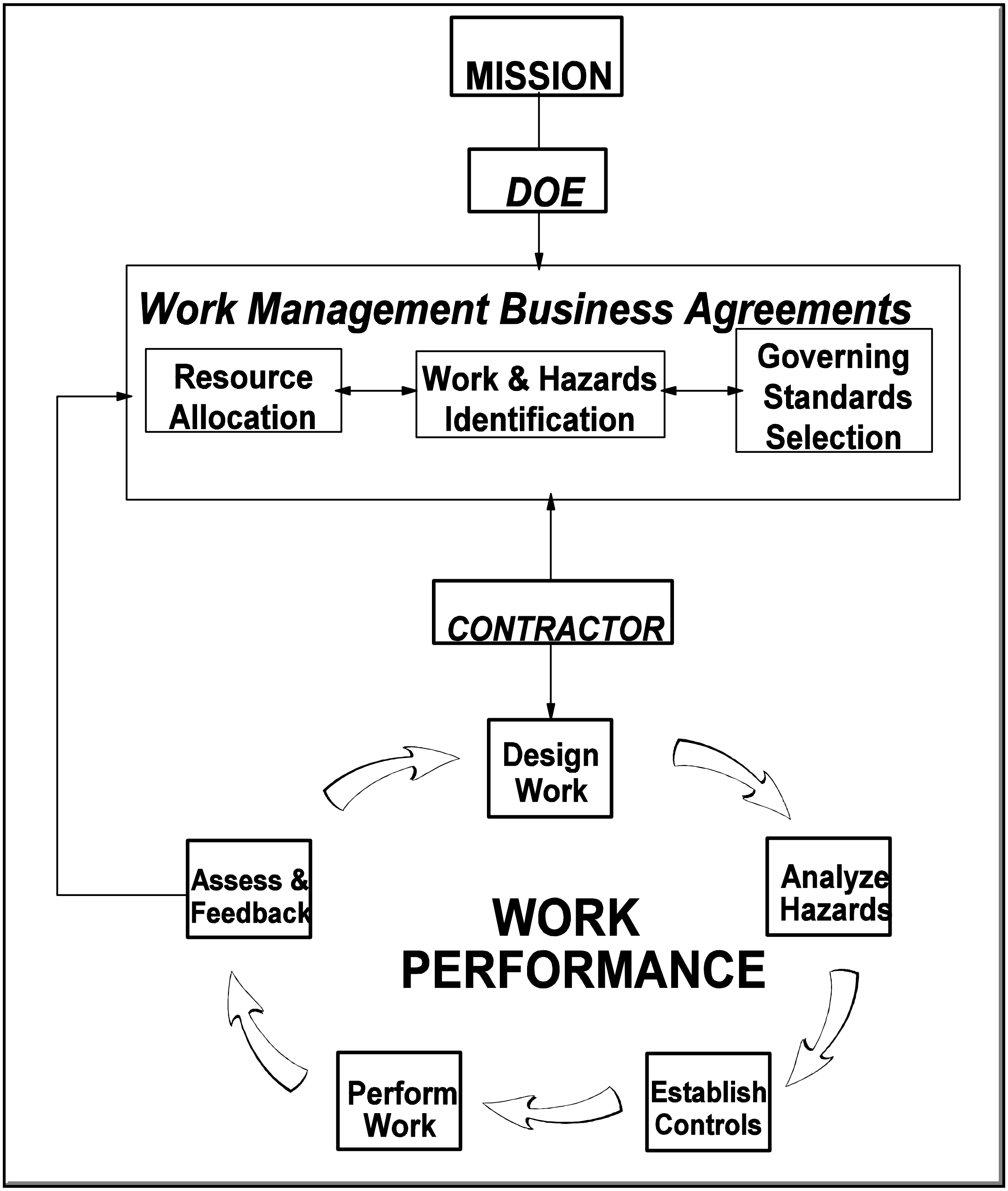


**Figure 3. Work Management Business Agreements Translate Mission Into Work**

The agreement between DOE and Westinghouse Savannah River Company for the F-Canyon Restart Project is an example of “translating” mission goal into work contract. It included defining the work, identifying the hazards associated with the work, and agreeing upon standards under which the work would be managed. The work involved the stabilization of hazardous material. The risks of the work were of short duration. The agreement included a set of standards to which the work would be performed. The standards were flexible and nonprescriptive, and allowed the work to be performed with minimal hazard to workers and the public. Examples of other DOE and contractor experiences in successful tailoring appear in Attachment B.

Contracts between DOE and site contractors provide both authorization bases and authorization agreements for the work of the contract, unless the contracts identify work for which additional authorization bases and agreements must be made. When additional authorization bases and agreements are needed, the contracts may specify the levels of formality and detail required.

Factors that affect the level of formality and detail in authorization bases and authorization agreements include uncertainty in the characterization of the work, the hazards, and the work environment; complexity of the work control systems; and level of political, operational, and/or health risk.

# ATTACHMENT A
# HAZARDS ANALYSIS

## Introduction

Hazards analyses are performed at many different times and for many different purposes in the work management process. For example, hazards analyses are performed at different stages in the life-cycle of processes and facilities.

- For new processes and facilities, at the conceptual (work) design stage, preliminary hazards analyses are performed to identify opportunities to eliminate or reduce hazards, before resources are committed to engineering design and construction.

- During engineering design and construction, design hazards analyses are performed to identify needed systems changes or process controls not identified at the conceptual stage.

- Before initial startup of a new system or process, pre-startup or operational readiness reviews are conducted to ensure that systems are in place to control all identified hazards.

- Process hazards analyses are conducted periodically during the life time of operating facilities/processes, and every time a process/facility undergoes significant modification, to identify any new hazards resulting from process changes, and to ensure that all hazards are adequately controlled.

- For decontamination and decommissioning (D&D) and environmental restoration projects, hazards characterizations are performed to characterize hazards and, if possible, to develop a priority ranking for hazards elimination.

- As D&D proceeds, hazards change. Hazards analyses become a routine part of the D&D process to ensure that hazards are identified and controlled.

Hazards analyses are also performed at different levels of work for different purposes. At the lowest working level, hazards analyses are performed on jobs or tasks.

## Job Hazards Analysis

Job/task hazards analyses focus on the worker in relation to the work. That is, they are performed to identify hazards to the worker or workers performing a particular job. These integrated analyses address radiation, industrial hygiene (IH), and occupational safety and health (OSH) hazards. They are most useful at the operations level to ensure adequate procedures and personal protection.

For simple, routine jobs, these analyses can be simple checklists. For jobs in which hazards are not well understood, they can be thorough, systematic examinations by workers and their supervisors, assisted by engineering and safety staff.

The most common types of job hazards analyses are checklist, what-if, and what-if/checklist, although other methods may be employed depending upon the job and the hazards. See "Selection of a Hazards Analysis Method" below.

## Engineering Hazards Analysis

Engineering or process hazards analyses are performed to identify process hazards—materials or circumstances that, inherently, have the ability to cause harm if uncontrolled. For example, the chemical hazards of a process might include chemical and radiological toxicity, reactivities, flammability, radiation fields, or shock sensitivity; the thermal hazards might include elevated temperatures; the pressure-volume hazards might include liquified material stored under pressure; and the electrical hazards might include elevated voltages.

Process hazards analyses examine engineering and administrative controls, process design, and operational controls. They are most useful at engineering and operations levels to ensure adequate process controls, preventers, protectors, and mitigators. For simple, well-understood processes they can be as simple as a checklist. For complex processes, they can be systematic and thorough examinations performed by a team of operators, engineers, maintenance and safety staff, and other technical experts, as needed.

Types of process hazards analyses include what-if, checklist, what-if/checklist, hazard and operability (HAZOP) study, failure modes and effects analysis (FMEA), fault tree analysis, and event tree analysis. Selection of a process hazards analysis method depends on the type as well as the complexity of the process. For example

- For complex processes involving hazardous materials, the method of choice within the chemical process industry is the HAZOP study, in which a team follows a rigorous protocol to review a unit operation line by line and vessel by vessel to consider all process deviations and to determine adequate preventive and/or mitigative controls. It is most effective for continuous processes, but can also be useful for batch operations and for maintenance. It is also very effective for analyzing operating procedures.

- For analysis of electrical systems and other utilities, FMEA is often the method of choice.

- Facility siting issues are usually analyzed using a checklist. Checklists also exist for human factors considerations/analysis.

Selection of an engineering hazards analysis method also depends on the extent of the hazards and how well they are understood. Routine hazards can generally be handled using checklists, with any unusual or extenuating circumstances subject to what-if analysis.

Descriptions and uses of engineering or process hazards analyses are discussed in *Chemical Process Hazards Analysis*, (DOE-HDBK-1100-96, February 1996). This handbook also demonstrates five different process hazards analysis methods on two different engineered systems, a hydrogen fluoride supply system and a cooling water chlorination system. In addition, in 1992, the Center for Chemical Process Safety published *Guidelines for Hazard Evaluation Procedures: Second Edition with Worked Examples*. The book is available from the American Institute of Chemical Engineers, New York, NY.

Radiation hazards generally can be analyzed using the same methods discussed in the above handbooks/guidelines. Even nuclear reactors are analyzed with the same methods as those used for chemical processes. In both cases, the methods are selected congruent with the magnitude of potential accident consequences to selected populations. See "Selection of a Hazards Analysis Method" below.

## Activity Hazards Analysis

Activity hazards analyses usually involve the analysis of multiple related tasks. These tasks may be related to work within a specific facility or location, or to work of a specific technical nature. When multiple tasks are involved, activity hazards analyses can be used to analyze hazards arising at the interfaces of the tasks. They can also be used in planning to coordinate and schedule or sequence tasks to minimize hazards. For example, if an electrician must work in a facility in which other hazardous work is also being performed, then the electrician's work must be coordinated with ongoing facility work, and the electrician must be made aware of the hazardous activities going on in the facility.

Activity hazards analyses can help managers and supervisors coordinate tasks in time and space to get work done safety. They can also be used to confirm training needs and work authorization specifications for individual tasks.

Activity hazards analyses are most useful in D&D and environmental remediation operations, after hazards have been characterized, during work planning and work performance. They are performed as a routine part of the D&D and remediation processes. The description and uses of activity hazards analyses are well discussed in *Integrating Safety and Health During Deactivation with Lessons Learned from Purex*, (DOE/EH-0486, September 1995).

## Other Types of Hazards Analyses

Within the DOE complex, specially-focused hazards analyses are conducted for distinct purposes. Among these analyses are nuclear criticality analyses, fire hazards analyses, human factors or human reliability analyses, emergency planning and preparedness analyses, and safeguards and security vulnerability analyses. The purposes and analytic methods used in these analyses differ. However, the opportunity exists to manage these analyses to ensure that results are shared and consistent. In addition, an essential product of a tailored safety management system is a repository for regularly updated facility, activity, task, and safety information from which all hazards analysis teams can draw in order to perform their analyses.

## Selection of a Hazards Analysis Method

The primary factors for selecting a hazards analysis method include:

- **The type and complexity of the work.** In general, more complex work requires more systematic and thorough hazards analysis methods. Also, as discussed above, some hazards analysis methods are particularly well suited to specific systems or processes. For example, FMEAs are well suited to electrical systems and other utilities. HAZOP studies are well suited to chemical processes.

- **The type and magnitude of the hazards.** In general, the greater the potential for harm (hazard), the more systematic and thorough the hazards analysis method needed.

- **Potential impacts of accidents on workers, the public, and the environment.** In general, the more people potentially affected, the more systematic and thorough the hazards analysis method needed.

- **Age of the process, facilities, or equipment.** This factor generally considers the life cycle stage of the process or facility—conceptual design, engineering design/construction, startup, etc., as described above. It also usually includes the accident/incident experience of the particular process or facility. In general, beyond startup, the longer a process or facility has been in operation, the greater the potential for deviations beyond design, and, thus for accidents, and the greater the need for more thorough and systematic hazards analyses. But, see below.

- **Operating history of the process or facility.** This factor also considers the accident/incident experience of the process or facility. However, it also usually includes familiarity with the process or facility, or with similar processes or facilities. Well-known and well-understood processes generally need less systematic and thorough review. For example, checklists exist for many common processes/facilities. Thus, hazards analysis teams may want to start with a checklist for a familiar process, then discuss how their particular process or facility is different/special.

Secondary factors for selecting a hazards analysis method include the following:

- **Team method.** Of the secondary factors, this one is probably the most important. Hazards analyses performed by teams provide benefit beyond just a more thorough analysis. They promote ownership and cooperation from those who participate in the analyses. In addition, team members also gain a more thorough understanding of the work, processes, or facilities they "analyze."

- **Ease of application/use.** This factor generally includes the familiarity of the team leader and/or team members with the methods. Especially for small or familiar systems, teams usually work better using methods with which they are familiar.

- **Resource requirements.** This factor usually considers staff time and availability. Hazards analysis teams are usually made up of two types of members, core team members, who participate throughout the entire analysis, and contributing members, who participate when their particular jobs or areas of expertise are the focus of the analysis. Core team members devote considerable (contiguous) time and energy to the hazards analysis process.

- **Type of results needed.** The results of hazards analyses may be qualitative or semi-quantitative. However, some hazards analysis methods are inherently more amenable to obtaining semi-quantitative results.

- **Traceability/auditability.** This factor usually considers how much documentation is needed, and the purposes for documenting the analysis. If documentation is a regulatory requirement subject to audit, then methods that lend themselves to more formal and systematic documentation may be preferred.

## Selection of a Hazards Analysis Team

Hazards analysis teams are usually made up of two types of members, core team members, who participate throughout the entire analysis, and contributing technical experts, who participate when their particular jobs or areas of interest or expertise are the focus. Core team members provide continuity to the hazards analysis process, and often devote considerable time and energy to the process. Technical experts participate on an as-needed basis.

The core team for any hazards analysis should include facility/operations staff (in the case of a job hazards analysis, the worker whose job or work is being evaluated and his/her supervisor) assisted by a safety professional. For job hazards analyses, these may be the only staff that make up the analysis team. Hazards analyses at the project or activity level of work, however, may need to augment their teams with technical experts.

Technical experts are individuals with knowledge about a particular aspect of a project, activity, or facility who participate in a hazards analysis on an as-needed basis. If internal contractor/project staff have the appropriate expertise, then internal staff should be used as technical experts to participate in hazards analyses. Thus, when possible, technical experts are chosen from among internal project engineering, operations, maintenance, and safety personnel. However, if a process or facility is new or if a recent modification has been made such that no internal technical experts are available, then external technical experts may be used.

Just as the worker is the most important member of a job hazards analysis team, project/facility operations and maintenance staff are the most important members of an engineering hazards analysis team, because they have first-hand knowledge of the work. They run the systems. They deal with the upsets. They know what can be done and how to do it. They also know what does not work.

Also like job hazards analysis teams, engineering hazards analysis teams should be small. Core teams of two to four members are optimal. Complete teams of four to eight members are optimal, depending upon the complexity of the work (process or facility) being analyzed. If teams are too small, hazards can be missed, because expertise is lacking. If teams are too large, they are hard to control. The analysis may suffer from too many digressions, and consensus on action items may be difficult to reach.

## Action Items and Recommendations

The critical result of a hazards analysis is the list of action items developed by the hazards analysis team. Action items are recorded any time the analysis team thinks that additional effort is warranted to review further a specific potential accident, to eliminate a hazard, or to reduce risks. Usually action items do not recommend specific corrective actions. They are meant to alert management to potential problems. Sometimes action items suggest alternatives to be considered. However, if a problem is simple, if a team is quite experienced, or if there is only one obvious solution, an action item may be written to recommend a specific corrective action.

The action items from a hazards analysis are presented to management for review and evaluation, and for determination of what, if any, actions should be taken to eliminate hazards or to reduce risks through preventive, protective, or mitigative controls. Because many action items may be generated during a hazards analysis, the team may choose to rank the action items according to the probability of occurrence of their corresponding potential accidents, or the severity of their consequences, or both. If the team is quite experienced, it may also choose to rank the action items based on the anticipated time and resources required to implement changes.

Management can use a variety of criteria to select and prioritize corrective actions and safety improvements. They include costs, other competing priorities, implementation schedules, the effectiveness of risk reduction, and technical feasibility.

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# ATTACHMENT B
# EXAMPLES OF TAILORING

## Department-Level Tailoring

Plutonium Vulnerability Study. The Departmentwide plutonium vulnerability study, conducted between March and November 1994, was a comprehensive review of the plutonium vulnerabilities of 166 facilities at 35 sites. The study used a consistent evaluation methodology to assess the adequacy of storage of more than 24 tons of plutonium contained in these facilities. Plutonium inventory storage conditions and hazards were identified by multidisciplinary teams of DOE and contractor staff. Vulnerabilities were identified, categorized by potentially affected populations (workers, public, and environment), and prioritized. A corrective action plan that tailored work efforts by focusing on the highest priority vulnerabilities first was issued as a Memorandum by Undersecretary Charles Curtis.

This study allowed a Departmentwide view of plutonium storage vulnerabilities, which was critical for DOE strategic planning. From the study, a Department-level tailored action plan was developed for the safe storage of plutonium.

Contact: David Pyatt, 301-903-5614

## Site-Level Tailoring

Standards/Requirements Identification Document for the Savannah River Site. The Standards/Requirements Identification Document (SRID) for the Savannah River Site (SRS) evolved as a series of agreements that were negotiated between DOE-Savannah River (DOE-SR) and Westinghouse Savannah River Company (WSRC) about the logic and assumptions for the development of a site SRID. The terms of the agreements were presented to DOE-SR for approval, along with the SRID. The completed SRID not only contains the standards/requirements set but also references site-level manuals and procedures that implement each. The approved SRID has been incorporated into the DOE-WSRC contract by reference. It represents an agreement between DOE-SR and WSRC about what standards/requirements will be used by WSRC to translate DOE missions into work at SRS.

The completed SRID has enabled SRS to proceed with many activities in a more direct and cost effective manner. It validates that most requirements are met by implementing site-level programs augmented, as necessary, by project, activity, and task-level procedures.

Contact: Eric Oser, 803-952-9893

Rocky Flats Plant Safety Management Program Based on Hazard Categorization. At the Rocky Flats Plant, a graded level of administrative control systems, including the site's configuration change control program, the site's "Conduct of Engineering Manual," quality assurance procurement levels, independent safety reviews and unresolved safety question determinations, and equipment calibration applicability, is correlated with the facility's hazard categorization. In addition, the integrated work control program for maintenance activities is based on hazard categorization.

In this example, tailoring safety management programs at the site level (the level of authorization agreement) allowed limited resources to be more effectively used on higher hazard activities. Lower hazard activities needed fewer reviews and approvals.

Contact: Terry Foppe, 303-966-7437

Lawrence Livermore Facility "Safety Basis" Based on Hazard Categorization. Lawrence Livermore National Laboratory (LLNL) and its DOE field office agreed that investment of extensive resources to produce safety analysis reports (SARs) for low hazard facilities was not productive, and that safety bases could be defined at several other points in the safety analysis process. They agreed that when material inventory screenings result in a low hazard designation, with no special hazards, the screening report becomes the safety basis for a facility; when inventory screenings result in greater than low hazard designation or when special hazards are present, a preliminary hazards analysis (PHA) is required. If the PHA shows the facility to be low hazard, then the PHA becomes the safety basis for the facility; when the PHA shows that the hazard level is moderate or high, or a category 1, 2, or 3 classification, then a SAR is required as the safety basis.

LLNL estimated that this agreement has saved about $1.2 million.

Contact: Jack Sims, 510-423-9742

EG&G Mound Potential Release Site Process for Site Remediation. EG&G Mound Applied Technologies developed the potential release site (PRS) process for site remediation to replace the operable unit concept. Approximately 200 facilities and 200 outside areas potentially contaminated with chemical and/or radiological materials were identified. Information was then collected for each facility/area and used as a basis for binning the potential release sites. Binning was done according to whether characterization data were sufficient to determine that remediation was necessary; sufficient to determine that no further action was necessary, i.e., the contamination was below cleanup limits; or insufficient to make a decision, i.e., further sampling was necessary to make a remediation decision. Many potential release sites required no further action.

This new process allowed quicker differentiation and determination of sites needing remediation.

Contact: Jim Booth, 513-865-4504

## Project-Level Tailoring

Rocky Flats Plant Critical Mass Laboratory Decommissioning. The Critical Mass Laboratory (Building 886) at the Rocky Flats Plant performed nuclear criticality experiments with plutonium and enriched uranium. Its original authorization basis, established in the mid-1960s per the requirements of DOE 5480.6, consisted of a safety analysis review and technical specifications. After its experimental mission was discontinued in the late 1980s, its authorization basis was inadequate to address the building inventory of highly enriched uranium nitrate solutions and the holdup of uranium and plutonium throughout equipment in the building. A basis for interim operation with technical safety requirements was developed to establish an authorization basis per DOE 5480.23 for the remaining limited life of the building in order to maintain the safety envelope for storage and holdup hazards, but not to decontaminate or decommission the building.

In this example, tailoring of hazards analysis and controls is based on the defined facility mission of safe storage and maintenance of the safety envelope. Tailoring allowed a cost-effective revision of the authorization basis for the Critical Mass Laboratory according to its new storage mission.

Contact: Terry Foppe, 303-966-7437

Rocky Flats Plant Plutonium Recovery Facility Basis for Operations. Using the Work Smart Standards process, a basis for operations (BFO) is being developed for the former Plutonium Recovery Facility (Building 771) at the Rocky Flats Plant. The BFO addresses baseline activities to maintain the safety envelope for storage of plutonium, enriched uranium, and americium, and hazards associated with the holdup of material in equipment throughout the building. It also addresses risk reduction activities to decommission the facility, which requires draining of tanks and stabilization of plutonium nitrate solutions into plutonium oxide powders.

Although the Plutonium Recovery Facility BFO is still in the confirmation process, it is an example of tailoring both the hazards analysis and the controls.

Contact: Terry Foppe, 303-966-7437

Lockheed Martin Standards Selection Based on Work and Hazards. As part of the work smart standards (WSS) process, identification teams at Lockheed Martin Energy Systems, Inc. recommended that only certain portions of consensus standards be included in the necessary and sufficient set. For example, only the design portions of ANSI standards B30.1, B30.5, B30.16, B30.20, and B30.21 related to hoists and cranes, were recommended. The teams' recommendations were based on the types of operations conducted and the hazards associated with those operations.

Contact: Bob Van Hook, 423-574-4322

## Activity-Level Tailoring

Limited Restart of F-Canyon at the Savannah River Site. An agreement between DOE-Savannah River and Westinghouse Savannah River Company was tailored to enable the limited restart of F-Canyon at the Savannah River Site to stabilize specific materials into a safer form for storage. A level of safety documentation and analysis was agreed upon to show that the stabilization activity, conducted under the conditions described, would present less risk than storage of the unstabilized materials until the complete nuclear facility documentation was available.

The work plan, including appropriate authorization (site Standards/Requirements Identification Document, safety basis, and resources) led the project to a successful conclusion.

Contact: Eric Oser, 803-952-9893

Elimination of Order-Specific Implementation Plans at Lawrence Berkeley. Lawrence Berkeley National Laboratory eliminated transition and order-specific implementation plans, and now evaluates the relevance of several federal and state regulations directly and specifically to work activities and associated hazards. Examples of regulations whose usefulness have been directly determined include the California Occupational Safety and Health Administration's construction standard for oversight of California construction subcontractors, and 10 CFR 20, radiation safety training for staff working in radiological facilities.

Contact: David McGraw, 510-486-5551

Enhanced Work Planning. Work planning processes using multidisciplinary teams have been developed at Hanford, Fernald, Savannah River, Oak Ridge, Mound, Idaho, and Pantex. Revised work control processes have strengthened work planning and hazards assessments. Teams have broken down the "stove pipes" in the work planning process. Staff members that formerly were excluded from work planning are integrated into multidisciplinary teams. Redundant, obsolete, and unnecessary forms and permits were replaced with efficient work planning documentation. Computer-based tools were developed. Tailoring of work packages from a risk perspective allows resources to be focused on the significant risks.

The percentage of work packages receiving environment, safety, and health reviews has doubled; average planning cycle times were reduced more than four fold; backlogs were reduced; and medical surveillance was improved. The pilot data suggest that focusing tailoring at the activity and task levels provides significant safety dividends, and the savings in resources more than pay for needed improvements.

Contact: Tony Eng, 301-903-4210

Hazards Screening at the PUREX Deactivation Project. Hazards screening was used at the PUREX Plant at Hanford to determine the appropriate level of hazards analysis. Each work activity that required an engineering study or that used a work plan was screened by a multidisciplinary team of workers, engineers, and safety and health professionals. The screening provided the basis for determining the appropriate level of additional analysis/evaluation.

Determination of the appropriate level of additional analysis was based on the relative complexity of the activity, the hazards associated with the activity, and the prior experience of the workers with the activity. The team recommended one of several hazards analysis methods, from simple checklists to hazard and operability studies, depending upon the findings of their screening.

Tailoring of hazards analysis using this screening process produced more systematic and comprehensive evaluations of hazards; decreased project costs; improved employee morale; and improved worker safety, as evidenced by lost workday statistics. The process has been incorporated into the Westinghouse Hanford Company's re-engineering initiative.

Contact: Tony Eng, 301-903-4210

# ATTACHMENT C
# ATTRIBUTES OF SUFFICIENCY

Determination that work controls are sufficient must be made both prior to the performance of new work as well as during the assessment of ongoing work. Moreover, management must not only establish sufficiency of work controls, but also define the conditions under which controls must be improved or processes/procedures changed. The attributes of sufficiency provided below may be considered in developing the expectations for sufficiency of work controls.

These attributes are not only attributes of sufficiency of work controls, but also attributes of sufficiency of higher-level standards. Thus, this list of attributes may be used/considered in evaluating sufficiency from the highest level of work design— selecting standards for the performance of work—to the most basic level of work performance—selecting work controls to protect against or mitigate the hazards associated with specific work tasks. In all cases, decisions should be by consensus process, with participation by those affected. Discussion of the attributes provided below should prompt responsible parties to arrive at expectations for sufficiency of controls that are clear, balanced, and achievable.

I. Stewardship

Controls protect the health and safety of:
- Environment
- Public
- Worker

Controls protect investment in:
- People (workforce and public)
- Environment/land assets/property
- Physical assets (capital equipment, facilities, etc.)
- Intellectual property

Controls maintain the confidence of:
- Congressional and other governmental agencies
- DOE and DOE contractors
- Public
- Worker

II. Recognized/Accepted Standards of Practice

Controls adhere to Guiding Principles (DOE P 450.4, 450.3, etc.).
Controls use recognized methods.
Controls provide systematic and thorough coverage.
Personnel are qualified.
Processes and/or products are auditable/demonstrable.

III. Cost-Benefit Considerations

Priorities are balanced (mission performance and protection).
Assessment methods are cogent.
Return is positive.

IV. Reasonable Person Acceptability

Controls promote confidence.

Based on stewardship, good practices, and cost-benefit considerations, a reasonable person can conclude acceptability/sufficiency. That is, given the same information, an objective third party could conclude that a decision of acceptability is reasonable.