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(changes in writeup are italicized)

Chemical Work Planning Guide

1.0 Introduction

The DOE Plan for Integrated Safety Management calls for the integration of environment, safety, and health with work planning and execution, with the objective being to "do work safely". This can be accomplish by improving the core safety functions of defining the scope of work, analyzing hazards, and developing and implementing appropriate hazard controls and by expanding work planning and control processes beyond maintenance work to include other activities such as research, waste minimization and management, and environmental restoration. Improved work planning and control processes begin at the task level associated with each discrete work activity to be completed. Safety can be improved at the job/task level through the Job Hazard Analysis (JHA) process that many DOE field operations have begun to use. The JHA defines the scope of work, identifies, and analyzes hazards, implement controls, and provides feedback and lessons-learned from the work. However, the JHA approach is only as good as the comprehensiveness of the analysis and understanding of the hazards, This is still a problem in the area of chemical safety. Within the DOE complex, a chemical injury or exposure occurs once a month, The root cause in most cases was that the victim was not aware of the hazard. This experience indicates that hazards of chemicals are not well understood or appreciated, Chemical hazards are often subtle and require a high degree of experience and training to identify and control. This is especially true for toxic and other unique chemicals, e.g., hydroxylamine nitrate. Yet, even common chemicals like carbon dioxide, used for smothering fires, have resulted in injury and death by asphyxiation when proper attention was not given to design, operation, and training.

This Chemical Work Planning (CWP) guide is "work-in-progress" and *represents the combined efforts of DOE professionals in chemical safety, occupational medicine, and work planning. The CWP* follows much of the format and adopts many of the features of the Hanford Automated Job Hazard Analysis User's Guide that applies to all hazards including chemical hazards. The CWP also incorporates best practices on chemical safety from the Rocky Flats' JHA and the Job Hazards Checklist approach used by Idaho. The purpose of the CWP guide is to assist other DOE sites in developing their own guides for controlling onsite chemical hazards in work activities.

2.0 Adequacy of Work Control

Work planning and control should include: (1) a team approach, (2) early worker and ES&H involvement, (3) a graded approach, (4) requirements management, (5) communication of hazards and controls, and (6) a post job review.

2.1 A Team Approach in Hazard Identification, Analysis, and Control Process

* The optimum situation is a work team that both plans and conducts the work, and whose efforts are supported by subject matter experts (SMEs) based on hazards or compliance issues. This approach should be used, especially for higher risk work activities.

* When workers who help plan the work are not the same ones who do the work, then a combination of training, pre-job briefing, and communication to prepare the work crew, as well as perhaps initial shift supervision or ES&H support become even more essential to safe and reliable operations.

* The full multi-disciplined team is not always needed, e.g., where the risk and complexity are low enough to work the job based on craft skills and past experience.

* It is important that the right people are involved early and communicate often and at the appropriate stages of planning. This may not require that the whole team meets for every planning session.

* Work teams do not always have to be organized as permanent, long standing teams. Teams can be formed for any specific work activity, disbanded, and new teams reassembled as new work is identified.

2.2 Early Worker and ES&H Involvement

* Involvement of workers/members of the craft assigned to the job.

* Early involvement of ES&H specialist and SMEs, if needed, based on hazards or compliance issues identified.

** Early involvement with Occupational Medicine Department to assure that fitness for duty determinations, surveillance/monitoring, and preparations for treatment of potential injury/illness are appropriate to the task.*

2.3 Planning and Conducting Work Using a Graded Approach Based on Risks and Complexity

* A key concept in using a graded approach for work planning and execution is applying the "balanced combination" of craft skills, written guidance, and work site supervision. The lower the risk and complexity, the more reliance that can be placed on craft skills as a primary means and control measure for safe and reliable work. The higher the risk and complexity, the more that work site supervision and written guidance/instruction are required to supplement craft skills.

* Each contractor or subcontractor and/or facility should have or develop work control documentation that defines how the graded approach is applied for work planning and specifically how the JHA, the balanced combination, and concepts such as team approaches are

applied based on risk and complexity.

* For low risk and low complexity tasks (sometimes referred to as "minor maintenance", "routine", or no "planning required") do not require an JHA, although a standing JHA can be prepared, if desired. *Written maintenance procedures for* craft skills are the primary control. Team planning, supervision, and work instruction are limited, if needed at all. The "team" for low risk and complexity work may only be the worker and supervisor with the work coordinated with the facility manager/representative.

* A "Standing JHA" provides an affective hazard analysis for low to moderate risk/complexity work activities that are regularly performed, such as preventive maintenance. A Standing JHA is effective for a period of time (for instance, one year). Whenever the activity is planned and conducted, the Standing JHA is used. However, if the hazards of the work change (e.g., due to varying locations), the Standing JHA may need to be revised or supplemented, or a new JHA may need to be done each time. If a Standing JHA is not adequate, for any reason, review of the work activity and completion of a task specific JHA must be conducted by the work planning team.

* For recurrent, low to moderate risk and complexity tasks (sometimes referred to as "skill of the craft"), a Standing JHA is highly recommended. Again, craft skills are a primary control. However, some degree of supervisory instruction, general work instruction (e.g., guideline instructions or an equipment manual), and discretionary ES&H consultation supplement craft skills. ES&H is involved in the Standing JHA completion, depending on hazards, but usually not each time the work is planned and conducted. The team may be the planning coordinator, supervisor, facility manager/representative and worker supplemented with discretionary ES&H consultation, but with ES&H participation (dependent on hazards) during preparation of any Standing JHA.

* Moderate to high-risk tasks require completion of an JHA every time the work is conducted. ES&H support, supervision, and work instruction are essential to supplement craft skills. In this case, team planning integrates a variety of disciplines based on the work challenges and hazards identified. Multi-disciplined teamwork is applied involving various SMEs, engineers, operations, workers, planning coordinators, supervisors, facility manager/representative, etc. depending on the hazards and compliance issues.

2.4 Requirements Management

Federal and state regulations, site policies and procedures, and facility specific requirements documents are properly referenced

2.5 Communication of Hazards and Controls throughout Planning Process

* Early preliminary identification of possible hazards, e.g., by using checklist of chemical hazards, to trigger involvement of SMEs, if necessary.

* *Notification of Occupational Medicine Department as soon as potential health hazard needs have been identified.*

* Ongoing communication between all those participating in planning regarding all hazards and controls associated with the work.

* Effective integration of requirements and controls through ongoing communication and interaction to ensure effective controls across disciplines and to avoid conflicting control actions.

* This also provides the basis for pre-job briefings and work reviews to ensure effective communication before and during work activities.

2.6 Post Job Review

* Whether a Standing or New, Task Specific JHA is used for the job, a Post Job Review should be applied at the discretion of the work planning team to provide for regular feedback, lessons learned, and continuous improvement.

* Should be used to ensure that the risk and complexity approach is effective and that the JHA is being used effectively in work planning and execution.

3.0 Chemical Risks and SMEs

This section provides general guidance on the identification of moderate to high risk and complexity work activities. The approach uses a specific set of questions that a planning facilitator would be asked to answer. A "yes" to a question on this list indicates that the work activity involves moderate to high risk/complexity. A "yes" also provides preliminary information about the job's hazards and more importantly, should trigger further analysis and the involvement of specific subject matter experts. A sample list of questions is given below:

1. Has any chemical been proposed for the project that has not been authorized for use, i.e., the chemical has not been evaluated for hazards and handling and has not been entered into the site chemical inventory system? SME triggered: Industrial Hygienist (IH)/Chemist

2. Has the proposed use of highly hazardous chemicals on the job/project been analyzed for possible risk reduction alternatives including use of less hazardous chemicals and smaller quantities? SME triggered: IH/Chemist

3. Does the work involve nonroutine use of unfamiliar chemicals or chemical blends not fully addressed by Material Safety Data Sheets (MSDSs) ? SME triggered: Chemist/Chemical Expert

4. Does any of the chemicals associated with the job/project have a NFPA health rating > 1? (NFPA ratings refer to the National Fire Protection Association's 704 hazard identification

system). SME triggered: IH/ Chemist or Supervisor/Manager with appropriate experience

5. Does any of the chemicals to be used have a NFPA flammability rating > 1? SME triggered: Fire Protection Professional/Specialist or Supervisor/Manager with appropriate experience

6. Does any of the chemicals to be used have a NFPA instability rating > 0? SME triggered: IH/Chemist or Supervisor/Manager with appropriate experience

7. Does any of the chemicals to be used have a NFPA special rating? SME triggered: Hazard dependent

8. Will the job/project involve legacy or residual chemicals that may pose chemical instability due to aging or storage conditions? SME triggered IH/Chemist

9. Does work involve uncharacterized chemicals or wastes (includes suspected container mislabeling and unknown piping/equipment contents)? SME triggered: Chemist/Chemical Expert

10. Are chemicals stored or used near work activity that could reasonably impact the work (or vice versa), i.e., result in interaction between chemicals or between chemicals and other materials in the workplace, or result in worker exposure to chemical vapors, mists, fumes, dusts in the event of an accident? SME triggered: IH/Chemist

11. Is there a potential for an accidental spill or release to the environment? SME triggered: Environmental Specialist

12. Could the activities have the potential to violate the Facility Authorization Basis for chemical exposures? SME triggered: IH/Facility Manager

13. Could workers be exposed to chemical hazards where emergency response training and spill containment may be needed in the event of an accident? SME triggered: IH/Chemist

14. *Does the work involve the use of chemicals or related activities for which a site medical surveillance program is in place? SME triggered: Occupational Medicine/Physician*

15. *Has any worker not been medically cleared to wear the appropriate personal protective equipment, such as respiratory protection or latex gloves? SME triggered: Occupational Medicine/Physician*

16. Would chemical to be used exceed the threshold quantities of the facility safety analysis report or emergency preparedness hazard evaluation? SME triggered: Facility Safety Representative

17. Does any of the chemicals for the project exceed the threshold quantities of either the

OSHA Process Safety Management (PSM) or the EPA Risk Management Program (RMP) rules? SME triggered: Process Safety Representative

18. Are explosives or potentially explosive chemicals involved? SME triggered: Explosives Expert

19. Does the work involve disabling (short or long term) a safety system designed to prevent or mitigate an accident resulting from chemical or flammable/combustible materials handling, processing, storage ,or disposal? SME triggered: Facility or Process Safety Representative and possibly others

20. Does the work involve new or specialized chemical processes or systems, with which craft are not well experienced? SME(s) triggered: Facility or Process Safety Representative and possibly others

21. Does the work involve the manipulation, coordination, or operation of multiple components? SME(s) triggered: Facility or Process Safety Representative and possibly others

22. Does the work involve an understanding of a combination of applicable regulations and requirements? SME(s) triggered: ES&H Personnel

4.0 Elements of a JHA

Elements of a JHA consist of: (1) description of job/project, (2)hazard identification, *(3) work force information*, (4) requirements, (5) information/guidance, (6) forms/permits, where applicable, (7) controls, (8) safer process options, (9) involvement of SMEs., where needed, (10) JHA report.

4.1 Job/Project Description

A complete job/project description including location and chemicals to be used enables the identification and understanding of hazards.

4.2 Hazard Identification

Work hazards fall into two general categories: "work activity hazards" and "interfacing hazards". Work activity hazards are those arising from the discrete work activity itself while interfacing hazards arise from external contributors that may not be considered central to the work itself but yet are significant and must be considered in the JHA.

4.2.1 Work Activity Hazards

Once members of the JHA team including the SME(s) are identified, the JHA begins with a walkthrough of each task element of the job. Once all team members are fully aware of the job

and its scope, the hazards and potential event scenarios are identified for each task element with team members making contributions based on experience and expertise. *Applicable lessons-learned analysis of past events from internal/external sources should also be reviewed.* The potential for each event scenarios is evaluated based on the controls in-place or needed.

A complete listing of all chemicals to be used for the job/project along with other chemicals that may be involved in the event of an accident is prerequisite to the identification of chemical hazards. Some of the chemicals, e.g., the less familiar substances/blends and all new chemicals need to be evaluated. In high risk cases, the work planning/review should include a chemical expert, and a chemical safety inspection/walkdown of the involved area with the expert may be necessary for the proper evaluation of the chemical hazards. *The Occupational Medicine Department should also be informed in order that they can be prepared to deal with accidental exposures to these hazards.*

Tools to identify and analyze chemical hazards include: (1) MSDSs, (2) site/facility records/compendium of past JHAs, (3) DOE-complex computerized JHA programs, and (4) industry assistance through EH-5, DOE HQ.

4.2.2 Interfacing Hazards

Interfacing hazards are those "external" to the discrete work activity. Depending on the particular design of the JHA procedure developed at a site, some or all of the following may be thought of as external contributors:

-- chemical process systems, laboratory equipment, or industrial equipment

-- facility and support systems, such as alarms, electrical supply, gas supply, or access/egress issues

-- concurrent work activities, impact on work activity and vice versa
-- rare events such as external accidents, fires, and natural phenomena

The team must be familiar with the analyses regarding the above, judge whether further information or analysis is needed and consider interfacing hazards within the JHA when pertinent. Scheduling of concurrent work activities and the potential impact of the work being analyzed on other work activities or building operations need to be determined and appropriate contacts and work authorizations processed.

Hypothetical examples of interfacing hazards in a laboratory could involve a fuming chemical reaction in a vessel heated over a narrow temperature range with a hot plate under a hood. If the hot plate were to malfunction and overheat, there could be a run-away reaction. This would be an example of an equipment hazard contributor. Even if the hot plate were operating properly, there may still be facility hazard contributors to consider. If the facility power were interrupted and there were no backup power or if the backup power failed to come on, the

reaction would continue in spite of the loss of electrical power due to the latent heat stored in the hot plate, but the fumes would not be vented as a consequence of the loss of ventilation.

4.3 Work Force Information

One goal of safety and health protection programs is to create a record linking information on job hazards to the individuals who are exposed to those hazards. This is essential for understanding whether the health problems occurring in the work force could be related to work. Associating JHAs with rosters of individuals performing the work helps further this goal. Full identification requires name, date of birth, and social security number. At most sites, a badge or other employee number is a suitable substitute since this can be used to obtain complete identifying information from the personnel department. However, for subcontractors and other non-employees, collection of complete identifying information may be needed. If assignments preclude some members of the crew from being exposed to the hazards analyzed, then this should be noted.

The information in the JHAs should be adequate to assist in targeting individuals for inclusion in medical surveillance programs aimed at early detection of illness or injury that might result from work. Unique hazards may trigger the need for fitness for duty medical examinations to rule-out participation of individuals with preexisting health problems that make them especially susceptible to harming themselves or others.

4.4 Requirements

The following list is not intended to be all inclusive, but rather to provide guidance regarding some of the pertinent regulations applicable to all prime contractors:

* 29 CFR 1910 OSHA Subpart Z - Toxic and Hazardous Substances
* 29 CFR 1910.20 - OSHA Access to Employee Exposure and Medical Records
* 29 CFR 1910.119 - Process Safety Management of Highly Hazardous Chemicals
* 29 CFR 1910.1000 - OSHA Air Contaminants
* 29 CFR 1910.1200 - OSHA Hazard Communication Standard
* 29 CFR 1910.1450 - OSHA Occupational Exposure to Hazardous Chemicals in Laboratories
* 29 CFR 1926.59 - OSHA Hazard Communication for Construction Activities
* 40 CFR Part 68 - EPA Risk Management Program
* 40 CFR 370 and 372 - EPA Superfund Amendments and Reauthorization Act (SARA), Title III of SARA, is known as the Emergency Planning and Community Right-to-know Act
* 40 CFR 261,262, and 263 - EPA Resource Conservation and Recovery Act (RCRA)
* 49 CFR - Transportation
* State Regulations

Other guidance/requirements are:

* Applicable site manuals/documents that are pertinent to chemical safety and industrial hygiene, e.g., those on fire protection, explosives safety, carcinogen control, hazard communication, and respiratory protection.

* Threshold Limit Values for Chemical Substances and Physical Agents, American Conference of Governmental Industrial Hygienists (ACGIH)

4.5 Information/Guidance

The JHA should include safety information and/or guidance for workers and craft skills performing the work, such as the following:

1. Supervisors and workers who use, handle, store or transport hazardous chemicals and chemical products should have hazard communication classroom training. Facility and job specific hazard communication should also be required.

2. Pre-job briefings and safety meetings should be used to provide activity or facility/project specific information and training on chemical hazards and controls. The JHA output can serve to support this training/briefing.

3. The Material Safety Data Sheets (MSDS) for chemicals are an excellent source of information regarding chemical product constituents, toxicity, flammability, etc.. If the MSDS doesn't fully address your situation, contact your chemical expert and have the expert contact the supplier/manufacturer, if necessary.

4. If feasible, select chemicals and products that are of relatively lower toxicity, flammability, corrosivity, and/or reactivity. Many times, replacement of more hazardous chemicals with less hazardous ones is the best hazard control measure.

5. When evaluating the hazard that the chemical agent poses to the worker, exposure through inhalation is often one of the first things considered. Be sure to also consider the skin and eye hazards.

6. Work with carcinogens, especially OSHA carcinogens and ACGIH A1 and A2 carcinogens, should be considered a high risk activity. Hazard controls, training, work site supervision, industrial hygiene support, work practices, and work instructions should reflect the higher level of risk.

7. Substance specific OSHA standards apply to certain chemicals (e.g., benzene, lead, inorganic arsenic, formaldehyde). Refer to these standards for specific requirements.

8. When work does not directly involve chemicals, but is being performed in areas where chemicals/products are stored or used, plan the work activity to protect against damaging, spilling, releasing, igniting, or otherwise impacting these chemicals and products. Reasonable "worst-case" scenarios should be analyzed with help of chemical safety experts.

9. Chemical interaction with materials in the room/space and consequences from inadvertent activation of safety systems, e.g., fire suppression systems using water and carbon dioxide, may need to be considered. Notes: Water reacts violently with certain chemicals. A release of carbon dioxide could result in an asphyxiating atmosphere and reduced visibility for egress. *Enclosed spaces and "low points" subject to potential buildup of gases should be evaluated to prevent personnel becoming poisoned or overcome.*

10. In the use or storage of chemicals, be sure to avoid containment vessels and structural containment materials that are incompatible.

11. When using or handling chemicals in radiological areas, be sure to avoid or minimize generation of mixed wastes, whenever feasible. See your Industrial Hygienist, RadCon Representative, and or Environmental Officer/Representative.

12. Always consider waste minimization, pollution prevention, and recycling and reuse when dealing with chemicals and chemical products.

13. Your Industrial Hygienist should evaluate the hazard posed by the chemicals or chemical products and select hazard controls, especially when conducting tasks of relatively higher risk. The potential magnitude and duration of exposure is a key factor in determining hazard controls.

14. Engineering controls, such as local exhaust ventilation, are preferred over personal protective equipment (PPE) and respiratory protection. Administrative controls, such as work practices and controlling duration of exposure are also preferred over PPE and respiratory protection.

15. Exposure monitoring should be conducted when there is a possibility that exposure could exceed one half the occupational exposure limit (OEL), to verify that controls are effective, when activities are of relatively higher risk, when required by specific OSHA standards or other requirements documents, and when deemed appropriate by your Industrial Hygienist.

16. Exposure or potential exposure to certain chemical agents at or above an exposure criteria requires medical monitoring for employees so exposed. Medical monitoring is required as a prestart item in certain cases, depending on the agent, exposure level, *and preexisting health problems of workers.*

17. *The Occupational Medicine Department should be contacted in advance of the use of hazardous chemicals to allow physical baselining of workers and emergency planning that includes the treatment of casualties in the event of accidental exposure.*

18. All spills/releases/permit exceedances must be reported immediately to the site Point-of-Contact.

4.6 Forms/Permits

Forms and permits help in preparing, performing, reviewing, and verifying work activities, such as pre-job briefing form, walkthrough form, work instruction forms (prestart, during work activity, and post job review) and others. At a minimum, the information provided should contain the following:

-Chemicals Involved ----------
-Job Leader/Requisitioner ----------
-Date-------- Time----------
-Job/Use Location----------
-Job/Use Description----------
-Hazard Review Team:
- Chemical Safety Expert(s)----------
(If level of knowledge inadequate for assessing hazard, get the right information or someone who has the expertise)
- Supervisor----------
- Workers--------,--------,----------

4.7 Control Measures for Chemical Hazards Management

4.7.1 Purchase of Chemicals

-Review for waste disposal problems
-Minimize products that become hazardous waste if not used
-Exclude/minimize acute hazardous substances
-Select least hazardous alternatives
-Avoid products difficult to handle/store/dispose
-Use just-in-time ordering to avoid warehousing
-Size package/quantity to avoid waste

4.7.2 Effective Chemical Management

-Life cycle chemical tracking
-Bar coding
-Chemical/Laboratory safety training
-Minimization of chemicals at all facilities
-Annual reconciliation audits of chemicals
-Characterization of unknown chemicals
-Chemical compatibility in storage

4.7.3 Chemical Safety Inspections/Walkdowns

-Regular scheduled basis
-Management/Supervisor participation

4.7.4 Personal Protective Equipment

-Apron
-Faceshield
-Glasses/Goggle
-Gloves
-Lab coat
-Respirator

4.7.5 Safety Equipment

-Eye wash fountain
-Emergency shower
-Extinguisher

4.7.6 Fire/Explosion Prevention

-Avoid chemical incompatibilities/conditions for generation of high energy
-Monitor for flammable atmosphere
-Eliminate ignition/spark sources
-Monitor exothermic processes

4.7.7 Prevention of Hazardous Atmospheres

-Avoid chemical incompatibilities/conditions for generation of toxic gases/fumes
-Maintain adequate ventilation/oxygen
-Monitor confined spaces
-Inspect fume hoods

4.7.8 Spill Prevention/Response/Cleanup

-Review chemical transfer procedures
-Analyze spill potential
-Review need for containment
-Review adequacy of spill response plan
-Review adequacy of emergency response plan
-Close drains and vents
-Drain and purge lines

4.7.9 Proper Labeling/Handling/Storage

-Carcinogens
-Corrosives
-Flammables
-Gas cylinders
-Oxidizers
-Toxic/highly toxic
-Other hazardous chemicals

4.8 Checklist For Safer Process Options

Unnecessary hazards may be present due to safety deficiencies in existing system designs/operations, e.g., residual energy in a system during shut-down. The JHA process needs to consider the existence of such hazards and to take steps to eliminate or reduce to a safe working level where such hazards are present before work begins. Often, such hazards are difficult to find. A good practice to help ensure safer work activities is to use or to change over to inherently safer designs or chemical processes, whenever possible.

The JHA process could also be used to provide feedback for improving plant/facility safety. In job planning and hazard analysis for specific tasks or projects, the JHA team in their review of the job/task and work area involved should report observations that could help improve safety in equipment design and process operations. The Center for Chemical Process Safety has developed a checklist on safer process options (Ref: "Inherently Safer Chemical Processes", Center for Chemical Process Safety, 1996). A partial list of trigger questions from their checklist is given below:

4.8.1 Minimize hazardous materials

-Have all in-process inventories of hazardous materials in storage tanks been minimized?
-Are all of the proposed in-process storage tanks really needed?
-Has all processing equipment handling hazardous materials been designed to minimize inventory?
-Is process equipment located to minimize length of hazardous material piping?
-Can piping sizes be reduced to minimize inventory?
-Can other types of unit operations or equipment reduce material inventories?
-Is it possible to generate hazardous reactants "in-situ" from less hazardous raw materials?

4.8.2 Substitution/Elimination of hazardous chemicals

-Is it possible to completely eliminate hazardous raw materials, process intermediates, or by-products by using an alternative process or chemistry?
-Is it possible to substitute raw materials that are noncombustible, less volatile, less toxic, less reactive?

4.8.3 Moderate conditions

-Can the supply pressure of raw materials be limited to less than the working pressure of the vessels they are delivered to?
-Can reaction conditions (temperature, pressure) be made less severe by using a catalyst, or by using a better catalyst?
-Can the process be operated at less severe conditions? If this results in lower yield or conversion, can raw material recycle compensate for this loss?
-Is it possible to dilute hazardous raw materials to reduce the hazard potential? For example, aqueous ammonia instead of anhydrous, or aqueous HCl instead of anhydrous.

4.8.4 Simplify design or process

-Can equipment be designed sufficiently strong to totally contain the maximum pressure generated, even if the "worst credible event" occurs.
-Can several process steps be carried out in separate processing vessels rather than in a single multipurpose vessel to reduce the potential for hazardous interactions?
-Can equipment be designed such that it is difficult or impossible to create a potential hazardous situation due to an operating error, e.g., by opening an improper combination of valves?

4.8.5 Safer Location/Siting/Transportation

-Can process units be located to reduce or eliminate adverse impacts with adjacent hazardous installations?
-Can process units be located to eliminate or minimize on-site/off-site impacts?
-Can the plant site be chosen to minimize the need for transportation of hazardous materials and to use safer transport methods and routes?
-Can a multistep process, where the steps are done at separate sites, be divided up differently to eliminate the need to transport hazardous materials?

4.9 Involvement of SMEs

Once SMEs are identified, the SMEs are notified of their involvement. The degree of involvement is based on risk and complexity, ranging from a telephone call and brief discussion to detailed planning sessions, walkthroughs, and control development. Work can not begin until there has been signature approval by the SMEs.

4.10 JHA Report

For low to moderate risk/complexity activities, the JHA report could often represent much or all of the work package. This particularly true where detailed, verbatim work instructions are not generated, and where tracking of labor and materials is fairly straightforward. For other cases, the information in the JHA can be incorporated into the work package without incorporating a lot of the JHA paperwork. For instance, hazards and controls identified and specified in the JHA can be built into work instructions or other parts of the work package.

5.0 Guide for An Automated JHA (AJHA) System

An automated system should use windows and "point and click" retrieval of input screens and guidance information. It should have easy accessibility and user friendly features such as a navigation screen that guides the user through the steps in developing a JHA and forces the user to insert the required information. An AJHA system needs to include inventory and status information on all JHAs for the facility. An example of a good AJHA is the DOE Hanford model. Some of the "good practices" of the Hanford model are briefly described here.

5.1 Hanford AJHA Inventory and Status Information

Hanford's inventory screen includes all previous AJHAs completed, as well as those in process. It also stores all forms and permits that have been created as part of the AJHAs. AJHAs are stored in the following categories: (1) prescreen only, where prescreening for procedure/work instruction adequacy or a risk/complexity determination indicated that a new AJHA was not required, (2) AJHA initiated/AJHA not completed, (3) AJHA completed/work not complete, (4) standing AJHA, (5) standing AJHAs about to expire, (6) inactive AJHA.

AJHAs can be edited/viewed, revised, cloned, or printed from the AJHA Inventory listings. The inventory screen also has places for a listing of forms/permits that have been created as part of the AJHA and for a listing of SME involvement. The latter provides real time information to alert any SME discipline as to which AJHAs have triggered their involvement. By reviewing this part of the inventory daily, the SMEs can have early notification of their needed input.

5.2 Hanford Navigation Screen

The Hanford model uses a navigation screen that includes key functions that pulls up additional screens for: (1) task information, (2) procedure adequacy, (3) risk and complexity, (4) hazards identification, (5) controls selection, (6) forms/permits, (7) SME involvement, and (8) finalizing and printing JHA report.

It should be mentioned that the task information screen allows the task to be divided into a main task and as many as three subtasks such that different hazard and control sets can be developed for the situation where the distinct phases of the work have different types and/or degrees of hazards. In all cases, information from this screen (e.g., the location and description of the task(s)/work) will automatically populate into most forms and permits that are created as part of the AJHA.