

## WORK PLANNING and HAZARD ANALYSIS

### INTRODUCTION

Careful planning of work assures that the work is performed efficiently and safely. Hazard analysis is a critical part of work planning. Work planning ensures the scope of work is understood, appropriate materials are available, all hazards have been identified and mitigative efforts established, and all affected employees understand what is expected of them.

This policy applies to all Fermilab personnel, including experimenters, temporary employees and subcontract/ term employees. Specific procedures for service and construction subcontractors may be found in the FESHM 7000 chapter series.

### DEFINITIONS

**Hazard Analysis** – Tool used to plan work.

HA Form PDF Version - [http://www-esh.fnal.gov/FESHM/2000/2060\\_FormHA.pdf](http://www-esh.fnal.gov/FESHM/2000/2060_FormHA.pdf)

HA Form Word Version - [http://www-esh.fnal.gov/FESHM/2000/2060\\_FormHA.doc](http://www-esh.fnal.gov/FESHM/2000/2060_FormHA.doc)

**Job Site Walk Down** – A visit to the job site for the purpose of identifying work control and ES&H issues that must be addressed prior to beginning work.

**Pre-job Briefing** – Dialogue between supervisor and those involved in the work to ensure that all understand the scope of what is to be accomplished, procedural steps, roles and responsibilities, and hazards and controls.

**Post-job Review** – A review of the work that has been performed to identify any improvements or experiences that should be recorded for future job planning efforts.

**Work Planning** – Systematic process for determining methods for completing the assigned task safely and efficiently. The process includes defining the work to be performed and the methods for performing the work, identifying the hazards and their controls, hazard analysis (possibly a written one) and a pre-job briefing.

### POLICY

All work activities shall be subjected to work planning and hazard analysis (HA). Depending on the complexity of the task and the hazards involved, the HA process may be a mental exercise and verbal discussion, or it may be more formal with a written hazard analysis and pre-job briefing. **Table 1 provides guidelines to assist in making**

**that determination.** Employees and supervisors are to use their professional judgment in determining the need for a written HA. The advice of the division/ section Senior Safety Officer (SSO) or ES&H Section should be sought if assistance is needed.

## RESPONSIBILITIES

**Division/Section Heads** are responsible for ensuring that this policy is implemented within their division/ section.

*Note: A division/section head may choose to impose more stringent requirements than those described in this policy. Additional requirements must be documented by internal procedures.*

**Supervisors and employees** are responsible for planning their work, and identifying those activities that require a written HA. Table 1 is a guideline in determining when a written HA is required. The supervisor is also responsible for:

- Ensuring that HAs are developed and reviewed by the employee before work begins.
- Ensure written HAs are signed by the affected employees.
- Seeking advice from Senior Safety Officer or others, as appropriate.
- Approving written HAs completed by employees in their group.
- If allowed by the work environment, conducting a job walk-down in those instances where a written hazard analysis is required.
- Conducting a pre-job briefing with employees before work begins.
- Ensuring that employees are trained in the process of developing an HA.
- Ensuring that employees are trained to work in the area of the job and trained in the tools/ equipment to be used in the completion of the job.
- Assuring that the work is performed in accordance with the hazard analysis.

**Senior Safety Officers (SSO)** or designee, are responsible for providing technical expertise in job planning and preparing written HAs.

**The ES&H Section** will provide training support by developing a standard lesson plan for preparing a work plan and writing HAs. The ES&H Section will also provide assistance in preparing and reviewing HAs upon request.

## WORK PLAN PROCESS

The work plan process consists of six elements: job site walk down, hazard analysis, pre-job briefing, performance of the work, post-job review, and HA record retention.

### 1. Job Site Walk Down

In those instances where the job site can be safely accessed, an inspection of the job site shall be conducted. Ideally this inspection should be conducted prior to developing the hazard analysis in order to assure all job site hazards and work

control issues are identified and addressed. Otherwise, the job site walk down shall be conducted by the workers performing the work prior to beginning work, as part of the pre-job briefing.

## 2. Hazard Analysis

- a. The supervisor and employees develop the hazard analysis. The results of the job site walk down shall be incorporated into the hazard analysis. ES&H professionals are available within all divisions/ sections to assist in the development of that HA.
- b. Using Table 1 as guidance, the supervisor and employees will determine if a written hazard analysis needs to be prepared, and then do so if required. Technical Appendix 2060-1 provides guidance in completing a written HA.
- c. If a written HA already exists, it must be reviewed and revised as appropriate for actual job site conditions and to incorporate previous work experiences and lessons learned.
- d. The preparation of the HA will include or involve the following aspects.
  - Detailed scope of work, including how the person/ team intends to complete the work;
  - Walk down or inspection of the work area and equipment while planning the work;
  - Identification of materials to be used
  - Identification of hazards;
  - Identification of work requirements, controls, procedures, instructions and personal protective equipment necessary to perform the work safely (including permits); and
  - Involvement of the workers in the preparation of the work plan.
- e. The level of detail in the HA should be relative to the complexity of the work and the hazards involved with the activity. For instance, cleaning and painting magnet components on an open worktable would require less detail than the same activity in the Main Injector Tunnel while standing on a ladder. The attached form shall be used to document the HA.
- f. The supervisor will review the HA for completeness and thoroughness and determine whether the hazards for the work activity have been adequately identified and controlled. Permits, Material Safety Data Sheets, etc., shall be attached to the written hazard analysis (to the extent possible) to consolidate the work package. The supervisor will then approve the HA.
- g. An additional written HA is not required if the work activity is performed under a standard operating procedure or if the work activity involves the use of a permit where all the hazards and their mitigation requirements are identified and addressed. Examples of this could include

lockout/ tagout procedures, radiation work permits, confined space permits, excavation permits, and electrical hazard analysis/ work permits. In all cases, job planning and some form of pre-job briefing are required.

- h. "Generic" HAs may be used. Generic HAs are those that would be routinely used for a specific activity (e.g., asbestos removal). They shall be reviewed by employees and updated as necessary prior to each specific activity to ensure that all hazards of the work and the job site are addressed. In all cases, some form of pre-job briefing at the job site is required.
  - i. Emergency repair activities may be required during off-shift hours. If a written procedure or hazard analysis for the work to be performed exists, it shall be reviewed and updated to incorporate field conditions. If a hazard analysis needs to be written, this can be done in the field. Verbal approval from the supervisor is to be sought in lieu of a signature. In all cases, a pre-job briefing is required. **Under no circumstances** shall an emergency serve as reason for ignoring established safe work practices.
3. Pre-Job Briefing
- a. Regardless of whether the HA is a mental or written exercise, the supervisor and employees performing the job shall discuss the work plan to ensure everyone is aware of how the job will proceed. For low-risk tasks the briefing may be a quick exchange between the supervisor and employee(s), or a mental review by the employee. For more complex and higher-risk tasks, a more detailed and formal pre-job briefing is required. The HA form can be used to conduct this briefing. The pre-job briefing shall consist of the following:
    - Summarizing the critical steps and materials.  
This would include steps where the success depends solely on the individual work, and that serious injury or significant loss of property could result from not following the prescribed safe work procedures.
    - Anticipating what can go wrong or where errors can occur.  
This would include distractions, confusing procedures, inexperience and assumptions. Examining what errors have occurred with the activity in the past may be helpful.
    - Foreseeing consequences  
What is the worst that could happen? Work plans should incorporate defenses to prevent the incident.
    - Review operating experience.  
How has the task gone in the past? Work plans should incorporate defenses to prevent a repeat incident. The SSO is a good informational source in this area.
    - Review of Equipment  
Review of PPE, equipment necessary for the job, engineering controls, and equipment controls.

- b. All who review the written HA will document the review by signing the form. Only then will the supervisor allow the work to begin.
4. Performance of Work
  - a. The work plan/ hazard analysis shall be posted in the work area or shall be readily available to those performing the work. Any visitors to the job site must also review and sign the written HA.
  - b. The work activity must be completed in accordance with the HA. If there is a change in the work scope, if work conditions change or if new hazards are identified, or the controls prove inadequate or ineffective, the work activity shall cease immediately. The HA shall be reviewed by the employees and supervisor, revised as necessary, and approval/ concurrence obtained before the work is continued.
5. Post Job Review

After the activity has been completed, the HA should be updated to include improvements that were identified while performing the work. This will help assure better planning and a safer work experience the next time the job has to be performed.
6. HA Record Retention

The supervisor will keep a copy of the HA for training employees. These will be made available to the SSO or anyone who requests them, for the purposes of providing oversight, trending, and/ or lessons learned.

In general, a written work plan/ hazard analysis should be kept on file for 1 year.

**Table 1 Written Hazard Analysis Guideline**

**These are guidelines for determining when a written hazard analysis is necessary. They are intended to be used as guidance and not to limit sound professional judgment.**

| Category                                    | High-Level Hazard  |
|---|--|
| Radiological Work                           | <ul style="list-style-type: none"> <li>When a Radiation Work Permit is required and not all hazards can be incorporated into the RWP. (See FRCM Article 322)</li> </ul>  |
| Electrical work                             | <ul style="list-style-type: none"> <li>Work activities near or on exposed electrical conductors, circuits, or equipment that are or may be energized and where there is a significant and unmitigated exposure to electrical shock or a significant potential for arcing, flash burns, electrical burns, or arc blast* (FESHM 5042)</li> <li>When not all hazards can be incorporated into the Electrical Hazard Analysis/ Work Permit.</li> </ul> |
| Confined Space Work                         | <ul style="list-style-type: none"> <li>Permit required confined space entry (FESHM 5063) where and when hazards cannot be adequately addressed in the permit</li> </ul>  |
| Crane & Hoist Usage                         | <ul style="list-style-type: none"> <li>Load requires exceptional care in handling because of size, shape, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors (FESHM 5021)</li> <li>Load tests at 100% or 125% of rated capacity (FESHM 5021)</li> </ul>   |
| Excavation and digging                      | <ul style="list-style-type: none"> <li>Digging or excavating in area where the potential exists for encountering buried utilities (FESHM 7030)</li> <li>Employees entering excavation/ trench that is <math>\geq 4</math> feet in depth</li> <li>When not all hazards can be incorporated into the Excavation Permit.</li> </ul>   |
| Hazardous substances & regulated pollutants | <ul style="list-style-type: none"> <li>Potential for release of hazmat on-site in quantities &gt; 50% of "Reportable Quantities" (40 CFR 302 and 40 CFR 355)</li> <li>Potential for release of 42 gallons or more of petroleum, fuel oil, oil refuse, and oil mixed with wastes (40 CFR Part 112.4(a))</li> </ul>  |
| Chemical Usage                              | Use of materials that are flammable, combustible, corrosive, reactive, toxic, caustic, poisonous, where the quantity or manner of use is hazardous to the health of the workers, the environment, or presents a potential for fire/ explosion  |
| Respiratory and Hearing Protection          | Work requiring hearing or respiratory protection due to exceedance of Permissible Exposure Limits (FESHM 5061 and 5103)  |
| Hazardous Substance Abatement Activities    | Work involving abatement of asbestos, lead, PCBs, or mercury   |
| Cryogenic Systems                           | <ul style="list-style-type: none"> <li>Potential for exposure to reduced atmospheric oxygen</li> <li>Working on cryogenic systems</li> </ul>   |
| Magnetic Fields                             | <ul style="list-style-type: none"> <li>Potential for exposure in excess of action limits established in FESHM 5062.5</li> </ul>  |
| Lasers                                      | <ul style="list-style-type: none"> <li>Use of Class III B or IV lasers (FESHM 5062.1)</li> </ul>   |
| Working at heights                          | Fall potential is > 4 feet when performing maintenance work, and > 6 feet when performing construction work, <b>and</b> additional fall protection is required (FESHM 5066)  |
| Stored Energy                               | <ul style="list-style-type: none"> <li>Potential for inadvertent startup of equipment</li> </ul>   |

| Category          | High-Level Hazard   |
|-------------------|---|
|                   | <ul style="list-style-type: none"> <li>• Potential for unexpected release of energy (hydraulic, pneumatic, thermal, potential, etc.) where lockout/ tag out is required</li> </ul>  |
| Tools & Fixtures  | <ul style="list-style-type: none"> <li>• In house designed or modified tools or tooling required for work activities where a tool or tooling failure could pose a risk of injury to workers.</li> <li>• In house designed or modified fixtures used for work activities where a fixture failure could pose a risk of injury to workers.</li> </ul>  |
| Sharp Instruments | Non-routine work requiring the use of sharp instruments or cutting tools where the worker is exposed to the unguarded cutting surface.  |
| Other             | <ul style="list-style-type: none"> <li>• Working with systems or equipment which are pressurized &gt; 15 psig</li> <li>• Working with vacuum vessels (FESHM 5033)</li> <li>• Work requiring welding, brazing, or open flames</li> <li>• Concrete coring and cutting when hazards cannot be adequately addressed in the Electrical Work Permit. (FESHM 7040)</li> <li>• Work requiring construction, altering, and/ or repair, including painting and decorating.</li> <li>• Materials being used in a state that is altered from its original form, that as a result may be hazardous to the health of the workers, the environment, or presents a potential for fire/ explosion</li> <li>• Activity involving a lower level hazard, but involving multiple organizations participating</li> <li>• Potential for job-induced alertness reduction (e.g., long hours, short deadlines)</li> <li>• Activities presenting lower hazards, but are performed infrequently</li> <li>• Activities presenting hazards unfamiliar to employees</li> </ul> |