

FESHM 2060: WORK PLANNING AND CONTROL

Revision History

Author	Description of Change	Revision Date
Eric McHugh	Added definitions for work group and loaned worker Added communication steps to incorporate FESHM 2020 Work Planning and Notification elements Added language to ensure 2+ persons for hazardous work in remote locations. Added and clarified language about multiple work groups, cross divisional/dept work. Added section Integrated Work Planning Risk Matrix – Clarified heading language. Added Fall exposure section, updated green hazard to include work from mobile elevating work platforms (MEWPs) Added Equipment Transportation Risks Addition of Technical Appendix to capture the Hazard Specification Sheets for enclosures accessed via the MCR	August 2022
Eric Schlatter Katie Swanson Jim Niehoff Kathy Vuletich	Added section 5.3 Record Retention.	December 2020
Eric Schlatter Katie Swanson Jim Niehoff Kathy Vuletich	Rewrite of 2060, incorporating SHAPE into work planning. Identified roles and responsibilities for Authorizing Supervisor, work planner, Point of Contact, and worker. Updated risk matrix and workflow chart. Added additional appendixes.	February 2020

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1.0 INTRODUCTION AND SCOPE

The goal of the work planning and control (WPC) process is to plan work efficiently and safely before a project or task commences. Careful planning of work assures that it is performed efficiently and safely. All work activities shall be subject to work planning and control. Work planning ensures the scope of work is understood, appropriate materials are available, all hazards have been identified, mitigation efforts established, work has been communicated to affected stakeholders, and all affected personnel understand their roles and responsibilities in the planning and execution of the work. The hazard analysis process is a critical part of work planning. The work planning and control process shall include proposing the work and defining the scope of the work, identifying hazards and controls, authorizing the work to commence, performing the work, and post work evaluation. Fermilab's program is defined by SHAPE: Scope, Hazard, Authorize, Perform, and Evaluate.

This program applies to all Fermilab personnel, experimenters, temporary employees, users and subcontract/term employees working at Fermilab and any leased spaces. The Fermilab Radiological Control Manual contains the details of work planning and control requirements pertaining to radiological work. Specific procedures for service and construction subcontractors may be found in the FESHM 7000 series.

2.0 DEFINITIONS

Authorizing Supervisor – The person responsible for reviewing and approving a work plan.

Hazard – Condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event. A hazard is the potential for harm. In practical terms a hazard often is associated with a condition or activity that if left uncontrolled can adversely affect personnel, equipment or the environment.

Hazard Analysis Process (HA) – A process used to assess risk. The result of a hazard analysis is the identification of different type of hazards and the mitigations to minimize the hazards. A hazard analysis then becomes a tool to aid in developing a work plan.

Hazard Specification Sheet (HSS) - Quick references utilizing icons to quickly communicate the unique hazards presented during entry to an enclosure. These do not cover hazards introduced that were unknown or presented by the task. Hazards not covered by the HSS may need to be documented in another way to address mitigation efforts to reduce risk to the personnel. The HSS is typically coupled to a Radiological Work Permit as determined by the accessed enclosure.

Informal Work Plan - An informal work plan is the verbal communication of the work plan that includes the scope, hazards, and mitigation measures identified in the hazard analysis process.

Integrated Management Planning and Control Tool ([IMPACT](#)) – An online tool used to create and manage work planning for various tasks. Includes functionality for authorization and

communication of the work plan.

Job Site Evaluation – An inspection visit to the job site for the purpose of identifying hazards, work controls, operational considerations and ES&H issues that must be addressed prior to beginning work.

Job Site Walk Down – An element of the pre-job briefing to inspect the work area, ensuring that all hazards and mitigation have been incorporated into the work plan while walking through steps of the job.

Loaned Worker – A worker, user, affiliate or contract employee that is loaned for work to another work group outside their typical work group or supervisory chain.

Point of Contact (POC) – A Point of Contact is an assurance role for the work planner acting as the liaison between the worker and the work planner while the work planner is not at the job location.

Pre-job Briefing – Dialogue between POC 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 best practices, lessons learned, improvements or experiences that should be recorded for future job planning efforts.

Radiological Work Permit and electronic Radiological Work Permit (eRWP) - Permit that identifies radiological conditions, establishes worker protection and monitoring requirements, and contains specific approvals for radiological work activities. The Radiological Work Permit serves as an administrative process for planning and controlling radiological work and informing the worker of the radiological conditions.

Requestor – Someone that is asking for work to be done.

Risk – Potential to cause harm or damage to a person, property or environment.

- Low/Green Risk: General tasks with a low probability to impact a person, property or environment
- High/Yellow Risk: Tasks with an elevated potential to cause harm to a person, property or environment
- Red Risk: Tasks with specific hazards that need additional controls, permits, forms, approvals

Risk Assessment – The overall process used to evaluate the hazard and risk factors with the potential to cause harm.

Standard Operating Procedure (SOP) – Formal documented process that focuses on a specific task and describes the standardized method to safely perform it. It shall address all hazards associated with the task.

SHAPE – Fermilab’s work planning and control program; defined as Scope, Hazard, Authorize, Perform, and Evaluate.

Worker – Anyone performing work including all Fermilab personnel, experimenters, temporary employees, users, and subcontract/term employees working at Fermilab and any leased spaces.

Work Group – A collection of employees, users, affiliates or contractors executing work that overlaps or is adjacent to that is common under one work planner and supervisor.

Work Notification Form (WPN) – An electronic tool to allow communication to the local occupants and stakeholders of future work that may affect them or their areas of work.

Formal Work Plan – The collection of documents that describe the work, identify the hazards and mitigation of those hazards. A work plan may be a combination of an HA, SOP, permits (Burn Permit, Confined Space Permit, Electrical Work Permit, etc.).

Work Planner – A work planner is a trained and qualified individual responsible for facilitating the activity-level work planning process in development of SHAPE.

Work Planning and Control – 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, development of hazard analysis or SOP, obtaining applicable permits, pre-job briefing, work authorization and communication of the work to affected employees and stakeholders.

3.0 RESPONSIBILITIES

All personnel have the responsibility to plan their work and implement every step of SHAPE for all tasks to work safely and efficiently. Personnel can fulfil one or multiple roles as described below.

3.1 Division/Section Heads and Project Managers (D/S/P)

The Division/ Section Heads and Project Managers are responsible for the implementation of this program within each Division/Section/Project. The requirements include:

Note: D/S/Ps may choose to impose more stringent requirements than those described in this program.

Additional requirements must be documented by internal procedures.

- Ensure all authorizing supervisors understand their roles and responsibilities within this chapter.
- Audit work plans in various stages to ensure work plans are followed.
- Establish a procedure and communicate the process of:
 - Lending workers to other D/S/Ps or groups within the D/S/P
 - Utilizing workers from other D/S/Ps or groups

- Assign the roles of authorizing supervisor and work planner
 - Ensure the appointed personnel have the skills, and experience commensurate with the task
 - Ensure that roles and responsibilities associated with this chapter are clearly communicated and understood, especially when involving multiple work groups or workers from other departments or divisions.

3.2 Authorizing Supervisor(s)

The authorizing supervisor(s) is/are responsible for reviewing the work plan including required training to ensure that the scope, hazards, and mitigations are adequately addressed to grant approval for work to the work planner.

Scope / Hazard

- Provide guidance to the work planner in identification of scope/hazards.

Authorize

- Review IMPACT/HA/SOP work plans as required and provide feedback.
- Verify the work plan has the appropriate scope with hazards and mitigation measures identified.
- Verify training is adequate for the work being performed and that workers have appropriate training.
- Authorize the work plan.

Perform

- Audit work being performed to ensure work plans are followed.

Evaluate

- Receive feedback and lessons learned to incorporate into future work planning.

3.3 Work Planner

The work planner coordinates all the activities associated with the work. The work planner ensures that all personnel are prepared (knowledge, training, PPE and tools) to conduct the work in a safe and efficient manner. If personnel are loaned to the work group from another department or division, the work planner shall ensure that all members of the work group are trained and have the tools to conduct the work in a safe and efficient manner.

Scope/Hazard

- Identify scope, hazards, mitigations, controls, and PPE.
- Identify training requirements for workers completing work.
- Ensure workers are trained to perform task.
- Submit work plan to authorizing supervisor for approval.
- Understand affected stakeholders and communicate relevant aspects of the work to ensure no conflicts

Authorize

- Understand potential affected employees and stakeholders. Communicate as necessary to make those personnel aware of work that may affect them.
- Determine and designate a Point of Contact (POC) if beneficial. *Point of Contact may be beneficial for: multiple work groups, inter-departmental crew, high hazards, and complicated or complex work.*

Perform

- Organize mobilization of tools, equipment, material, and PPE.
- Responsible for all Point of Contact's duties.

Evaluate

- Conduct post-job debrief
- Incorporate lessons learned and feedback into future work planning.
- Enter noteworthy lessons into the Lessons Learned Database within iTrack.

3.4 Point of Contact (POC)

A Point of Contact is an assurance role for the work planner acting as the liaison between the worker and the work planner while the work planner is not at the job location.

Scope/Hazard

- Complete pre-job briefing.
- POC must escalate to work planner if any aspect of the work plan is unclear.
- Verbally confirm workers are trained for specific tasks.
- Assures proper tools, equipment, material, and PPE present to perform work.

Authorize

- Assure workers have signed required formal work plan documents.
- Communicate work to affected individuals before, during and after work

Perform

- Respond appropriately to workers communication on unsafe acts, behaviors, or conditions.
- Communicate changes in scope to work planner when new hazards are identified or introduced.
- Update and communicate work plan as necessary.

Evaluate

- Conduct post-job debrief and provide feedback/lessons learned to work planner.

3.5 Worker

Anyone performing work including all Fermilab personnel, experimenters, temporary employees, users, and subcontract/term employees working at Fermilab and any leased spaces.

Scope/Hazard

- Participate in pre-job briefing.
- Verbally confirm they are trained and capable to perform specific tasks assigned to them.

- Be able to identify the work planner/POC of the work.

Authorize

- Review the work plan, sign if required.

Perform

- Understand and perform work within the scope, hazards, controls and mitigations of the work plan.
- Pause work and evaluate the work plan to capture change in scope, hazards and mitigations. Communicate changes in the work plan to the work planner or work POC and stakeholders before restarting work.
- Stop work and notify work planner/POC if they identify unsafe acts, behaviors, or conditions, or new hazards are identified.

Evaluate

- Participate and provide feedback in the post job debrief

3.6 Environment, Safety and Health Section and Subject Matter Experts

Environment, Safety, and Healthy and Subject Matter experts are available to provide guidance, expertise, and review when requested or required.

Scope/Hazard

- Provide expertise when requested.

Authorize

- Provide authorization as needed. May include DSO/SME approvals for formal work plan requirements.

Perform

- Evaluate work being performed as needed.

Evaluate

- Communicate lessons learned and feedback.

4.0 PROGRAM DESCRIPTION

Fermilab's work planning and controls process utilizes SHAPE:

- **S**cope
- **H**azard
- **A**uthorize
- **P**erform
- **E**valuate

SHAPE is the continuous process of work. All aspects of SHAPE are continually evaluated throughout the entire process of work. Personnel are responsible for working within the parameters of SHAPE.

4.1 Scope

When initiating work the scope must be clearly defined. See Appendix 1. The scope should be updated throughout the work planning process as necessary. Scope should identify the following items:

- Who
- What
- Where
- When
- How
- Why

4.1.1 Verify Scope

The scope should be evaluated by the work planner to determine if the request is appropriate and within their capabilities to complete safely. If unable to complete the scope, the work planner should communicate with the requestor.

4.2 Hazard

The hazard step of SHAPE involves analyzing the scope for a condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event. Hazards should be mitigated to an acceptable risk level to perform work, and a formal work plan may be required.

4.2.1 Hazard Analysis Process

The hazard analysis process involves considering the hazards associated with each aspect of the scope of work.

(1) Job Site Evaluation

The job site evaluation assists in the hazard analysis process and should be utilized when conditions allow at the job site location. The job site evaluation should analyze and address all aspects of the scope in the hazard analysis process.

4.2.2 Determine the Required Work Plan

The work planner will determine if an informal work plan or a formal work plan is required to proceed with the work. The Risk Matrix (Appendix 2) will guide which type of work plan is required based on the hazards identified within the scope of work.

(1) Informal Work Plan

An informal work plan is the verbal communication of the work plan that includes the scope, hazards, and mitigation measures identified in the hazard analysis process. An informal work plan is acceptable when the criteria is not met for a formal work plan to be required.

(2) Formal Work Plan

A formal work plan is required if (refer to Appendix 2) the task involves:

- Two or more green/low hazards = written hazard analysis (HA) or standard operating procedure (SOP) required.
- Any yellow/high hazard = written HA or SOP required.
- Any red hazard = permit, form, or subject matter expert (SME), Laser Safety Officer (LSO), Authority Having Jurisdiction (AHJ), or Division Safety Officer (DSO) approval required.

(a) Elements of a Formal Work Plan

The preparation of a formal work plan may include the following elements based on the hazards identified in the hazard analysis process:

- Written hazard analysis – See section 5, Requirements of Formal Work Plan Documents.
- Permit or Form – Additional information for requirements of individual permits/forms can be found in their respective FESHM chapters.
 - Contact your DSO to determine if an additional written HA/SOP is needed.
- Approval from SME/DSO
- Standard operating procedure – see section 5, Requirements of Formal Work Documents.

(3) Exceptions

Emergency repair activities may be required during off-shift hours. If a formal work plan for the work to be performed exists, it shall be reviewed and updated to incorporate current field conditions. If a hazard analysis needs to be written, this can be done in the field. Verbal approval from the authorizing 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 a reason for ignoring established safe work practices.

Personnel responding to an emergency may need to act quickly to minimize property damage. In time-sensitive emergencies an informal work plan may be initiated by the point of contact, discussed amongst essential personnel, and may be substituted for a formal work plan. When the emergency is over, the situation shall be reassessed, and the necessity of a formal work plan shall be revisited.

4.2.3 Submit Work Plan to Authorizing Supervisor(s)

The work plan is submitted to the authorizing supervisor for approval authorizing the work to be performed. In the case of multiple work groups (i.e. different departments or different divisions), all participating employee's supervisors should approve the work. This approval should be noted via the chosen work planning tool (i.e Hazard Analysis, IMPACT or procedure). This helps each supervisor with work planning, communication of location specific hazards, resource allocation and awareness of employee activities.

4.3 Authorize and Communicate

Authorization involves granting approval of the work plan to ensure hazards, scope, mitigation, roles, responsibilities have been identified and communicated to appropriate personnel.

4.3.1 Authorizing Supervisor(s)

The authorizing supervisor(s) is/are responsible for reviewing the work plan to ensure the scope, hazards and mitigation are identified. The authorizing supervisor(s) must verify the workers completing the job have adequate and current training for the work being performed. The authorizing supervisor(s) may then authorize the work.

4.3.2 Work Planner

The work planner must obtain authorization to perform work from the authorizing supervisor(s). The work planner must authorize a Point of Contact (POC) if they are not present to oversee the work being performed. Responsibilities from the work planner must be clearly communicated and confirmed by the POC. It is the responsibility of the work planner to understand and identify affected personnel and stakeholders and communicate the work plan to those individuals in an appropriate time frame.

4.3.3 Point of Contact

A Point of Contact is an assurance role for the work planner acting as the liaison between the worker and the work planner while the work planner is not at the job location.

4.3.4 Worker

The worker must understand the scope, hazards, mitigation and be able to identify the work planner/POC for the job. Verbal acknowledgement in an informal work plan or worker's signature in a formal work plan constitutes the worker is now ready to perform work.

4.4 Perform

Performing the work requires: mobilization, pre-job brief, working within controls, cleaning up, and releasing work.

4.4.1 Stop Work Authority

Anyone that is on a work site has the obligation to stop work if they identify unsafe behaviors, acts, or conditions. Stop work should be brought to the attention of the work planner or POC. Unsafe acts, behaviors, and conditions can be corrected, and work can proceed. The work plan should be updated as necessary and communicated to all members affected. However, if issues or disagreements cannot be resolved, then follow protocol established in [FESHM 1010](#) Technical Appendix 3.

4.4.2 Mobilize

Equipment, tools, material, and PPE need to be staged to perform work. Staging may be done before or after the pre-job brief depending on the complexity of the mobilization.

4.4.3 Pre-Job Brief

A pre-job brief shall be conducted by the work planner/POC prior to performing work to communicate the hazards, mitigations, and scope of the work. A pre-job brief should include:

- Review of scope, hazards and mitigations
- Job walk-down
- Review of work plan, sign if formal authorization required for work plan
- Confirmation of training, material, postings and barriers
- Inspection of equipment and tools
- Confirmation and inspection of PPE
- Confirmation that the scope, hazards, and mitigations have been incorporated into the work plan and update as needed.
- Confirm that all affected employees and stakeholders have been apprised of the work plan.

4.4.4 Perform Work Within Controls

Work must be performed within the controls of the work plan. If work plan is deviated from, or unsafe acts, behaviors, or conditions are identified, then work must stop. Reference 3.4.1 Stop Work Authority.

4.4.5 Clean-Up

Area should be kept clean as work is being performed. After work is complete all items and debris should be removed from the area. Barriers, postings, and other applicable safety features may be left in place if still required.

4.4.6 Release Work Area

Once work is completed and cleaned the area should be released to the appropriate personnel.

4.5 Evaluate

Work should be continuously evaluated while being performed to ensure that SHAPE work planning is being followed.

After the work has been completed, a post job debrief shall be performed to develop feedback and lessons learned to be delivered to applicable personnel and incorporate into future work planning. The HA/SOP should be updated as necessary.

- All participants in the work should attend if possible
- Ask questions such as what went right? What went wrong? Anything unexpected occur? Can we make it better?
- Update any work planning documentation, SOP, checklists, work orders, etc. from the feedback. Communicate lessons learned. If the lesson learned is significant for others outside the group, record via the Lessons Learned Database.

5.0 REQUIREMENTS OF FORMAL WORK DOCUMENTS

Written hazard analysis and standard operating procedures are covered in this portion. Permits/forms are covered in their respective FESHM chapters.

5.1 Written Hazard Analysis (HA)

A written hazard analysis (or IMPACT) must take the following into consideration:

- HA must be job specific and include the scope/hazards identified
- Coordination and authorization for multiple work groups or work that affects other groups/divisions (see Section 6.0)
- Specific PPE and training requirements must be clearly defined
- Content presented in training does not need to be restated, except for critical steps
- Signed HA must be present at the work area
- Incorporate lessons learned

5.2 Hazard Specification Sheet (HSS)

Hazard Specification Sheets are utilized as a quick reference to hazards prior to obtaining an access key at the Main Control Room. These HSS's utilize icons and text to quickly communicate hazards that may be encountered through a tunnel access.

- The HSS works in concert with the Radiological Work Permit (RWP) or electronic Radiological Work Permit (eRWP) to detail general hazards associated with accessing that particular enclosure
- The HSS and the (e)RWP highlight the general hazards and do not necessarily cover the work that may be planned. Further work documents (HA) or permits may be required to complete your work and identify all relevant hazards.
- See Technical Appendix 4 for more information about the HSS.

5.3 Standard Operating Procedure (SOP)

Standard operating procedures (such as travelers) should be used instead of an HA for tasks that are repetitive and frequently performed. SOPs shall include the aspects of SHAPE.

- Supplemental elements of a formal work plan may be required to cover specific hazards at the work area if:
 - 2 or more green hazards identified in addition to hazards identified in SOP
 - Any yellow hazard identified in addition to the hazards identified in SOP
 - Any red hazard identified in addition to hazards identified in SOP
- SOP training shall be completed initially, after any major changes, or as required by the SOP.
- SOPs should be reviewed by the authorizing supervisor at least annually.
- SOPs shall be included as part of the pre-job briefing.
- SOPs shall include the following elements at a minimum:
 - General scope of work
 - Materials/Pre-requisites/Training required
 - Responsibilities
 - Hazards and Hazard Mitigations
 - Detailed Procedure Steps
 - Additional permits or approvals required
 - References

5.4 Record Retention

- The work planner or authorizing supervisor will keep a copy of the formal work plan (including HAs) for training employees.
- Formal work plans will be made available to anyone who requests them for the purposes of providing oversight, trending, and/or lessons learned.
- Written formal work plans shall be kept on file (readily accessible) for 1 year and must be stored for 5 years after the year in which the work took place. Work permits and permits allowing work with hazardous exposures (asbestos, beryllium, confined space, lead, etc.) shall be maintained for 75 years from the date of execution of the work. Electronic records assist with this retention requirement.

6.0 INTEGRATED WORK PLANNING

- When work involves multiple work groups, communication can be challenging. Communication with respect to work hazards, work allocation, resource allocation can be improved utilizing existing work planning tools such as hazard analyses, IMPACT, SOPs, etc. It is the responsibility of the work requestor to communicate with the work group supervisor(s)/lead(s) to ensure local hazards or unique conditions are communicated and all affected persons/infrastructure is notified and approve the work.

- When the work group consists of workers from outside the immediate organization, i.e. outside the organization planning the work (another department, another division, etc.), it is incumbent upon the work planner to ensure all workers have the proper knowledge, experience, training, PPE, tools, etc. to conduct the work safely and efficiently. Roles and responsibilities should be clear to all workers.
- When work is performed by an organization in another organization, group or other stakeholder's space it is required to provide timely notification of a proposed construction project or work activity that may impact the stakeholder. Utilizing IMPACT or the [Electronic Work Notification Form](#) or other Work Planning Tool is required.

7.0 TECHNICAL APPENDICES

7.1 Technical Appendix 1: Scope

When initiating work the scope must be clearly defined. Scope should identify the following items:

Who – Who needs to be involved in the work and work planning? Who is this work going to affect?

- Workers
- Supervisor
- Point of Contact (POC)
- Division Safety Officer (DSO)
- Radiation Safety Officer (RSO)
- Subject Matter Experts (SME)
 - Industrial Hygiene (IH)
- Building Manager (BM)
- Laser Safety Officer (LSO)
- Authority Having Jurisdiction (AHJ)
 - Fire Protection
 - Electrical
 - Structural
- Stakeholders and local personnel

What – What is needed to perform the work?

- Job/task/work description
- Materials
- Equipment
- Experience
- Energy – What types of energy present a hazard to the work?
 - Electrical
 - Nuclear – Radiation
 - Gravity – Falls
 - Hydraulic
 - Pneumatic
 - Thermal – Heat/Cold
 - Noise
 - Mechanical
 - Light
 - Magnetic
 - Chemical

- Elastic
- Stored
- Tools
- PPE
- Permits
- Waste Generated
- Approvals

Where – Where is the work being performed?

- ODH area
- Radiation area
- Building
- Access requirements
- Confined Space
- Natural environment (i.e. near water)

When – When is the work being performed?

- Time?
 - Standard operating hours
 - Outside normal operating hours
 - Other activities being performed at the same time?

How – How is the work going to be done?

- Method
- Controls
- Mitigation
- Risk Matrix
- Waste generated handled and disposed

Why – Why is the work being done?

- Need
- Preventative Maintenance (PM)
- Risk
- Routine

7.2 Technical Appendix 2: Risk Matrix

*Risk matrix is not inclusive of all hazards and serves as a guide. If in doubt about a level of hazard identified or not on the risk matrix, contact your DSO for assistance. Note that work deemed by supervision or the work planner to be hazardous in nature or in a remote area may require at least two-persons to ensure two-way communication of those individuals in the event of an emergency. It is incumbent upon the work planner or supervision to make this determination and plan the work to ensure two-way communication or periodic check-ins occur.

*See the [FESHM Manual](#) for additional guidance relating to each topic below.

Green Low-Risk General Hazard (If your task has TWO or more green general hazard categories, write a Formal Work Plan (IMPACT/Hazard Analysis or Standard Operating Procedure))	Yellow High-Risk Hazards (If your task has ONE high-level hazard category, write a Formal Work Plan (IMPACT/Hazard Analysis or Standard Operating Procedure))
Red - Additional controls or approvals required: DSO, RSO, SME, LSO, AHJ, Permit	
Chemicals, Hazardous or Toxic Substances	
<ul style="list-style-type: none"> • Use of chemicals/materials which under a normally controlled work environment do not pose a significant safety or health hazard. (Refer to the SDS). • Over the counter chemicals in their original packaging being used for their intended purpose. 	<ul style="list-style-type: none"> • Based on the input from Industrial Hygiene Group the use of chemicals/materials which may pose a significant safety or health hazard. (Refer to the SDS). • Potential release of hazardous materials (list found in FESHM 8030, 40CFR302, and 40CFR355). • Potential release of chemicals, petroleum products, etc. to surface waters (streams or ponds) or drains that lead to surface waters. • Potential release, intentional or unintentional, of chemicals, petroleum products, etc. to the sanitary system.
Contact Industrial Hygiene Group for guidance on identifying the hazard level of chemicals.	
Confined Space Work	
Confined Space Permit or Reclassification form REQUIRED for all confined space work. Additionally, contact DSO to determine if a written HA will be needed to supplement.	
Crane, Hoist, & Forklift Use	
<ul style="list-style-type: none"> • Any material handling using these types of equipment “standard” crane or forklift operations where a load is 	<ul style="list-style-type: none"> • Load tests at 100% or 125% of rated capacity (FESHM 10100)

being lifted within the rated capacity using approved lifting fixtures and devices.	<ul style="list-style-type: none"> • Atypical load, non-routine, unique configuration, or atypical center of gravity
D/S/P Engineering Review Required for: <ul style="list-style-type: none"> • Below-the-hook lifting devices require engineering note and review • Lifts involving prototype or homemade lifting devices and fixtures or attachments • Planned engineering lift (greater than the crane's rated load capacity) Lifts that meet the definition of critical (FESHM 10200) will require an approved lift plan DSO Approval & Sign off from FESS crane office required for: <ul style="list-style-type: none"> • Use of any crane personnel basket/crane personnel platform (FESHM 10190) 	
Cryogenic Equipment or Systems	
	<ul style="list-style-type: none"> • Transporting cryogenic dewar in an elevator (FESHM 5032.3) • Repair to cryogenic system
<ul style="list-style-type: none"> • New cryogenic systems or a change in system configuration to cryogenic systems need to be re-evaluated (FESHM 5000s) • Review applicable safety documentation prior to work on or with cryogenic equipment/system 	
Electrical Work	
<ul style="list-style-type: none"> • Consult with electrical coordinators to verify low hazard. • Work on equipment that has been placed in a verified Electrically Safe Work Condition (ESWC) by personnel working in compliance with FESHM 2100, Fermilab Energy Control Program (Lockout/Tagout) does not pose an electrical hazard. • Work on exposed cables or circuit parts that operate at nominal voltages of 50 volts or less, or the current is limited to less than 5 milliamperes even under fault conditions, or to a nominal 100 volts or less DC or the current is limited to under 40 milliamperes even under fault conditions does not pose an electrical hazard. • Operating electrical utilization equipment (less than 600 volts). Must have no exposed cables, wires, or circuit parts. 	<ul style="list-style-type: none"> • Diagnostic Energized Work (as defined in section 5.2 of FESHM Chapter 9100, Fermilab Electrical Safety Program) on exposed conductors or circuit parts that exceed 50 volts and 5 milliamperes AC or 100 volts and 40 milliamperes DC, including fault conditions, that has not been verified to be in an ESWC. • Verification of an Electrically Safe Work Condition (ESWC), as defined by NFPA 70E Article 120. This must be performed by qualified personnel using required shock and arc flash protection PPE. • Entry into an electrical distribution system manhole in which all cables in the manhole have been verified to be in an ESWC.

- Operation of circuit breakers and disconnect switches that are in a normal operating condition (NFPA 70E 130.2(A)(4) energized at 600 volts or less.

Electrical Hazard Analysis with review by D/S/P Electrical Coordinator Required for:

- Operation of equipment, circuit breakers, disconnect switches, and plugging and unplugging connectors that are not in a normal operating condition and have not been verified to be in an ESWC.
- Operation of equipment, other than equipment that has been listed by a Nationally Recognized Testing Laboratory (NRTL) in accordance with the manufacturer's directions, unless the equipment has been approved by a NRTL or AHJ field inspection, or the installation has received an Operational Readiness Clearance (ORC).
- Entry into an electrical distribution system manhole in which not all cables in the manhole have been verified to be in ESWC. (Confined Space requirements must be separately considered).
- Coring or cutting into concrete, masonry, and walls, floors and ceilings of any type of material where it cannot be proven in advance that there are no electrical circuits or equipment embedded in or located on the side of the concrete or building surface opposite the worker. [FESHM 7040](#).
- Manipulative Energized Work (as defined in section 5.2 of [FESHM Chapter 9100](#), Fermilab Electrical Safety Program) on exposed conductors or circuit parts that have not been verified to be in an ESWC requires approval from the D/S/P Electrical Coordinator, D/S/P Head, and the Fermilab Directorate.

Excavation and Digging

Excavation EJULIE Permit required for all excavation and digging work. Environmental Review Form required for excavation and digging work.

NOTE: All excavation must be overseen by excavation competent person.

Fall Exposure

- | | |
|---|---|
| <ul style="list-style-type: none"> • Work from a ladder at 6 feet or more above the floor. • Work from mobile elevating work platforms (MEWPs). | <ul style="list-style-type: none"> • When fall potential is >4 ft. while performing operation and maintenance work, and >6 ft. while performing construction work. <i>NOTE: also requires rescue plan when using fall protection equipment (FESHM 7060)</i> • Any use of scaffolding, including erection of the scaffolding. <i>NOTE: Any erection or dismantling of scaffolding must be overseen by scaffolding competent person. (FESHM 7070)</i> |
|---|---|

Competent Person required for:

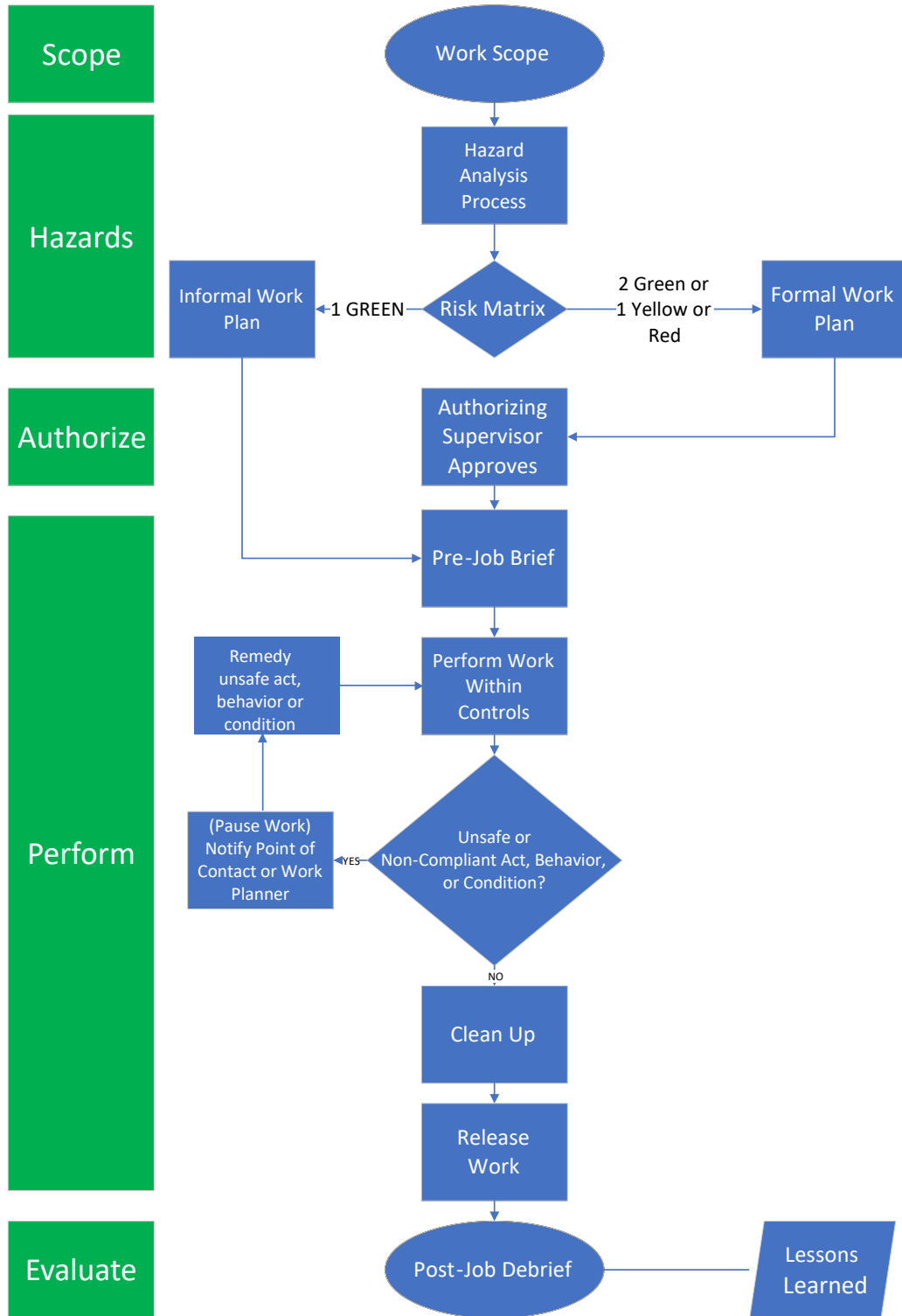
- Erection or Dismantling of scaffolding
- Inspection of Scaffolding prior to use each day

"First time use" of new or unfamiliar equipment	
<ul style="list-style-type: none"> • First time use of mechanical or electrical equipment. The task is outside the normal duties and responsibilities or being performed in a location unfamiliar to the work group. 	<ul style="list-style-type: none"> • First time production work following ORC on Fermilab designed or modified equipment • Critical multi-step activity without existing SOP • Unfamiliar hazards to employees • Multiple work groups that require coordination or where one group's work may overlap with other group's work.
Hand Tools	
<ul style="list-style-type: none"> • Using commercially available tools with a sharp blade or edge 	<ul style="list-style-type: none"> • Using a tool that is modified, homemade, or fabricated non-commercial.
DSO approval required for bypassing guards on hand tools.	
Hydraulic and Pneumatic Systems ("Fluids such as oil, water, air, etc.)	
<ul style="list-style-type: none"> • Connecting hoses or lines to pressurized oil, water, or air systems. • Pressure washing operations or power sprayers. 	<ul style="list-style-type: none"> • Any work where a sudden uncontrolled release (failure) of pressure or fluids could result in injury (e.g. people working around a heavy object supported hydraulically could get "caught between") or impact to the environment (air, land, or water). • Operating hydraulic cutters. • Transporting compressed gasses in elevators (FESHM)
Modifying or reconfiguring hydraulic or pneumatic systems needs to be re-evaluated	
Lasers	
	Work with a Class 3R (3a), 3b or 4 shall be identified as a potential hazard within the Work Plan/Hazard Analysis. See "Red" section below for additional requirements when working with Class 3b or 4 lasers.
Laser Safety Officer approval required for: <ul style="list-style-type: none"> • Work with a Class 3b or 4 laser (FESHM 4260) Note: Work with a class 3b or 4 laser requires Laser Safety Officer approval, eye examination and training.	
Machining	

	Machining hazardous materials such as lead, uranium, etc.
DSO or Shop Supervisor approval required: Operating machinery without appropriate guards.	
Grinding/Welding/Brazing and Flame Cutting	
Welding work in an area where passers-by can see the arc.	<ul style="list-style-type: none"> • Grinding/Welding/Brazing hazardous materials such as lead, uranium, etc. • Work requiring an unusual or awkward position (e.g. overhead grinding, etc.)
Grinding/Welding/Brazing and Flame Cutting require Hot Work Permit Structural AHJ approval required for removal of structural welds.	
Magnetic Fields	
Working in or creating accessible magnetic fields of > 5.0 gauss (FESHM 4270).	Any situation where ferrous objects can be subject to magnetic forces causing sudden or unexpected movement into the magnetic field. If uncertain, contact your DSO.
Noise Hazard	
<ul style="list-style-type: none"> • Eight hours of work in an environment where you must raise your voice (but not shout) to be heard from a distance of 3 feet or sound pressure levels in excess 85 dBa. • Communication is difficult due to noise 	<ul style="list-style-type: none"> • Work where it is necessary to shout in order to be heard from a distance of 3 feet. (FESHM 4140)
Contact Industrial Hygiene Group for work activities where double hearing protection is required. Contact Industrial Hygiene Group for actual sound level readings and guidance.	
Other Work Environments	
<ul style="list-style-type: none"> • Nuisance dust from general cleaning, sweeping, or windy conditions. • Work in areas above 86 degrees F or below 25 degrees F 	<ul style="list-style-type: none"> • Exposure to animal feces during clean-up operations (birds, rodents, raccoons, etc.) • Prolonged work in temperatures above 86 degrees F or below 25 degrees F. (FESHM 4250)
Contact Industrial Hygiene Group for guidance	
Radiation	
<ul style="list-style-type: none"> • Work on Class 1 (< 1mR/hr) or Class 2 (< 10mR/hr) radioactive items outside of beamline enclosures. • Using radioactive sources. • Work in posted Radiological Areas. 	<ul style="list-style-type: none"> • When a Radiation Work Permit is required and not all hazards can be incorporated into the RWP. (See FRCM Article 322) Bringing hazardous material into Radiological Areas or other work that will

	generate a mixed (radioactive + regulated) waste. Bringing hazardous material into Radiological Areas.
Radiation Safety Officer approval & RWP required for: <ul style="list-style-type: none"> • Work in a High Radiation Area, on or with Class 3-5 objects, with activated liquids, depleted uranium (DU), or contaminated objects, requires a Rad Work Permit (RWP). • Work in posted Radiological Areas or work with radiological material/sources requiring HA. • Work with Radiation Generating Devices/neutron generators. • Pressure (vacuum/water) or stress testing of activated components. • Work on/with water systems. exhaust systems, absorbers, targets, and other beamline components. 	
Stored Energy	
<ul style="list-style-type: none"> • Work near equipment that has the potential to release stored energy through falling, rotating, or other unplanned movement NOT covered by a LOTO procedure. • Work on or near computer actuated mechanical equipment. 	<ul style="list-style-type: none"> • Any unusual arrangement of heavy objects. Other mechanical stored energy hazards (e.g. springs). • Work on equipment where there is potential for unexpected release of energy (hydraulic, pneumatic, thermal, potential, etc.) where LOTO is required.
Equipment Transport	
<ul style="list-style-type: none"> • Routine or typical transport of equipment, non-sensitive equipment transport 	<ul style="list-style-type: none"> • The transported load may be significantly vulnerable to standard transport risks (truck tire rolling a curb/hitting a pothole, traffic incidents/accidents, etc.) and/or the stresses and shocks of strapping/rigging/securing the load. • Transport utilizes custom/bespoke shock/vibration mitigation systems (sprung frames, designed crate/frame, etc.) • Equipment is critical, one-off, high-risk/value, long-distance with risk of damage to such components transport.
FESHM 10210 describes requirements for additional oversight for equipment transportation. Consult 10210 prior to transports of significant risk or value (critical to lab operations or projects, high cost, long replacement time). FESHM 10210.1 contains procedural and technical reference material for equipment transport of all modes of transport and various sizes.	

7.3 Technical Appendix 3: Flowchart



7.4 Technical Appendix 4: Hazard Specifications Sheet (HSS)

INTRODUCTION

Fermilab enclosures and experimental areas contain unique hazards and unique configurations that must be communicated prior to entry. We communicate these hazards and configurations in a way that conveys the information quickly and efficiently. These communication documents are specific to Fermilab enclosures and experimental areas and are closely integrated with the enclosure access permissions and the Radiological Work Permit (RWP) system. Fermilab has two methods to quickly communicate the unique information for access to these spaces, the Hazard Specification Sheet (HSS) and/or the Hazard Awareness document for the space. These two documents supplement the Work Planning & Control program in that they quickly communicate the hazards/configurations presented during an enclosure access. These documents do not detail or cover hazards that are presented due to changing/unknown conditions in the area or the hazards that specific work may present. Those hazards should be analyzed and documented via a hazard analysis and communicated via the pre-job briefing. The two documents differ in that they communicate in slightly different ways, the Hazard Awareness document is detailed, whereas the HSS communicates the unique area via hazard icons for a quick reference. The HSS is also coupled with the RWP within the Enclosure Access Binder, and eRWP online. Hazard Awareness documents are typically associated with experimental areas in which the influx of visiting personnel benefit from the increased detail in the document. Hazard Awareness documents are typically associated with a training course in TRAIN.

DEFINITION

Unique Hazard or Configuration: A hazard or configuration that is not normally or typically found in office or general industrial workspaces.

Controlled Access: A condition of enclosure entry in which a limited number of personnel are permitted by the radiation safety interlock system to enter an enclosure or set of enclosures without breaking the radiation interlocks. Special requirements pertain to such accesses are specified elsewhere in FESHM and in RWPs. Enclosures entered on Controlled Access have not received radiation surveys that reflect the latest results of accelerator operations. All personnel entering on Controlled Access are required to be carrying on their person the correct enclosure enter key(s).

Enclosure (Exclusion Area): An area, generally an accelerator or beamline enclosure, subject to radiological and/or other hazards to which access during accelerator or beamline operations is prohibited and prevented by means of a system of locks, interlocks, and passive shielding.

Enclosure Access Binders: Collection of documents that detail general enclosure access hazards to the entrant. These documents are typically located in the Main Control Room (MCR).

Hazard Awareness document: Utilized to communicate the unique configuration or hazards that may be encountered at a building or space, where a greater detail of communication is necessary, typically where there are visitors or users who may not be familiar with the local configuration or operations.

Hazard Specification Sheet (HSS): Quick references utilizing icons to quickly communicate the unique hazards presented during entry to an enclosure. These do not cover hazards introduced that were unknown or presented by the task. Hazards not covered by the HSS may need to be documented in another way (i.e. IMPACT/hazard analysis) to address mitigation efforts to reduce risk to the personnel.

Radiological Work Permit (RWP) and electronic Radiological Work Permit (eRWP): Permit that identifies radiological conditions, establishes worker protection and monitoring requirements, and contains specific approvals for radiological work activities.

Supervised Access: A condition of enclosure entry in which a limited number of personnel are permitted by the radiation safety interlock system to enter an enclosure or set of enclosures for which the radiation interlocks have already been broken. Special requirements pertain to such accesses specified elsewhere in FESHM and in RWPs. Each person on such accesses shall carry the appropriate enter key(s). Under supervised access conditions current radiation survey maps are made available with the RWPs to those performing the access.

TRAIN: Fermilab's training database.

RESPONSIBILITIES

Enclosures and experimental areas are found throughout the lab and various divisions are responsible for those areas. To ensure consistency, the responsibilities of maintaining the Hazard Awareness and HSS falls upon the D/S/P Division Safety Officer (DSO).

D/S/P DSO Responsibilities

- Conducting or assisting the division with reviewing and updating the Hazard Awareness or HSS when entry hazards significantly change or annually. Ensure updates are made both in DocDB as well as the Enclosure Access Binders.
- Coordinate with other DSOs when the Hazard Awareness or HSS crosses divisional lines, to update and review the documentation.
- Update FESHM 2060 TA4 as necessary.

Division/Section/Project Responsibilities

It is the responsibility of the department head or group leader who oversees or is responsible for the area to:

- Communicate any changes in area conditions that affect the safety of the entrant. Communication of the changes should be addressed to the personnel indicated in this TA to ensure work planning documentation is adequately updated in a timely manner.

Supervisors/Points of Contact (POCs)

- Responsible for communicating this chapter's expectations to their affected employees.

- Ensure employees conduct work planning in accordance with this chapter.

Employee/User/Subcontractor Responsibilities

- Responsible for understanding the hazards involved in their work. This includes reading the HSS, Hazard Awareness document, RWPs, or other work authorization document. If hazards and associated requirements and/or restrictions are not clear, employees/users/subcontractors are responsible for asking for clarification from their supervisor/POC prior to entering the area or performing work. All personnel have the right and responsibility to stop or pause work and report if there is an unsafe condition or unidentified hazard.
- Communicate changes in scope or conditions to their supervisor and/or DSO. Update any relevant work planning documentation to detail the changes and mitigations.
- Complete any training required to access the areas where they will perform work.

PROCEDURES

General Procedures

Enclosures or experimental areas that fall under the scope of this technical appendix have unique hazards or configurations that must be communicated clearly and efficiently to the entrant, prior to the initial entry. The D/S/P DSO or Division Designee maintains the Hazard Awareness and HSS documents located in DocDB and Enclosure Access Binders. The intent is to identify the unique hazards or configurations that are present at the time of entry to the area. Neither the Hazard Awareness nor the HSS describe hazards that may present themselves due to the nature of the work or conditions that may have changed in between the last update of the document. Those hazards must be analyzed prior to commencing work and documented as appropriate.

These documents are to be reviewed on an annual basis, or at which time a hazard has been identified that was not captured on the document.

Hazard Awareness Training Formatting

The formatting used for the Hazard Awareness documents and training are customized to the hazards presented and tailored to the audience. The template for the Hazard Awareness Training can be found here: <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=6620>

HSS Formatting

The formatting can be updated to capture the applicable entry hazards for the areas. The updating of icons or language should be discussed with the stakeholders and author of this chapter prior to updating to ensure all personnel understand the intent of the icon. Icons should generally be self-explanatory and generally accepted throughout the relevant industry. The HSS template for enclosures and the standardized icons for population of the enclosure HSS are located here: <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=6617>