

FESHM 2060: WORK PLANNING AND CONTROL

Revision History

Author	Description of Change	Revision Date
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, and all affected personnel understand what is expected of them. 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.

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.

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.

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 improvements or experiences that should be recorded for future job planning efforts.

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.

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, and work authorization

3.0 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.

3.1 Scope

When initiating work the scope must be clearly defined. See Appendix 3. The scope should be updated throughout the work planning process as necessary. Scope should identify the following items:

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

3.1.1 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.

3.2 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.

3.2.1 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.

3.2.2 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 1) 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 1) 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.

3.2.3 Submit Work Plan to Authorizing Supervisor

The work plan is submitted to the authorizing supervisor for approval authorizing the work to be performed.

3.3 Authorize

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

3.3.1 Authorizing Supervisor

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

3.3.2 Work Planner

The work planner must obtain authorization to perform work from the authorizing supervisor. 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.

3.3.3 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.

3.3.4 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.

3.4 Perform

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

3.4.1 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 2.

3.4.2 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.

3.4.3 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.

3.4.4 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.

3.4.5 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.

3.4.6 Release Work Area

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

3.5 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 should 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.

4.0 RESPONSIBILITIES

All personnel have the responsibility to plan their work and implement every step of SHAPE for all tasks to work safely and efficiently.

4.1 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

4.2 Authorizing Supervisor

The authorizing supervisor is 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

- 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.

4.3 Work Planner

The work planner coordinates all the activities associated with the work.

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.

Authorize

- 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.

4.4 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.

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.

4.5 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.
- 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

4.6 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.

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 must take the following into consideration:

- HA must be job specific and include the scope/hazards identified
- 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 Standard Operating Procedure (SOP)

Standard operating procedures 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

5.3 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.

6.0 TECHNICAL APPENDICES

6.1 Technical Appendix 1: 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.

*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 hazards, write a Work Plan/Hazard Analysis or Standard Operating Procedure)	Yellow High-Risk Hazards (If your task has ONE high- level hazard, write a Work Plan/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 being lifted within the rated capacity using approved lifting fixtures and devices. 	<ul style="list-style-type: none"> • Load tests at 100% or 125% of rated capacity (FESHM 10100)

D/S/P Engineering Review Required for:

- Below-the-hook lifting devices require engineering note and review
- Lifts involving prototype or homemade lifting devices and fixtures or attachments
- Planned engineering lift outside 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:

- Use of any crane personnel basket/crane personnel platform ([FESHM 10190](#))

Cryogenic Equipment or Systems

- Transporting cryogenic dewar in an elevator ([FESHM 5032.3](#))
- Repair to cryogenic system

- 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. • Operation of circuit breakers and disconnect switches that are in a normal | <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. |
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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

- Work from a ladder at 6 feet or more above the floor.
- Work from a scissors lift or articulating boom lift.

- Fall potential is >4 ft. when performing operation and maintenance work, and >6 ft. when performing construction work. *NOTE: HA also requires rescue plan when using fall protection equipment ([FESHM 7060](#))*
- Any use of scaffolding, including erection of the scaffolding. *NOTE: Any erection or dismantling of scaffolding must be overseen by scaffolding competent person. ([FESHM 7070](#))*

Competent Person required for:

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

"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
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.

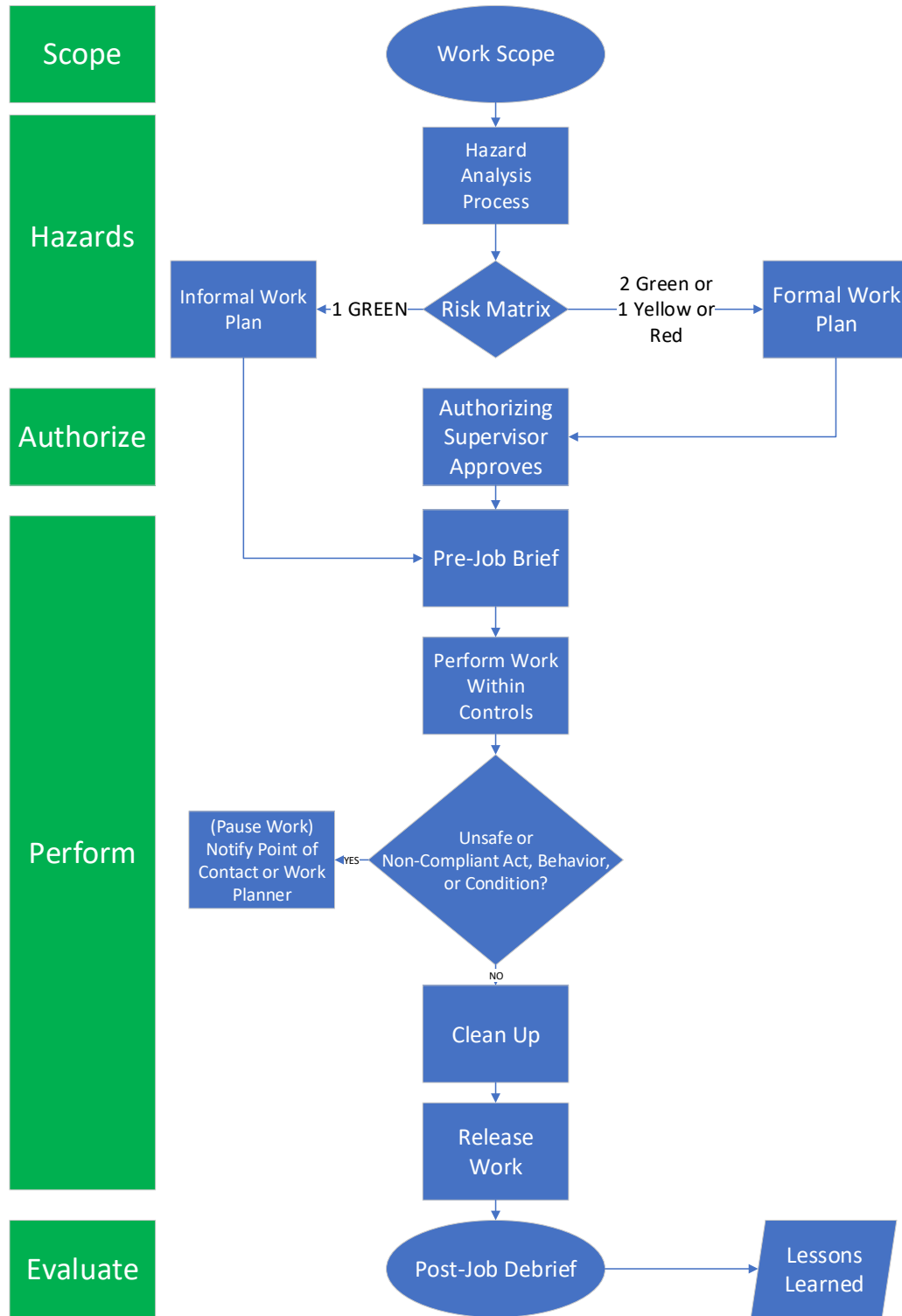
Radiation Safety Officer approval & RWP required for:

- 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

- | | |
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| <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. |
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6.2 Technical Appendix 2: Flowchart



6.3 Technical Appendix 3: 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
- Stakeholders

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
- Risk