Contents: Work Planning and Control for Experiments and Operations

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

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Definitions

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Training Requirements and Reporting Obligations

This subject area contains training requirements. See the Training and Qualifications Web Site.

This subject area does not contain reporting obligations.

References

Biosafety in Research Subject Area

Bloodborne Pathogens Subject Area

BNL Counterintelligence Office

BNL Hazard Identification Tool

Calibration Subject Area

Centers for Disease Control and Prevention (CDC) Web Site

Chemical Management System

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Environment, Safety, Health and Quality (Tier I) Inspections Subject Area

Environmental Assessments Subject Area

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ES&H Standard 1.4.0, Compressed Gas Cylinder Safety

ES&H Standard 1.4.1, Pressurized Systems for Experimental Use

ES&H Standard 1.4.2, Glass and Plastic Window Design for Pressure Vessels

ES&H Standard 1.5.0, Electrical Safety

ES&H Standard 1.5.1, Lockout/Tagout Requirements

ES&H Standard 1.5.2, Design Criteria for Electrical Equipment

ES&H Standard 1.5.3, Interlock Safety for Protection of Personnel

ES&H Standard 1.14.0, Identification of Piping Systems

ES&H Standard 2.3.2, RF and Microwaves

ES&H Standard 4.0.0, Fire Safety Program

ES&H Standard 4.1.2, Means-of-Egress (Exits)

ES&H Standards 4.2.0, Impairment of Fire Protection Systems and Fire Alarm Systems

ES&H Standard 4.3.0, Cutting and Welding

ES&H Standard 4.4.0, Local Fire Protection Signaling Systems

ES&H Standard 4.10.2, Flammable Liquids: Storage, Use and Disposal

ES&H Standard 4.11.0, Installation of Flammable Gas Systems (Experimental & Temporary Installations)

ES&H Standard 4.12.0, Special Precautions for Locations Containing Flammable Atmospheres

ES&H Standard 4.12.1, Refrigerators for Flammable Liquid Storage

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Exhaust Ventilation Subject Area

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Transfer of Hazardous Materials Onsite Subject Area

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Underage Workers (Minors) Subject Area

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Underground Injection Control Subject Area

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Work Planning and Control Management System Description

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Standards of Performance

Managers shall analyze work for hazards, authorize work to proceed, and ensure that work is performed within established controls.

Managers shall ensure that work is planned to prevent pollution, minimize waste, and conserve resources, and that work is conducted in a cost-effective manner that eliminates or minimizes environmental impact.

All staff and users shall identify, evaluate, and control hazards in order to ensure that work is conducted safely and in a manner that protects the environment and the public.

All staff and guests shall comply with applicable Laboratory policies, standards, and procedures, unless a formal variance is obtained.

All staff and guests shall assure that only appropriately authorized individuals have access to facilities, information, resources, and assets.

All staff and users shall conduct work within the facility-specific operational boundaries specified in Facility Use Agreements.

Management System

This subject area belongs to the **Work Planning and Control** management system.

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Introduction: Work Planning and Control for Experiments and Operations

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

The purpose of this subject area is to establish requirements at Brookhaven National Laboratory (BNL) so that all work is properly managed by using a level of planning and control commensurate to the ES&H hazards, job complexities, and work coordination needs.

This subject area establishes work control processes based on the Integrated Safety Management (ISM) Core Functions to define the scope of work, identify the hazards, develop controls, work within the controls, and provide feedback and continuous improvement. The subject area provides a graded approach to manage a wide range of operational and experimental activities from routine to highly complex, and integrates other systems and subject areas such as hazard analysis tools, training requirements, and environmental management into the processes. For this subject area, "work" is defined as the activities that involve the design, operation, maintenance, modification, construction, demolition, or decommissioning of facilities, systems, or experiments by BNL or non-BNL staff. The Work Planning and Control for Experiments and Operations Flowchart gives a basic overview of how the process is designed to work.

There are four processes used at BNL to plan and control work as driven by the hazards, complexities, and job coordination levels. The Work Planning and Control Management System Description describes these processes. Two, "Experimental Safety Review" and "Work Planning and Control for Operations," are covered in detail in this subject area. The others, "Project Management" and "Standard Operating Procedures," are covered in other subject areas.

These four processes for planning and control of work are as follows:

1. **Experimental Safety Review** - All organizations conducting experiments use this process to identify the hazards, plan the work controls, and authorize the experiment. The process provides a graded approach to determine the level of planning rigor needed in the documentation. Each Department/Division uses an Experiment Review Coordinator to determine if a proposed or modified experiment requires a new Experiment Safety Review Committee review or if it fits within established controls from previous reviews.
2. **Work Planning and Control for Operations** - This process applies to all physical work performed by BNL and non-BNL staff, and also uses a graded approach to identify hazards, risks, and complexity levels, and to establish the level of rigor for planning and review. The process requires use of a site-wide work permit form for all moderate and high hazard work, not already covered in Standard Operating Procedures, to key the work control process.
3. **Project Management** - This process provides the overarching standards by which some work is planned and executed at BNL to meet both the customers' objective and BNL's mission within schedule and cost constraints. These standards provide project controls that bound existing departmental procedures. The individual Departments/Divisions use specific operational procedures for project management to plan and manage capital and expense projects. These lower level implementation requirements establish the detailed methodology for project management plans, project tracking methods, scheduling systems, and other management techniques. See the Project Management Subject Area for more information.
4. **Standard Operating Procedures (SOP)** -This process provides the requirements for developing and controlling standard/internal operating procedures for tasks that are repetitive and typically impact only a specific organization. The process requires a hazards analysis, work controls, and work instructions with details commensurate to the complexity of the operation or job. See the Internal Controlled Documents Subject Area for more information.

Some work may require a combination of the processes; for example, a planned experiment will require an Experimental Safety Review, but may also need a work permit to assemble the experiment, an operating procedure (SOP) to provide instructions to operate the experiment, plus a work permit to safely dismantle the experiment.

BNL's Training and Qualification Program provides the system and the requirements for staff to have the necessary training for work that is considered within their normal assignments. See the Training and Qualifications Subject Area and the Training and Qualifications Web Site for more information.

The "skill of the worker" concept recognizes the skill levels and technical capabilities of the crafts, technicians, and scientists to handle certain duties with minimum documentation (i.e., work rated as low hazard, therefore no requirement to use a Work Permit Form); these job activities do not require most of the level of rigor outlined in this subject area. Evaluation of skill of the worker tasks is conducted by the individual Department/Division, based on the specific activities they perform. Line Management is responsible for ensuring that their workers are trained to the level required, to perform tasks they are assigned.

Graded Approach

ISM Guiding Principle #6 states that hazard controls shall be "tailored" to the work being performed. A graded approach is used to apply a level of planning rigor, work controls, and documentation commensurate to the level of ES&H risks, work complexity, and coordination requirements. In the BNL work control system, jobs can be classified into low-, moderate-, or high-hazard categories using a graded approach. See the section Application of the Graded Approach in the Graded Approach for Quality Requirements Subject Area.

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Subject Area: ***Work Planning and Control for Experiments and Operations***

1. Experimental Safety Review

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

Applicability

This information applies to BNL staff and non-BNL staff planning and conducting experiments.

Required Procedure

This section applies to all existing or proposed experimental activities conducted under BNL control. The rigor of the review and documentation must be commensurate with the level of hazard using a "graded approach." The overall goal is that all experiments operate in a way that ensures they are carried out safely and within an environmentally secure manner. Experiments must be reviewed and approved at the Departmental/Divisional level. Expertise from Subject Matter Experts will be obtained from other Department/Divisions as necessary. Experiments with significant hazards and consequences could require a higher level of independent review, documentation, and approval. The Experimental Safety Review Committee makes this determination.

Each Associate Laboratory Director and each Department Chair/Division Manager are ultimately responsible for the safe conduct of experiments within their organizations. This section references many companion SBMS documents that provide more detailed information on specific hazards, documentation requirements, operating limits, and start-up criteria.

If hazards of an experiment cannot be adequately identified and controlled by this section, use the section Work Planning and Control for Operations. This situation may arise during setting up or tearing down an experiment, especially if non-BNL or non-project staff do these activities, and if significant construction and assembly is required.

Departments/Divisions may assign responsibilities and roles differently in their procedures versus the assignments indicated in this section. However, Departments/Divisions must ensure all responsibilities described in the steps are assigned to qualified people.

Note: Although this section has been designed as an implementing procedure, each Department/Division may establish a specific procedure for their area. If a specific Departmental/Divisional procedure is used, it must be maintained so that it is current with the contents of this subject area. Consult with your Department/Division management to determine appropriate use of procedures.

Experimental Safety Review contains seven subsections:

1.1 Experimental Safety Review

The Experimental Safety Review (ESR) is a document that identifies all experimental hazards and hazard mitigations. The review establishes controls and operational limits (as required) for the proposed experiment. (The Experiment Safety Review Form, or an equivalent form, may be used to format the review. Regardless of the format, the idea is to incorporate the components of the Experimental Safety Review Contents exhibit).

Generic controls may be established so that similar and routine or repetitive experiments do not need new Experimental Safety Reviews. In this case, the Chair of the Experimental Safety Review Committee or the Experiment Review Coordinator may decide to generate a new Experimental Safety Review. See the Experimental Safety Review Flowchart for an overview of the review process.

Step 1	The Department Chair/Division Manager appoints an Experiment Review Coordinator (ERC). **Note:** All ERCs are required to take appropriate WP&C Training, such as WP&C CBT Course TQ-Work Plan or approved equivalent.
Step 2	Before its initiation, the Principal Investigator/Responsible Person (PI/RP) notifies the ERC of his/her intent to conduct a new experiment or modify an existing one.
Step 3	Depending on the hazards associated with the experiment, the ERC determines if an Experimental Safety Review (ESR) is required, and if outside subject matter experts (SME) are needed, or both. **Note:** If a proposed experiment falls within the controls and operational limits of a previously defined envelope or a previous experiment's safety review, **and** the experiment will be operated within those controls and limits, then there is no requirement to write a new ESR. The PI/RP or ERC should reference the existing ESR.
Step 4	The PI/RP, working with the ERC and other SMEs (as necessary), writes an

	Experimental Safety Review. See the exhibit Experimental Safety Review Contents, which outlines the required contents (as applicable) that must be addressed in the review. Other considerations to ensure proper control of the experimental hazards may be added to the review as appropriate. **Note:** Departments/Divisions may use other mechanisms or similar documents to record these requirements.
Step 5	When generating controls and operational limits, in step 4, the PI/RP and the ERC consider the following items: - Security Requirements (See the exhibit Security Checklist); - Limits on operating variables (i.e., current, voltages, pressures, flows, temperatures, energy potentials, radiation levels) required to control risk to staff; - Chemicals; - Lasers; - ALARA optimization techniques; - Requirements related to the calibration, testing, maintenance, or inspection of equipment needed to protect personnel or the environment; - Requirements for protection of the environment; - Administrative controls (i.e., minimum staffing levels, required procedures, minimum operable equipment); - Workplace engineering controls (such as shielding, ventilation, alarms); - Use of emergency power for important aspects of the experiment (e.g., refrigerators, cold boxes, or operational equipment); - Required limits of the amount of toxic or hazardous experimental material to perform the experiment; - Quantity of nuclear material/fissionable materials/radioisotopes; - Facility limits/controls documented in the Facility Use Agreement (FUA).
Step 6	As applicable, the PI/RP or ERC verifies that a NEPA review was conducted as required by the National Environmental Policy Act (NEPA) and Cultural Resources Evaluations Subject Area.
Step 7	The PI/RP and/or the ERC does the following: - Ensures any design or modification of equipment or facilities (i.e., engineering calculations, drawings, or specifications) required by the experiment is prepared, revised, and reviewed according to the Engineering Design Subject Area; - If the experiment is using controlled substances, refers to the Using Controlled Substances in Research Subject Area for requirements before

	acquiring the controlled substances; • Works with the ECR, as necessary, to review their experiment if it has significant environmental aspects, as determined by applying the exhibit BNL Criteria for Significant Aspects in the Identification of Significant Environmental Aspects and Impacts Subject Area; • Ensures training requirements, associated with the hazards of the experiment, are discussed with the support staff responsible for maintaining the Department/Division Job Training Assessments (JTAs). See the Training and Qualifications Subject Area. • If the experiment will involve the transportation of hazardous materials, refers to the applicable transportation subject area (i.e., Transfer of Hazardous Materials Onsite, Transfer of Radioactive Materials Onsite, Transportation of Hazardous Materials Offsite, and Transportation of Radioactive Materials Offsite). • If the experiment is using any biological materials, refers to the Biosafety in Research Subject Area for requirements.
Step 8	The ERC, working in conjunction with the Building Manager, determines if planned experimental activities impact the hazard classification, programmatic/quality issues, or safety/environmental envelope of the facility. Examples of this could be use of chemicals in quantities greater than state and federal regulation, addition of radioactive material in excess of what is already stated in the FUA, or other items, which would require a modification to the FUA. If so, the ERC works with the Building Manager to ensure the FUA is updated. See the Facility Use Agreement Subject Area for more information. **Note:** For major changes to the FUA (i.e., changes to the Operational Safety Envelope of the Facility), the FUA Change Analysis Document must be signed by the Deputy Director for Operations before the start of the experiment. (The FUA does not need to be posted on SBMS before starting the experiment).

1.2 Experimental Safety Review Committee

Each Department/Division determines and establishes the appropriate implementation mechanisms (i.e., internal procedures, R2A2s) necessary to systematically ensure all proposed experiments and significant modifications to experiments are reviewed by an Experimental Safety Review Committee (or subcommittee) to ensure they are in compliance with this subject area.

The Experimental Safety Review Committee is responsible for reviewing experiments (and significant modifications to experiments) for the following:

- ES&H concerns;
- Ensuring appropriate controls for each experiment (during set-up, operations, and tear-down) are established;
- Recommending to the Department/Division approval or disapproval of the installation and/or operation of the experiment.

Generic controls may be established so that similar and routine/repetitive experiments do not need repetitive committee approval. The Department Chair/Division Manager or designee

need repetitive committee approval. The Department Chair/Division Manager or designee can approve these.

Step 1	The Department Chair/Division Manager appoints members, with appropriate experience, to the Experimental Safety Review Committee (ESRC). The committee membership includes as a minimum the following: - Experimental Review Coordinator (usually serves as chairperson); - Facility Support Representative; - Environmental Compliance Representative; - ES&H Coordinator. **Note:** Additional SMEs, such as Industrial Hygienists and Industrial Safety staff, may be consulted on an ad-hoc basis, depending on the nature of the hazards.
Step 2	The ERC, with the PI/RP, determines if a proposed or modified experiment requires an ESRC review. **Note:** If a proposed experiment falls within the controls and operational limits of a previously defined envelope or a previous experiment's safety review, then there is no need for a review.
Step 3	The PI/RP presents the Experimental Safety Review to the ESRC for review, comment, and concurrence.
Step 4	The ESRC determines if the Experimental Safety Review documentation is adequate enough to ensure a proper safety analysis of the experiment, i.e., are all the hazards, hazardous devices/processes identified and mitigated? Use the BNL Hazard Identification Tool and the exhibit ESH&Q Considerations when Designing an Experiment as guidance for making this determination. For help in analyzing environmental issues, see the Process Assessment Subject Area.
Step 5	If appropriate for the Department/Division, the ESRC determines if the experiment is within the Operational Safety Limits or Accelerator Safety Envelope established by any pertinent Safety Analysis Report or Safety Assessment Document/Accelerator Safety Envelope Document.
Step 6	The ESRC considers the potential for off-site impact from identified hazards. **Note:** The Checklist for Identifying Issues/Decisions that May Require Community Involvement in the Community Involvement in Laboratory Decision-Making Subject Area can be used for guidance. If an impact is determined, the ESRC should complete the form and send it to the Community Involvement Office.
Step 7	If not already done, the ESRC determines if additional Laboratory review committees are required to review the Experimental Safety Review. Among these committees are Laboratory Environmental Safety & Health, Laboratory Electrical Safety, BNL Institutional Review Board (Human Studies),

	Transportation Safety Working Group, Institutional Biosafety, BNL Radioactive Drug Research, Institutional Animal Care and Use, Integrated Security, and Counter-Intelligence.
Step 8	The ESRC documents the committees' review of the experiment in writing. **Note:** This documentation can be in the form of a new or amended Experimental Safety Review.
Step 9	The ESRC documents any appropriate inspections required, before operations, to confirm readiness of necessary hardware, systems, work controls, procedures, QA, and training.
Step 10	The ESRC recommends any Experimental Safety Reviews that may need further review by Subject Matter Experts in other Departments such as the Radiological Control Division (RCD), Waste Management Division (WMD), Environmental Services Division (ESD), and/or the Safety and Health Services Division (SHSD).
Step 11	The ESRC recommends to the Department Chair/Division Manager or designee whether to approve or disapprove the installation and/or operation of the experiment. The ESRC will define the appropriate controls/limits for the experiment as a condition of approval. **Note:** Depending on the hazards associated with the experiment, the ESRC may request to the Department Chair/Division Manager that the cognizant Associate Laboratory Director, or the Deputy Director for Operations, or both, approve the experiment. **Note:** If the ESRC recommends disapproval, then they should denote the reasons and any guidance given to the PI/RP on how to correct problems with the experiment or the Experimental Safety Review.
Step 12	The PI/RP performs and documents completion of any pre-start-up or post-start-up actions required by the ESRC. **Note:** Documentation of completed tasks should become part of the Experimental Safety Review package.
Step 13	The ERC or designee maintains the Experimental Safety Review documentation and any ESRC documentation or minutes according to the Records Management Subject Area.

1.3 Notifications to Other Departments/Divisions

By following subsections 1.1 and 1.2, the PI/RP and ERC ensure an experiment can be conducted safely. However, at times, it may be important to notify other Departments/Divisions about hazards associated with an experiment (or significant modification to an experiment). Fire Safety (Emergency Services), the Occupational Medical Clinic (OMC), and Safety & Health Services Division (SHSD) may need to be notified. These Departments/Divisions may use this notification as a method to concur on what precautions have been taken, to suggest additional precautions, to prepare themselves to address potential experimental hazards, or for information only.

Step 1	The PI/RP or ERC refers to the exhibit Department Notifications Table for suggested notifications. **Note:** The PI/RP or ERC may notify other Departments/Divisions of hazards associated with the experiment at any time.
Step 2	If the experiment causes a situation or condition that affects the building's Facility Use Agreement (see step 8 in subsection 1.1), the PI/RP or ERC informs the Building Manager. The Building Manager and ERC decide if other Departmental/Divisional notifications are required.

1.4 Experimental Approval

The level of review and approval necessary for experiments depends on the severity of the hazards and consequences as dictated by DOE Orders and ES&H Standards. BNL relies on Experiment Review Coordinators (ERC) and Experimental Safety Review Committees (ESRC) to ensure that the appropriate Subject Matter Experts review the appropriate experiments. In all cases it is important that the PI/RP work closely with the ERC and ESRC to ensure full assessment and mitigation of hazards.

Laboratory "Line Management" has the ultimate responsibility for conducting experiments safely and in compliance with this subject area.

Step 1	Unless the ESRC recommends a higher approval level, the Department Chair/Division Manager or designee approves the experiment. The ESRC and the Department Chair/Division Manager document their approval. (If used, the approval can be documented on the Experiment Safety Review Form, or equivalent). All approvals must be documented. The Experimental Safety Review must clearly state the - Controls and limits of the experiment; - Expected time duration of the approval. **Note:** Significant modifications (changes to the controls and limits already approved by the Department Chair/Division Manager) require a new review and approval before their implementation. **Note:** Even if the ESRC does not recommend higher approval authority, the Department/Division can require higher approval authority at any time.
Step 2	Approve engineering specifications, engineering drawings, engineering calculations, or associated design reviews/modifications to these types of documents according to the Engineering Design Subject Area.

1.5 Operations

All PI/RPs and participating scientists must follow the guidelines and controls as stated in the approved Experimental Safety Review.

As stated in the previous subsection, Laboratory "Line Management" has the ultimate responsibility for conducting experiments safely. The Department Chair/Division Manager or designee has the authority to cease operation of any experiment at any time.

Step 1	The ERC/ESRC verifies that all pre-start-up conditions and requirements of the Experimental Safety Review are in place before the beginning of the experiment.
Step 2	The PI/RP (experimenters) operates the experiment within the terms, limits, and conditions established by the ESRC and approved by the Department/Division.
Step 3	The PI/RP (experimenters) ceases operation of the experiment and performs mitigative actions if controls and limits, required to protect the environment or personnel safety, are exceeded. Report these situations to the Department Chair/Division Manager. **Note:** The experiment remains shutdown until the PI/RP can justify its restart to the Department Chair/Division Manager or designee. **Note:** If the circumstances involved radiological issues, then the Department Chair/Division Manager or designee informs the Facility Support Representative. They will determine if a Radiological Awareness Report is required. **Note:** As appropriate, the Department/Division will notify the Occurrence Categorizer to determine if the circumstances constitute a reportable event. See the Occurrence Reporting and Processing System (ORPS) Subject Area for more information.
Step 4	The Department Chair/Division Manager or designee (ERC) routinely monitors experiments to ensure they are being operated as approved.
Step 5	The Deputy Director for Science and Technology periodically assesses Experimental Safety Review Processes.
Step 6	The PI/RP, Participating Scientists, ERC, ESRC, and Department Chair/Division Manager request feedback and look to identify opportunities for improvement of the Experimental Safety Review process. They feedback any pertinent information to the Department/Division self-assessment process, as well as the Work Planning & Control POC.

1.6 Review of Long-term Experiments

All long-term experiments, those experiments greater than one year in duration, must be reviewed annually. This review is conducted to ensure that the design and operation of the experiment has not changed since the most recent approval by the ESRC/ERC. Items to consider are controls and limits, hazards, scope of the experiments, and materials used. The ERC, ESRC, or both review significant modifications to experiments before their

implementation.

Step 1	The ERC/designee contacts the PI/RP to initiate the yearly review. Annual reviews focus on ensuring that the design and operation of the experiment has not changed since its last approval. This review ensures the design and operation is within its experimental safety review. This review may also include the addition of new items, which will take place in the following year.
Step 2	If modifications are planned on experiments, the ERC or designee reviews these modifications and determines if further review by the ESRC or other Laboratory Committees is required before implementation. Modifications are reviewed to • Document the change for configuration control; • Ensure there is no need to change any controls and limits previously approved by the Department Chair/Division Manager. If changes to controls and limits are needed, a review by the ESRC is required as well as new approval by the Department/Division.
Step 3	The PI/RP or ERC documents both the annual reviews and reviews of modifications. Document these by doing one of the following: • Adding an amendment to the Experimental Safety Review (ESR); • Creating a new ESR; • Adding an attachment to the ESR; • Denoting on the existing ESR that nothing has changed. **Note:** Until the Department/Division approves an updated Experimental Safety Review, the original ESR along with any letters, attachments, and amendments will make up the up to date ESR.
Step 4	If the PI/RP or ERC determines that the control and limits required to protect the environment or personnel safety are exceeded, then the experiment must be shutdown and the Department Chair/Division Manager informed. **Note:** The experiment remains shutdown until the PI/RP can justify its restart to the Department Chair/Division Manager or designee. **Note:** As appropriate the Department/Division will notify the Occurrence Categorizer to determine if the circumstances constitute a reportable event. See the Occurrence Reporting and Processing System (ORPS) Subject Area for more information.
Step 5	The Department/Division ensures any opportunities for improvement, identified in this review process, are incorporated into the process.
Step 6	The ERC and the Building Manager coordinate their efforts to upgrade the Facility Use Agreement (FUA) if needed. See the Facility Use Agreement Subject Area for more information.

1.7 Experimental Termination

At the conclusion of an experiment, the experimental area must be left in a condition that is satisfactory to the host Department/Division.

Step 1	The PI/RP or participating scientist informs the host Department/Division's management, ERC, or Building Manager that the experimental activities will soon terminate.

Step 2	The Department/Division or collaboration conducting the experiment provides the resources to remove the experiment from the space, and return the space to a condition that is acceptable to the host Department/Division.
	
	Removing the experiment includes the following:
	
	• Disposing of radioactive, industrial, hazardous, and mixed wastes. See the following subject areas for more information:
	  ◦ Hazardous Waste Management;
	  ◦ Mixed Waste Management;
	  ◦ Radioactive Waste Management;
	  ◦ Regulated Medical Waste Management.
	• Disposing of or reusing chemicals (reconciling the chemical inventory). See the Working With Chemicals Subject Area for more information;
	• Tearing down and disposing of, or reusing experimental equipment. See the section on Work Planning and Control for Operations for more information;
	• Returning or replacing utilities. See the section on Work Planning and Control for Operations for more information;
	• Appropriate decontamination of the area;
	• Any type of area monitoring that may be required (i.e., lead, air, cadmium, Be, asbestos).
	
	Note: The Work Control Manager/Coordinator of the host Department/Division may need to assist in coordinating this effort.

Step 3	As appropriate the Department/Division tracks experimental termination items to closure. **Note:** Depending on many variables (size, duration, and location of the experiment, the number of collaborators involved, the past performance of collaborators), the host Department/Division may wish to walkthrough and verify the condition of the area. If a walkthrough is performed, it may be documented on the Experiment Safety Review Form (or equivalent), if a review form was used, or a memorandum attached to the ESR. **Note:** If needed, a formal Exit Readiness Review may be conducted.
Step 4	If required, the Building Manager updates the Facility Use Agreement (FUA). See the Facility Use Agreement Subject Area for more information.

References

Biosafety in Research Subject Area

BNL Hazard Identification Tool

Engineering Design Subject Area

Facility Use Agreement Subject Area

Hazardous Waste Management Subject Area

Identification of Significant Environmental Aspects and Impacts Subject Area

Mixed Waste Management Subject Area

National Environmental Policy Act (NEPA) and Cultural Resources Evaluations Subject Area

Occurrence Reporting and Processing System (ORPS) Subject Area

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Subject Area: ***Work Planning and Control for Experiments and Operations***

2. Work Planning and Control for Operations

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

Applicability

This information applies to BNL and non-BNL staff who conduct maintenance, modification, setup, demolition, decommissioning, construction, or operation of facilities, systems, and experiments.

Required Procedure

This section is an implementing procedure; however, the Work Control Managers may establish a specific work planning and control procedure for their Department/Division to document how their system operates within the flexibility allowed by this subject area. The exhibit Outline for Implementing Procedure outlines the key elements that an implementing procedure should address. If a specific Departmental/Divisional procedure is used, it must be maintained so it is current with the contents of this subject area.

The rigor of the planning and control process will be commensurate with the level of ES&H risks (hazards), complexity, work coordination, and programmatic impact. Much of the work will be performed as "skill of the worker" (work characterized as low hazard) due to worker training and qualifications and low residual risk. Although a work permit may be used for low-hazard work, these types of activities will not require work permits.

This section and the section Experimental Safety Review overlap on some activities, such as the setup, tear down, and changes to an experiment. The experimental hazards and quality issues, associated with this type of experimental work, will be covered by the Experimental Safety Review document or by work permits as needed. If any experimental hazards or quality issues cannot be adequately identified and controlled by using the section Experimental Safety Review, then use this section to cover those activities.

Departments/Divisions may assign responsibilities and roles differently in their procedures versus the assignments indicated in this section. However, Departments/Divisions must ensure all responsibilities described in the steps are assigned to qualified people.

Work Planning and Control for Operations contains ten subsections:

2.1 Assigning Key Personnel

Step 1	Each Department/Division must determine whether this section applies to the work performed within their organization. For example, if the work in an organization is predominantly administrative (i.e., Financial Services), then this section does not apply. This section **does not apply** to • Design and analysis of experiments as covered under the section Experimental Safety Review; • Operating S&T machines or experimental systems if those operations are controlled by Standard Operating Procedures or by the section Experimental Safety Review; • General administrative work.
Step 2	For the organizations where this section does apply, the Department Chair/Division Manager appoints a Work Control Manager to implement the work planning and control process for operations. **Note:** If the only reason a Department/Division needs a Work Control Manager is for screening contractor and vendor requisitions for Integrated Safety Management (ISM) flowdown language, then one is not required, as long as the Department/Division uses a Work Control Manager/Coordinator from another organization to conduct the screening.
Step 3	The Work Control Managers appoint Work Control Coordinators for each area or appropriate group within their Department/Division. **Note:** All Work Control Managers and Work Control Coordinators are required to take the appropriate WP&C Training, such as WP&C CBT Course TQ-Work Plan or approved equivalent. **Note:** At the discretion of the Department/Division the Work Control Coordinator may be a qualified contractor; however, this practice should be limited.
Step 4	The Work Control Managers maintain a roster of the Work Control Coordinators in their Department/Division. Maintain the roster on the Department/Division Work Control Managers and Work Control Coordinators Web Site.

Step 5	The Work Control Managers appoint a Primary Reviewer(s) for their Department/Division. Typically a Primary Reviewer is a • Work Control Manager; • Work Control Coordinator; • ES&H Coordinator; • Line Manager. **Note:** The Primary Reviewer represents line management, and his/her signature means that the work permit has been adequately reviewed and that the ES&H issues have been identified and will be controlled according to BNL requirements. They are responsible for the overall review and approval of permits rated as moderate- and high-hazard.
Step 6	The Work Control Managers maintain a roster of the Primary Reviewers in their Department/Division. **Note:** If a specific Department/Division implementing procedure is used, the roster may be included in the procedure.

2.2 Justifying Skill of the Worker

The "skill of the worker" concept has been established at numerous DOE sites as a means to formally recognize the capabilities of the work force. The craft, technical, and scientific personnel have the skill level and technical capabilities to handle a wide variety of jobs with minimum documentation and no direct supervision. By formally separating the work rated as low-hazard from moderate- and high- hazard work, work requests are handled more efficiently. The key idea is that more time is available for planners to concentrate on moderate- and high-hazard work.

Each Department/Division, based on the specific activities they perform, determines and evaluates their "skill of worker" tasks.

Each Department/Division determines the appropriate skill of the worker for the staff in their organization. Each Department/Division justifies the skill of the worker for performing work rated as low-hazard within BNL ES&H boundaries. As stated before, work rated as low hazard can be performed at BNL with minimum documentation (i.e., no requirement to use a Work Permit Form).

Line Management is responsible for ensuring their workers are trained to the level required, to perform tasks they are assigned.

Step 1	Justify/document the skill of the worker concept for performing low-hazard work in the Department/Division. Use any of the following examples: • Job Training Assessments; • Qualification Matrix exhibit; • Letters to file, training records from other sites, and documented level of expertise (degree, certification, license, resumes, etc.).

2.3 Screening Work Requests for Work Permit Determination

The Work Control Coordinator screens all internal work requests, not already documented by the Department/Division as skill of the worker, or covered by Standard Operating Procedures (SOP) or Internal Operating Procedures (IOP).

Work Control Coordinators also screen all work requests for external services.

Note: Work permits may not be required to stabilize emergency situations. However, the need for proper hazard recognition, use of ES&H principals, good job planning, and notifications of facility personnel is still required. Once the situation is stabilized, the work planning process (this section) will again apply.

Step 1	The Work Control Coordinator initially screens jobs to determine whether a work permit is required. The Work Control Coordinator establishes a system (formal or informal) to ensure the staff within their authorized area forward the proper job/work requests for review. See the Work Permit Flowchart. **Note:** Others in the process can request that a work permit be used to perform a task any time. **Note:** Craftspersons and technicians can request work permits, or re-screening of tasks, if they feel there are location hazards, changes at the jobsite, hazards not previously identified, and/or job complexity issues that need to be addressed (even if the task is rated low). They contact their supervisor, who will work with the appropriate Work Control Coordinator, to ensure that a work permit is written. **Note:** Occasionally, the work requester may not need a permit since no location hazards exist, but the service provider may require it due to task hazards. In these situations, the service provider generates the permit. For example, a Building Manager reports a loss of steam service to their facility. The task of repairing the failed steam valve in the service pit will require a permit as determined by the service provider's supervisor due to the task hazards. Therefore, the service department initiates this permit.
Step 2	If the job being screened could affect experimental operations, the Work Control Coordinator informs the appropriate personnel.
Step 3	If the hazards associated with the job being screened could impact areas off-site, consider contacting the Community Involvement Office.
Step 4	If the job being screened involves a radioactive waste or treatment activity, then consider contacting the Waste Management Division (or the Radioactive Waste Management SME).
Step 5	If the job being screened could impact the hazard classification or safety envelope of the facility, or may require changes to the Facility Use Agreement

	envelope of the facility, or may require changes to the Facility Use Agreement, then the Work Control Coordinator informs the Building Manager.
Step 6	The Work Control Coordinator uses the Department/Division's documentation evaluating their skill of the worker tasks and the exhibit Screening Guidelines for Work Permit Determination to aid in determining whether a work permit is required for a work request. If the Work Control Coordinator decides that a work request is rated as low hazard, a work permit is not required. This decision does not have to be recorded in any recordkeeping system. **Note:** Even though it is not required to document the decision to rate a task as low hazard, this is one method for the Department/Division to evaluate skill of the worker tasks. Another method would be to generate a low-hazard work permit and use it as documentation in the future.
Step 7	If the Work Control Coordinator decides that a work permit is required, he/she must record the job information into the Work Permit Logbook. The following information must be recorded: • Date; • Work permit number; • Short description of the activity. Additional information such as status (open or close) and comments may be added as the Department/Division wishes. **Note:** Except for standing work permits (see subsection 2.10), original work permits are usually used in the field; a copy should be retained in the Work Permit Logbook.

2.4 Categorizing Work Requests and Filling Out Work Permit Sections 1 and 2

Job requests are placed into low-, moderate-, or high-hazard categories using a graded approach. The low-hazard jobs are considered "skill of the worker," whereas the moderate- and high-hazard jobs must have a work permit (unless covered by an SOP/IOP) and certain levels of planning rigor. See the exhibit Examples of Low, Moderate, and High Tasks.

The Work Permit Form is a means for each Department/Division to control moderate- and high-hazard work. It may also be used for low-hazard work as an aid in coordinating the effort. The form, which has been designed around the ISM five Core Functions, provides work information and plans, ES&H checklist items, the proper reviews, and a mechanism for worker involvement. Additional safety permits, work instructions, and drawings are attached to the work permits as needed.

The following three factors must be considered when categorizing work requests into low-, moderate-, or high-hazard job categories:

- ES&H Issues;

- Complexity;
- Work Coordination.

Step 1	The Work Control Coordinator or Work Requester/designee, generating the work permit, assigns the permit number and writes this in the header of the Work Permit Form. Fill out the appropriate portions of Section 1 and as much of Section 2 as possible, identifying the location hazards and work controls. See the Work Permit Form for further instructions for filling out the permit.
Step 2	The Work Requester/designee meets with or sends the work information to the service provider. This information helps the service provider in planning the job.
Step 3	The Work Control Coordinator (from the requesting Department/Division, and as appropriate from the Department/Division providing the service), and/or as appropriate the Walk Down Team of Subject Matter Experts (SME), complete Section 2 by identifying the task hazards and any other ES&H concerns, job complexities, and work control issues. **Note:** The primary function of the Walk Down Team is to visit the job site, identify ES&H issues, identify work controls on the permit, and agree on a final job category (low, moderate, or high) for the work. The Work Control Coordinator assembles this team.
Step 4	The Work Control Coordinator categorizes the job as low-, moderate- or high-hazard. This decision is based on his/hers (and the requester's) detailed knowledge of the ES&H issues, complexity, and work coordination. The Work Control Coordinator may defer on making this decision and rely on a Walk Down Team to determine the job category. **Note:** Regardless of whether the Work Control Coordinator or the Walk Down Team categorizes the task, they can use the rating guidelines in the exhibit Screening Guidelines for Work Planning & Control and Application of the Quality Graded Approach to assist them in determining the ES&H rating. The ratings for complexity and coordination are based on the job-site knowledge of the Work Control Coordinator and/or Walk Down Team.
Step 5	If a permit is used for a job rated low hazard, then the Work Control Coordinator and Service Provider sign their concurrence in the lower right-hand corner of the permit. **Note:** Although not required, you can still fill out the back side of low-hazard permits if so desired.
Step 6	An individual in the affected Department/Division (Supervisor, Work Control Coordinator) usually authorizes work to start by signing in the lower right-hand corner. No further processing of the permit is required. If the permit is rated moderate or high hazard, go to subsection 2.5.

2.5 Filling out Work Permit Sections 3 - 5 for Moderate- and High-Hazard Activities

Step 1	The Work Requester/designee, and as appropriate the service provider, fill out the "work plan" part of Section 3 with input from the Walk Down Team, the Review Team, or both. The work plan or work package contains a detailed description of the work and any precautions that need to be taken. They contain any attached safety permits, work instructions, or referenced procedures that may be required to do the work. **Note:** Consider using multiple work permits to cover each phase of the work for work planning for larger jobs or projects. The permits can then accommodate multiple crafts lines and technician groups involved in critical tasks phased over a long period. A suffix number or letter, on the end of the work permit, may be used to tie the permits to one project or request.
Step 2	The Work Requestor/designee develops a Job Safety Analysis (JSA) for all work rated as high hazard. Use the exhibit Job Safety Analysis for developing it. **Note:** Developing a JSA is encouraged for moderate-rated work.
Step 3	The Work Requester/designee sends the work permit to one of the Department/Division's Primary Reviewers for review and approval. **Note:** The Primary Reviewer assembles a Review Team appropriate to the level of complexity, hazards, and coordination needs. The Review Team is typically made up of the following: Primary Reviewer, the Service Provider (must be part of the team), Facility Support Representative, and ES&H staff, as needed. Include as many of the staff as possible, who will perform the work, so they can help with hazard identification and mitigation.
Step 4	The Primary Reviewer and the Review Team review the ES&H analysis, facility concerns, work controls, and the overall work plan. The Review Team ensures that the planning is adequate for the hazards and complexities involved and that the hazards and risks associated with the work will be controlled according to BNL requirements. **Note:** The review of the work planning should be conducted in a group meeting led by the Primary Reviewer to facilitate interactions, among the members, who frequently identify additional planning needs. The review and signoffs can also be done in "series," where the permit is circulated or mailed from person to person ("series" reviews should be limited if possible). **Note:** Since many of the same personnel will be involved with both the Walk Down and the Review Teams, the functions of both teams can be performed simultaneously.
Step 5	After the Review Team concludes that the work is adequately planned, each

	team member signs off in "The Reviewed By" part of Section 3 of the permit.
Step 6	The supervisor conducts a pre-job briefing, for all moderate- and high-hazard tasks, with the work crew to review job hazards, permits, and coordination requirements. Additional crewmembers arriving on the job after the original briefing must also be briefed.
Step 7	The Workers sign Section 4 of the permit, or an attached sign-off list, indicating they understand the hazards and the work permit requirements before they start working. It is not permissible for the job supervisor to sign for the workers.
Step 8	The affected Department/Division usually authorizes the start of the job by signing Section 5. The person signing this section verifies that the requirements designated on the permit (work controls, system isolations, etc.) have been met and that the job may proceed. **Note:** The person signing has usually been part of the review and may be the Supervisor, the Work Control Coordinator, or whoever is most knowledgeable of the job site, the hazards, and the system configuration.

2.6 Control of Work

This subsection describes the process for controlling work and any changes while the work is in progress.

Note: All staff have the authority to stop work if

- If an immediately dangerous condition exists;
- Radiological work does not meet Laboratory requirements or could result in an exposure/release of radioactive material.

See Stop Work - Imminent Danger Procedures and the Radiological Work Stop Procedure for information.

Step 1	The Work Control Coordinators and Supervisors ensure work is conducted according to the approved plans and permits. Workers must work within the limits of the guidelines provided. **Note:** As the work progresses, sometimes it may not go as originally planned, e.g., experiencing false starts, waiting for additional resources (workers and materials, or both), taking significantly more time than anticipated, disagreements among the workers on how to go forward, near misses, and apprehension among the workers. If these things occur, the Work Control Coordinator and Supervisor determine if the activity should be put on a temporary hold until the planning can be reassessed and improved. **Note:** After any work interruption, personnel should review work planning documentation before restarting work.
Step 2	Workers inform their supervisors of any concerns they may have with doing the

	work.
Step 3	Supervisors evaluate these concerns. If they are valid, take action to correct the situation. **Note:** The Supervisors should communicate to the workers any additional actions that were taken, or if actions were not taken, why not.
Step 4	If during the work, the Work Control Coordinator or Supervisor determines additional or different work methods will be required to complete the job, they • Put a temporary hold on the work; • Have these additional or different methods reviewed and added to the work documentation; • Brief the workers on the change, and then restart the work.
Step 5	If during the work, hazards are encountered that are not addressed in the JSA or Work Permit, the Work Control Coordinator and Supervisor • Put a temporary hold on the work; • Have the hazard(s) reviewed by the appropriate ES&H staff and incorporate it into the JSA or Work Permit; • Brief the workers on the new hazard(s) and then restart the work activity. **Note:** If the hold on work was due to an incident, then refer to the Critiques Subject Area.

2.7 Feedback (Sections 6 and 7 of the Work Permit)

A critical element in the Work Planning and Control process is worker feedback. Feedback can be received and distributed in many ways. Some examples are the following:

- Sections 6 and 7 of the Work Permit;
- Pre-job briefings and walk downs;
- Post-job critiques/briefings;
- Safety Meetings;
- Safety Bulletins;
- Tool Box Meetings;
- Work in Progress Reviews;
- Standard Operating Procedure changes (after workers have reviewed them);
- Lessons Learned Memorandums.

It is important to document feedback so that any appropriate information is incorporated into the Department/Division's procedures and processes.

Step 1	The Supervisor or Work Requester/designee determines if a post job review is required. If a review is required, fill in the names of the reviewers in Section 6 of the work permit and obtain signatures. Document any pertinent information generated during the review on a sheet attached to the work permit.

	Note: Occasionally, the Review Team may decide that a post job review would be beneficial for Lessons Learned and can request the review.
Step 2	Soliciting worker feedback, by the Supervisors and Work Control Coordinators, is encouraged during and after moderate- and high-hazard jobs. **Note:** The Work Control Manager/Work Control Coordinator may request worker feedback by answering yes in section 7(a) of the Work Permit. When worker feedback is requested, the Work Control Manager/Work Control Coordinator or Work Supervisor solicits and documents worker feedback. Regardless of the answer in section 7(a), the workers are encouraged to complete section 7(b). Information generated from worker feedback is documented on the Work Permit or an attached sheet. **Note:** For larger or more complex jobs, Supervisors and Work Control Coordinators/designees should consider work in progress reviews. This will allow all staff, involved with the work, to review progress to date as well as make suggestions on how to better proceed with the task. **Note:** Critique repetitive tasks after the first evolution. **Note:** Post-job reviews and worker feedback may be performed simultaneously.
Step 3	When possible, the Work Control Manager incorporates any worker feedback, as soon as possible. Any feedback that will be incorporated into the Department/Division's processes at a later date is tracked to closure. **Note:** Supervisors should communicate to their workers what feedback was incorporated into the process or if it was not, why. **Note:** Departments/Divisions may wish to consider using a process, which links feedback received, to a procedure, work permit, or Radiological Work Permit. This process will help create a track record of continuous improvement.
Step 4	The Work Control Manager sends appropriate feedback issues to the Laboratory Lessons Learned Coordinator for distribution to other organizations.

2.8 Closeout (Section 8 of the Work Permit)

Step 1	When the work has been completed, the Supervisor forwards the completed work permit to the Work Control Coordinator. **Note:** The work permit usually is returned to the Work Control Coordinator of the Department/Division that organized and authorized the work to be done

	the Department/Division that organized and authorized the work to be done.
Step 2	The Work Control Coordinator reviews the work permit for completeness and **verifies that the work area has been returned to an acceptable condition.** When the Work Control Coordinator is satisfied, he/she signs Section 8 of the work permit. **Note:** It is acceptable for the job supervisor to verify that the area has been returned to an acceptable condition; he/she then informs the Work Control Coordinator of the status.
Step 3	The Work Control Coordinator files work permits according to the Records Management Subject Area. Moderate and High Hazard Permits are kept for 75 years.

2.9 Use of Work Permits by Vendors and Contractors

Before the Procurement and Property Management Division (PPM) will issue a purchase requisition for contractor or vendor services, it must be determined if Integrated Safety Management (ISM) flowdown language is needed in the contract, and if a work permit is required.

See the Construction Safety Subject Area for other concerns dealing with contractors and vendors doing work on-site.

Step 1	The Work Requisitioner completes the Requisition Questionnaire for ISM Flowdown, Procurement Operations Manual to determine if the work will be exempt from ISM flowdown language. **Note:** Work may be exempt if it is low risk (i.e., administrative, no physical labor, no operating equipment).
Step 2	If no ISM flowdown language is required, then Procurement and Property Management (PPM) processes the requisition. No further action is necessary. If ISM flowdown language is required, then go to step 3.
Step 3	The Work Requisitioner informs his/her Work Control Coordinator of the work he/she wants the contractor/vendor to perform.
Step 4	The Work Control Coordinator screens the work by following subsection 2.3.
Step 5	If no work permit is required, PPM processes the requisition. No further action is necessary. If a work permit is required, then go to step six.
Step 6	The Work Control Coordinator or Work Requisitioner informs PPM that a Work Permit is required. PPM incorporates the ISM flowdown language into the contract.
Step 7	The Work Control Coordinator processes the Work Permit by following subsections 2.4 through 2.8.

2.10 Standing Work Permit

A Standing Work Permit can be used as a longer-term hazard analysis and work authorization tool for jobs where the ES&H concerns are static and the activities are repetitive. The organization issuing the Standing Work Permit processes the form by following these steps.

Step 1	Check off the Standing Work Permit box at the top right part of the Work Permit Form. The "start" and "end" dates in Section 1 are the duration of the standing permit. The duration can only be for one year; then the form must be reissued.
Step 2	The person generating the Standing Work Permit ensures the workers are briefed and gets their signatures in Section 4, or on an attached sheet. Their signatures are good for the duration of the permit (not to exceed one year). **Note:** The original Standing Work Permits should be kept with the Department/Division Work Control Manager. A copy of the permit may be used in the field. **Note:** If you are writing repetitive standing work permits, for work within your work area or group, then you should consider writing a Standard Operating Procedure.

Guidelines

When performing work in work planning and control for operations areas (often this is in support of experimental work), use the following as general guidance for classifying work.

Guidance in determining low-hazard work: Routine work by the craft, technical and/or scientific personnel, for which the ES&H risks, complexity and coordination are all considered low, is classified as low-hazard work. This work classification, requiring minimum documentation (i.e., no requirement to use a Work Permit Form), is based on the concepts of "skill of the worker" and is supported by the level of experience, qualifications, and training.

Guidance in determining moderate-hazard work: Nonroutine work and routine work, for which none of the ES&H risks, complexity, and coordination are considered high, but at least one is considered moderate, is classified as moderate-hazard work.

Guidance in determining high-hazard work: Nonroutine work, and routine work, for which at least one of the ES&H risks, complexity, and coordination is considered high, is classified as high-hazard work.

See the exhibit Examples of Low-, Moderate-, and High-rated Tasks for additional guidance.

As previously stated, work in the low-hazard classification does not require use of a Work

Permit Form, however, the form may still be used. Work in the moderate- and high-hazard classifications requires levels of planning, documentation, and control appropriate for the specific ES&H risks, work complexity, and coordination.

References

Construction Safety Subject Area

Critiques Subject Area

Department/Division Work Control Managers and Work Control Coordinators Web Site

Radiological Work Stop Procedure

Records Management Subject Area

Procurement Operations Manual

Stop Work - Imminent Danger Procedures

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Subject Area: ***Work Planning and Control for Experiments and Operations***

3. Conducting Self-assessments

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

Applicability

This information applies to BNL staff planning and conducting self-assessments of their work planning and control processes for experiments and operations.

Required Procedure

Each Department/Division must conduct a periodic self-assessment of their work planning and control process for experiments and operations. This periodic assessment can identify problems, areas of excellence, and lessons learned that would continually improve their processes.

Step 1	The Work Control Manager and/or the Experiment Review Coordinator, in conjunction with the Department/Division Self-assessment Coordinator, determine the time frame, scope, and resources necessary to conduct a self-assessment on the work planning and control process for experiments and/or the work planning and control process for operations. The scheduling of these assessments will be based on the priorities of each Department/Division performing the assessment.
Step 2	The Department/Division Self-assessment Coordinator updates the Department/Division annual self-assessment plan as necessary to incorporate planned work planning and control self-assessment activities.
Step 3	The Department/Division conducts the defined self-assessment. Some of the self-assessments should involve the review/observation of fieldwork. • Use the exhibit Self-assessment Aid for Planning and Control of Experiments as a tool to assist in the self-assessment of the experimental process. • Use the exhibit Work Control Self-assessment as a tool to assist in the self-assessment of the operations process. The Department/Division must ensure that changes identified to improve the planning process, experiment safety review process, and the safe conduct of experiments are continually fed back into the review process. This should include lessons learned from occurrences, occupational injury/illness, and near misses.
Step 4	At the conclusion of the self-assessment the Work Control Manager or Experiment Review Coordinator documents and tracks any corrective actions to completion using the Department/Division tracking system. **Note:** Your Family ATS is recommended for tracking corrective actions.

Step 5	The Work Control Manager or Experiment Review Coordinator sends any lessons learned generated from the self-assessment(s) to the Work Planning & Control POC. **Note:** Any lessons learned from occurrences, occupational injury/illness, and near misses should also be sent to the WP&C POC, if not already done so.
Step 6	The Work Control Manager or Experimental Review Coordinator provides a copy of any self-assessment results to the Work Planning & Control POC.
Step 7	The Work Planning & Control POC uses findings in the Department/Division self-assessments to focus future self-assessments of Management System Descriptions. **Note:** Findings in Management System Description Self-Assessments are tracked in the subject area's POC's Family ATS.
Step 8	The Work Planning & Control POC provides lessons-learned feedback to the Departments/Divisions, through the Work Control Manager/Experiment Review Coordinator periodic meetings, on any Work Planning and Control Management System self-assessment that he/she performs.
Step 9	The Department/Division that performs the self-assessment files the self-assessment in accordance with the Records Management Subject Area.

References

Records Management Subject Area

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4. Guests and Visitors Performing Work

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

Applicability

This information applies to guests and visitors working at BNL, their host Department/Division, and supervisors.

Required Procedure

Thousands of people visit BNL each year. Several work in a variety of roles such as scientific consultants, job shoppers, guest researchers/collaborators, nonscientific consultants, student researchers/collaborators, subcontractors, DOE personnel, and others. The host Department/Division is responsible for ensuring all guests and visitors receive the proper training before they work on-site.

For contractors and vendors, see the Construction Safety Subject Area.

For foreign nationals, see Standard Practice Instruction (SPI) 5-09 Visits and Assignments of Foreign Nationals.

Step 1	See the exhibit Guidelines for Handling Guests and Visitors for information.
Step 2	See the New Employee/Guest Training and Processing section in the Training and Qualifications Subject Area for the training requirements for new employees, guests, and visitors.
Step 3	The Supervisor/Designee uses the New Employee/Guest Orientation (NEO) Form in the Training and Qualifications Subject Area to determine the training needs, and to track and record the results. **Note:** The work planning procedures for experiments (the section on Experimental Safety Review) and for operations (the section on Work Planning and Control for Operations) uses Experimental Safety Reviews and work permits to analyze and control hazards and to list any additional training requirements for

	personnel (employees, guests, or visitors), as driven by the specific work.
Step 4	The individual's supervisor gives the Guidebook for Guests Conducting Research to all visiting research personnel to inform them on a wide range of BNL issues, services, and requirements. The guidebook outlines several safety requirements and expectations concerning hazardous materials, radiation safety, lock-out/tag-out, work planning, stop-work, and other related items. **Note:** This guidebook does not replace training requirements.

References

Construction Safety Subject Area

Guidebook for Guests Conducting Research, Guests and Visitors Subject Area

Standard Practice Instruction (SPI) 5-09, Visits and Assignments of Foreign Nationals

Training and Qualifications Subject Area

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5. Off-site Work

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

Applicability

This information applies to all Departments/Divisions that send their staff off-site to conduct assigned work.

Required Procedure

This section discusses the requirements associated with the actual work itself taking place off-site, not items such as reimbursement, authorization to travel, advances, reservations, or sensitive countries. For information on these items, see Standard Practice Instruction (SPI) 4-01, Domestic Travel and the Official Foreign Travel Subject Area. This section also provides guidelines for work at different locations off-site.

Step 1	Use the exhibit Guidance in Conducting Off-Site Work to help determine how to approach tasks at different work sites.
Step 2	BNL staff conducting work at an off-site laboratory or industrial company follow the procedures and safety requirements of that organization supplemented by BNL procedures and processes.
Step 3	If the off-site work requires a Radiological Work Permit (RWP) and the laboratory or industrial company does not have a RWP procedure, then the lead BNL person generates an off-site RWP according to the Off-Site Radiological Work Permits Subject Area. **Note:** If the laboratory or industrial company does have their own RWP procedure, then follow their requirements.
Step 4	If any BNL worker on an off-site assignment needs to ship hazardous materials from that off-site location to BNL, or from BNL to that location, then he/she complies with the requirements in Transportation of Hazardous Materials Offsite Subject Area.

Step 5	If the work taking place off-site is not performed within the confines or jurisdiction of an Industrial Facility or Laboratory Environment (e.g., drilling a sample well outside Laboratory boundaries or a marine study in Long Island Sound), then a Work Control Coordinator screens it according to subsection 2.3 in the section Work Planning and Control for Operations to determine if a permit is required. If the task is an experiment, then go to step 7. **Note:** If the work is classified as "Skill of the Worker" or covered by a Standard Operating Procedure/Interim Operating Procedure, there is no need to screen the activity.
Step 6	If a work permit is required, then the Work Control Coordinator and the staff conducting the work, follow the subsections 2.4 - 2.9 in the section Work Planning and Control for Operations.
Step 7	The Experiment Review Coordinator reviews the proposed experiment to determine if an Experiment Safety Review should be written. If a review is required, then follow the requirements in the section Experimental Safety Review.

References

Off-Site Radiological Work Permits Subject Area

Official Foreign Travel Subject Area

Standard Practice Instruction (SPI) 4-01, Domestic Travel

Transportation of Hazardous Materials Offsite Subject Area

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Subject Area: ***Work Planning and Control for Experiments and Operations***

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Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

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Subject Area: ***Work Planning and Control for Experiments and Operations***

ESH&Q Considerations When Designing an Experiment

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

Note: These guidelines are not intended to be all-inclusive or mandatory. They are intended to provide guidance on experimental setup and review based on experience. The BNL Hazard Identification Tool in the Hazard Analysis Subject Area may also be used as a mechanism for hazard screening.

Environmental Issues	
Safety Issues	-Loss of radioactive cooling water or fire-protection water -Inadvertent radioactive or gaseous air emissions -Loss of radioactive waste or hazardous waste to ordinary waste stream -Induced activity in soil and subsequent contamination of groundwater -Loss of hazardous material to trenches or to soil and groundwater
Potential Initiators of Safety Problems	-Loss of pressure on domestic water supply -Violation of procedures for removal of waste -Cooling-water-pipe break and loss of water to a storm sewer and recharge basin -Inadequate containment between accelerator structures and the contiguous earth -Broken gas line or gas-filled chamber -Equipment leak or malfunction (i.e., transformer, capacitor, vacuum pump)
Items to Consider When Designing for Safety	-Containment structure to protect soil and groundwater -Special shields to reduce soil activation to ALARA -Formal design reviews for modifications -Drawing configuration control -Domestic water supply equipped with back-flow preventors -A system to hold-up spilled liquids

	-A system for normal and emergency gas ventilation -Specific waste-handling training of operators -Lock-down of ordinary waste stream, hazardous waste stream, radioactive waste stream -Removal of or blocking-off storm-sewer drain-lines near accelerator -Alarms on local sumps and manual starting of sump pumps -Air or water Permits in place if required -Special procedures to inspect area or system for leaks periodically -Controls established specific to equipment/process
Applicable Subject Areas	• Drinking Water • Engineering Design • Environmental Assessments • Environmental Monitoring • Hazardous Waste Management • Identification of Significant Environmental Aspects and Impacts • Liquid Effluents • Mixed Waste Management • National Environmental Policy Act (NEPA) and Cultural Resources Evaluations • Non-Radioactive Airborne Emissions • PCB Management • Pollution Prevention and Waste Minimization • Process Assessment • Radioactive Airborne Emissions • Radioactive Waste Management • Regulated Medical Waste • Underground Injection Control
Quality-related Issues	
Personnel Training	Select Qualified personnel before work. Their training must be identified, completed, recorded, maintained, and reviewed before work. See the Training and Qualifications Subject Area.
Documents	Identify documents considered necessary for meeting objectives, and for the safe conduct of operations of the facility/experiment, described processes, specify requirements, or established design. See the Internal Controlled Documents Subject Area.
Records	Identify records documenting actions taken during an experiment/operation that have affected execution, milestones, or ESH&Q issues. See the Records Management Subject Area.

Calibration	Establish calibration procedures and frequency for equipment and devices considered necessary to meet the project's objectives and safe conduct of operations/experiments. See the Calibration Subject Area.
Control of Nonconforming Items	Identify, control, and correct items, services, and processes that do not meet established requirements. See the Nonconformances, Identifying and Reporting and Corrective and Preventive Action Subject Areas.
Design	Prepare drawings, specifications, and other design documentation that are considered necessary to define the design parameter of the item/process. See the Engineering Design Subject Area.
Procurement	Select and apply quality-related requirements to be imposed upon a BNL supplier. Evaluate the capability of suppliers of critical, costly, or complex items. See the Graded Approach for Quality Requirements; Purchase Requisition Review for Quality-related Requirements; Supplier Evaluation Subject Areas.
Inspection and Acceptance Testing	Conduct source, receiving, in-process, and final inspection/testing of specified items, services, and processes using established acceptance and performance criteria. See the Inspections and Acceptance; Suspect/Counterfeit Items Subject Area.
Applicable Subject Areas	• Training and Qualifications • Internal Controlled Documents • Records Management • Calibration • Nonconformances, Identifying and Reporting • Corrective and Preventive Action • Engineering Design • Graded Approach for Quality Requirements • Purchase Requisition Review for Quality-related Requirements • Supplier Evaluation • Inspections and Acceptance • Suspect/Counterfeit Items
Personnel Exposure Issues	
Safety Issues	- Accidental exposure of workers to radioactive contamination or toxic materials

	- Failure to follow the design review procedures - Improper fabrication of accelerator devices - High temperatures or pressures - Cooling pipe break on systems with ethylene glycol - Oil leak from capacitors, transformers, pumps, motors - Unsafe practices for handling radioactive, hazardous, and toxic materials - Fire near uranium or other pyrophoric metal - Improperly designed or functioning lab hood - Chief Mechanical Engineer or Safety and Health Services Division certifies vessels, pressure chambers, relief valves - Chief Mechanical Engineer or Safety and Health Services Division certifies construction and testing procedures - Gas flow limits established - Operators trained on procedure for operation of gas or gas-mixing systems - Fail-safe temperature or pressure interlocks - Approved operator procedures and training for handling hazardous materials - BNL Hazard Communication Training for operators - Labeling of pipes and vessels as to contents - Inspection of chemical and hazardous materials inventories - Minimal combustible loading - Operators trained in appropriate emergency procedures - Controls established specific to equipment or process
Applicable ES&H Standards and Subject Areas	**Subject Areas** • Bloodborne Pathogens • Exhaust Ventilation • Hazard Analysis • Issuing and Use of Personnel Monitoring Devices • Working With Chemicals **ES&H Standards** • 1.4.0 Compressed Gas Cylinder Safety • 1.4.1 Pressurized Systems for Experimental Use • 1.4.2 Glass and Plastic Windows for Pressure Vessels • 1.14.0 Identification of Piping Systems • 4.11.0 Installation of Flammable Gas Systems (Experimental & Temporary Installations)
Flammable Or Combustible Materials Issues	
Safety Issues	- Loss of life or severe injury - Damage to components or facilities - Impact on the experimental program due to fire-related interruptions - Damaged or improperly connected electrical cables - Ignition of flammable gases - Ignition of flammable liquids

	- Ignition of flammable liquids - Inadequate cooling design - Poor housekeeping - Sprinkler and halon protection systems for high-value areas or components - High-sensitivity fire-detection systems - Selection of materials that reduce the potential for flame spread - Emergency exhaust ventilation systems - Use of strategically located exits - Use of audible alarms to reduce the potential of loss of life - Elimination of potential ignition sources - On-site fire/rescue organization notified on movement of flammable materials - Emergency planning and drills - Limits on flammable gas or liquid inventory and on flow rates - Required safety review for any modification on use of flammable gases or liquids - On-site safety inspection for installed equipment or material containing large amounts of wood, paper, plastic or other combustible matter - Use of fire wire fire-detection systems - Electrical energy interlocks tripped by heat or smoke detectors - Using refrigerators or containers that meet the criteria of Underwriters Laboratories or Factory Mutual for flammable materials - Identifying and posting hazardous locations for flammable or combustible materials storage or use - Written procedures whenever temporarily impairing fire detection/protection systems - Fire watch - Controls established specific to equipment or process
Applicable ES&H Standards and Subject Areas	**Subject Area** Environment, Safety, Health and Quality (Tier I) Inspections Subject Area Hazard Analysis **ES&H Standards** • 4.0.0 Fire Safety Program • 4.1.2 Means of Egress • 4.2.0 Impairment of Fire Protection Systems and Fire Alarm Systems • 4.3.0 Cutting and Welding • 4.4.0 Local Fire Protection Signaling Systems • 4.10.2 Flammable Liquids: Storage, Use and Disposal • 4.11.0 Installation of Flammable Gas Systems (Experimental & Temporary Installations)

	(Experimental & Temporary Installations) • 4.12.0 Special Precautions for Locations Containing Flammable Atmospheres • 4.12.1 Refrigerators for Flammable Liquid Storage • 5.2.0 Flammable Cryogenic Liquids
Electrical Energy Issues	
Safety Issues	- Electrocution death and injury - Electrical arching and molten-metal spray injury - Secondary injury from being thrown by electrical shock - Unsafe practices such as failing to follow lock out and tag out rules - Working and testing hot - Poor package design - Stored energy discharge - Failed captive key system - Approved procedures and training - Control zones around energized parts with signs and barriers - Use of permits to work hot - Equipment-specific lock out and tag out procedures - Externally controlled manual discharge devices - Automatic discharge of stored energy - Safety grounding - Installation of barriers on exposed bus, terminals, capacitor banks - Sufficient insulation and clearances - Captive-key system - Use of a safety watch or two-man rule where appropriate
Applicable Standards and Subject Areas	**ES&H Standards** • 1.5.0 Electrical Safety • 1.5.1 Lockout/Tagout Requirements • 1.5.2 Design Criteria for Electrical Equipment • 1.5.3 Interlock Safety for Protection of Personnel
Oxygen Depletion Issues	
Safety Issues	-Asphyxiation - Rescue of a victim overcome by lack of oxygen - Inadvertent entry into gas-filled confined space - Release of asphyxiant during entry into a routinely occupied space - Entry into an existing oxygen deficient environment - Entry procedure required for confined space - Written procedures for purging any hazardous gases from confined spaces - Safety reviews and functional testing before specific operations - For complex systems, conduct Failure Mode and Effect analysis to assess potential release paths - Medical certification of workers - Access controls

	- Medical certification of workers - Access controls - Use of self-rescue self-contained breathing apparatus - Use of fixed and portable oxygen monitors to determine oxygen deficiency before entry - Emergency response procedures - Generic and site-specific training - If the oxygen deficiency hazard is caused by a cryogenic, review by Laboratory Environmental Safety and Health Committee
Applicable Subject Areas	**Subject Areas** • Oxygen Deficiency Hazards (ODH), System Classification and Controls • Respiratory Protection • Confined Spaces
Hydrogen Issues	
Safety Issues	- Physical injury (e.g., eye injury, broken bones) - Burns - Explosion, equipment damage
Potential Initiators of Safety Problems	- Fire near a hydrogen device - Electric sparking in or near a hydrogen enclosure - Leak in hydrogen distribution system
Items to Consider When Designing For Safety	- Vacuum sensors, where appropriate - Hydrogen gas detectors in vent lines - Fire wire around nearby equipment - No smoking or open flame boundaries defined and posed - Use of a separate hydrogen enclosure that meets Class I Division II criteria for electrical circuits in explosive atmospheres - Controls on the introduction of ordinary equipment into the hydrogen enclosure - Fire detectors in and around the enclosure - Interlocks to turn off power to potential ignition sources should a fire develop, a vacuum leak be detected, or hydrogen gas be detected - Automatic, fail-safe venting of hydrogen gas out a vent stack - Trained operators who have procedures to respond to alarms - Written procedures for the operators; for example, hydrogen venting, filling, testing for hydrogen gas leaks - Safety reviews and functional testing before specific operations - Evacuation alarms and training for operators and nearby personnel, if required - Verification of alarm annunciation - Limit the amount of hydrogen gas to the minimum necessary to conduct experiment
Applicable Standards and	**Subject Area**

Subject Areas	Hazard Analysis **ES&H Standards** • 4.11.0 Installation of Flammable Gas Systems (Experimental & Temporary Installations) • 5.2.0 Flammable Cryogenic Liquids
Magnetic Fields and Electromagnetic Radiation Issues	
Safety Issues	- Reaction with medical implants - Magnetic push or pull of heavy metal object - Hyperthermia, Cataracts, Lenticular Opacities (rf)
Potential Initiators of Safety Problems	- Inadvertent exposure to stray magnetic field near spectrometer magnet - Exposure to rf radiation or laser light from improperly enclosed devices - Failure or bypass of interlock system - Areas with strong magnetic fields are to be fenced and posted with appropriate warnings - Magnets with large gaps undergo and environmental review before turned on to ensure signs and warnings are present, to ensure loose ferrous objects are not present, and to ensure magnet will be properly restrained - Measurement of magnetic fields around spectrometer magnets should be used to ensure fencing and posting are locate appropriately - Doors are posed with warnings for persons using a cardiac pacemaker - Local barriers are placed around rf stations - RFI gaskets are used on equipment to prevent rf radiation leakage - Routine monitoring of rf radiation to determine if gaskets are effective - Interlocks on laser barriers - Eye protection of laser users
Applicable Standards and Subject Areas	**Subject Areas** • Laser Safety • Static Magnetic Fields **ES&H Standards** • 2.3.2 RF and Microwaves • 1.5.3 Interlock Safety for Protection of Personnel
Thermal Energy Issues	
Safety Issues	- Burns - Fires

	- Fires
Potential Initiators of Safety Problems	- Spills of cryogenic liquids - Contact with cold lines associated with liquid cryogenic systems - Contact with hot surfaces of machinery or soldering irons - Improper protective clothing for cutting and welding operations - Inadequate or lack of labeling of piping systems
Items To Consider When Designing For Safety	- Insulation on cold or hot surfaces - On-site review of installation - Use of a Cutting and Welding Permit - Posting or fencing in boundaries for cutting and welding
Applicable Standards and Subject Areas	**Subject Areas** • Natural Hazards in the Environment Subject Area **ES&H Standards** • 1.14.0 Identification of Piping Systems • 5.1.0 Nonflammable Cryogenic Liquids • 5.2.0 Flammable Cryogenic Liquids
Kinetic Energy Issues	
Safety Issues	- Physical injury (e.g., eye injury, broken boned, hearing loss, fatal injury) - Misoperation of power tools or motorized equipment - Pressure testing with inappropriate vessels or piping - Inadvertent contact with rotating or moving machinery - Improper rigging of experimental apparatus or shielding - Failure to wear proper personnel protective equipment
Items to Consider When Designing For Safety	- Machine guards - Written procedures for large equipment moves - Person in Charge (PIC) of large equipment moves - Safety reviews and functional testing before specific operations - Personnel protective equipment requirements - Equipment operators training and certification - Dedicated lifting equipment with limits stenciled on device
Applicable Subject Areas	**Subject Areas** • Lifting Safety • Noise and Hearing Conservation
Potential Energy Issues	
Safety Issues	- Physical injury (e.g., eye injury, broken bones, hearing loss)
Potential Initiators of	- Release of stored energy associated with compressed gases

Potential Initiators of Safety Problems	- Release of stored energy associated with compressed gases or large vacuum spaces - Puncture of a vacuum window - Improper hoisting operation - Failure to wear proper personnel protective equipment - Pressure and vacuum equipment is designed to applicable codes - Safety reviews and functional testing before specific operations - Written procedures for use of compressed gas systems - Window covers and shutters on vacuum windows - Chief Mechanical Engineer certification of thin vacuum windows - Chief Mechanical Engineer certification of vacuum or pressure vessels - Written procedures for pressure testing or vacuum window testing - Written procedures for in-house assembly of vacuum or pressure vessels - Use of personnel protective equipment
Applicable Standards and Subject Areas	**ES&H Standards** • 1.4.0 Compressed Gas Cylinder Safety • 1.4.1 Pressurized Systems for Experimental Use • 1.4.2 Glass and Plastic Window Design for Pressure Vessels
Biological/Chemical Hazards Issues	
Safety Issue	- Accidental exposure of workers to a biochemical hazard greater than TLV or IDLH - Release of a biochemical hazard to the environment - Failure to follow the experimental review process - Unsafe practices for handling biochemical hazards - Lack of appropriate personnel protective equipment - Change of material being evaluated without knowing hazards - Improper or lack of labeling of material - Improper storage of biochemical material - Exposure of material to heat/cold/radiation that alters its known properties
Items to Consider When Designing for Safety	- Peer review when working with unknown material - MSDS evaluation - Secondary containment - Minimization of material used - Conduct experiment in approved exhaust hood - Use of personal protective equipment - Adequate labeling - Approved operator procedures and training for handling hazardous materials - Hazard communication training

	- Eye wash and shower in area
Applicable Standards and Subject Areas	**Subject Areas** • Bloodborne Pathogens • Exhaust Ventilation • Working With Chemicals
Criticality Safety Issues	
Safety Issues	- Inadvertent criticality - Release of fission products and radionuclides - Release of energy
Potential Initiators of Safety Problems	- Changes in moderation - Addition of fissionable materials - Changes in geometry - Changes in neutron poisons
Applicable Policy	**Environment, Safety and Health Policy Manual** II - Nuclear Safety Appendix E.1 - Fissionable Material Control Procedures

Radiation Issues Design Review Checklist

Note: ALARA Operations Review Checklist is included for reference and was developed by the Training Resources and Data Exchange (TRADE) network for use at DOE facilities.

In new facility/experimental design or modification, measures must be taken to maintain radiation exposure in controlled areas ALARA through facility and equipment design and administrative control. The primary methods used must be physical design features (e.g., confinement, ventilation, remote handling, and shielding).

Administrative controls and procedural requirement must be employed only as supplemental methods to control radiation exposures. For specific activities where use of physical design features are demonstrated to be impractical, administrative controls and procedural requirements must be used to maintain radiation exposures ALARA.

During the design of facilities/experiments or modifications to, the following objectives must be adopted:

a. Optimization methods must be used to ensure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls.

b. This design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2000 hours per year) must be to maintain exposure levels below and average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The design objectives or

exposure rates for potential exposure to a radiological worker where occupancy differs from the above must be ALARA and must not exceed 20 percent of the applicable standards of 835.202.

c. Regarding the control of airborne radioactive material , the design objective must be, under normal conditions, to avoid releases to the workplace atmosphere and in any situation, to control the inhalation of such material by workers to levels that are ALARA; confinement and ventilation must normally be used.

d. The design or modification of a facility/experiment and the selection of materials must include features that facilitate operations, maintenance, decontamination, and decommissioning.

   The following is a list of items that should be considered for applicability to the facility/experiment under consideration:

   1. Shielding
      a. Appropriate shielding material selection
      b. No straight penetrations
      c. Overlapping layers/shields
      d. Appropriate maze design
   2. Ventilation system
      a. Air flow from clean to nonclean areas
      b. Hoods and containment boxes under negative pressure or flow
      c. Is HEPA filtering required?
      d. Is air sampling required?
   3. Material selection
      a. Ease of surface decontamination
   4. Access controls
      a. Entry and exit arrangements for contamination and buffer areas
      b. Radiological area separated from nonradiological areas where possible and transition to nonradiological areas
      c. Interlock systems installed where required
      d. Interlock systems documented and reviewed in accordance with 10 CFR

d. Interlock systems documented and reviewed in accordance with 10 CFR 835 and ES&H Standard 1.5.3, Interlock Safety for Protection of Personnel

5. Dispersible materials operations
    a. Are step off pads required?
    b. Are quantities of materials greater than ALI quantities?
    c. Bioassay requirements
    d. Frisking/portal monitors
    e. Decontamination facilities
    f. Waste Handling operations
6. In-place radiation monitoring systems
    a. Required fixed area monitors
        i. Lights
        ii. Alarms
    b. CAM
        i. Beta/Gamma
        ii. Alpha
    c. Warning lights/indicators
        i. "X-ray on"
        ii. "Beam On"
7. ALARA Pre-operational Review Checklist
    a. For each phase of the operation, have the following been done?
        i. Procedures established that include appropriate radiological steps or considerations;
        ii. Number of workers, their positions, movements, and stay times estimated for each phase; and
        iii. Estimates based on measured or calculated dose rates determined for each position noted for the

1. whole body
2. extremities
3. skin and
4. other, as applicable?

b. Dose estimates made for
   i. Each worker (or a typical worker) in each phase;
   ii. Collectively for each phase; and
   iii. ALARA goals (totals or for each phase)?

c. Have the following been considered or planned?
   i. Lowering radiation or airborne radioactivity levels by
      1. Shielding;
      2. Draining, flushing, or purging of components;
      3. Decontaminating components, areas, etc.; and
      4. Filtering ambient air;
   ii. Minimizing time spent in radiological areas by
      1. Using special or remotely operated tools;
      2. Using experienced workers;
      3. Providing special or additional training for workers;
      4. Using mockups and run-through;
      5. Planning access paths, means of transport of heavy equipment;
      6. Having a prejob briefing;
      7. Removing physical interferences and blockages from area;
      8. Having appropriate portions of the work performed out of radiological areas;
      9. Listing and collecting all tools, parts, spared, etc., ahead of time;
      10. Providing adequate lay down space; and

10. Providing adequate lay down space; and

11. Providing service lines to area;

iii. Accommodating human factors by

1. Providing extra lighting;

2. Providing scaffolding, ladders, and supports as needed;

3. Providing ventilation adequate for comfort; and

4. Providing adequate communication methods (with backups if in dangerous or high radiation areas);

i. Controlling the potential spread of contamination by

1. Decontaminating components, areas.;

2. Covering or spraying contaminated surfaces to reduce airborne;

3. Covering or coating clean surfaces for ready decontamination;

4. Providing containment or enclosure (tent, glove box, receiving bags for contaminated items, and the like);

5. Providing means of collecting drainage, loose particles, and other escaping material (in pans, with vacuum suctioners or cleaners);

6. Providing local ventilation ; and

7. Filtering exhaust air;

ii. Controlling access by

1. Providing adequate procedures, checks and HP coverage for entries into appropriate radiological areas;

2. Having area prominently posted by the HP group before the operation;

iii. Minimizing impact on other areas, systems, and operations by

1. Weighing effects of increased dose rate on adjacent areas;

2. Ensuring that air flow does not transport airborne contaminants out of the subject area;

3. Isolating the subject system from other systems and uninvolved

components in the same system, as appropriate;

4. Coordinating the subject operation with other operations; and

5. Ensuring that any new installation or operation does not adversely affect future use of other systems (their operation, maintenance, inspection, calibration.);

iv. Ensuring safety by

1. Providing adequate procedures and safeguards when disabling or bypassing safety systems and components (e.g., overriding interlocks);

2. Making sure contingency plans exist if rescue becomes necessary;

d. Have radiological controls been planned?

i. Radiation work permit - review and approval?

ii. Posting

iii. HP coverage

iv. Hold points

v. Other

e. Have the following been provided for the operational records, as appropriate?

i. Photographs

ii. Supplemental dosimetry

iii. Portable air samplers

iv. Other

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Examples of Low, Moderate, & High Tasks

In the BNL work control system, jobs are screened into low-, moderate-, or high-hazard categories using a graded approach. The low-hazard jobs are considered skill-of-the-worker tasks, whereas the moderate- and high-hazard ones must have a work permit and certain levels of planning rigor. The following three factors are taken into consideration when categorizing work requests into low-, moderate-, or high-hazard job categories:

- ES&H Issues;
- Complexity;
- Work Coordination.

Job ratings are shown below for work examples with various degrees of hazards, job complexity, and coordination.

Job Hazard Rating - LOW

Example: A gate valve needs to be replaced in a non-potable water system. Here the leak is just a nuisance. The Work Control Coordinator categorizes the job as low hazard. The job is given to a tradesperson with minimum paperwork. He uses his "skill of the worker" knowledge to complete the task. The ES&H issues, job complexity, and work coordination needs are all rated low.

Requirements:

- Verbal instructions;
- Minimum supervisory involvement;
- Skill of the worker sufficient for task.

Job Hazard Rating - MODERATE

Example: A gate valve needs to be replaced in a chemical processing system. The task of replacing the valve is simple, but the isolation of the chemical system demands some rigor. This job requires written instructions or a procedure and some work-site supervision (i.e., pre-job briefing, work-site visitation) The ES&H issues are high, the complexity low, and coordination moderate.
Requirements:

- Work permit;
- Normal supervisory involvement;
- Work instructions for the craft.

Job Hazard Rating - MODERATE

Example: A chilled water system is being replaced in a laboratory; the system feeds several sensitive experiments in several rooms with numerous interlocks. The ES&H issues are low, job complexity moderate, and work coordination high.
Requirements:

- Work permit;
- Coordination instructions;
- Normal supervisory involvement;
- Skill of the worker sufficient for task.

Job Hazard Rating - HIGH
Example: An air compressor in a plant safety class system requires a complete overhaul; it is in a radiological controlled area and the process piping may have internal contamination. The ES&H issues are high, the complexity moderate, and work coordination high.
Requirements:

- Work permit;
- Detailed written instructions;
- Maximum supervisory involvement;
- Job Safety Analysis.

Subject Area: ***Work Planning and Control for Experiments and Operations***

Experimental Safety Review Contents

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

The experimental documents, prepared in draft form by the Principal Investigator/Responsible Person (PI/RP) and reviewed by the Experimental Safety Review Committee (ESRC) (or subcommittee), should consider and address the following as applicable to the experiment. Other considerations to ensure the proper control of the experimental hazards may be added to the review, as appropriate, based on prior experience or input from subject matter experts and/or the ESRC.

1. The experiment purpose and scope;
2. Location of experiment (bldg./lab., off-site locations, etc.);
3. Expected duration of experiment, including setup and teardown
4. Personnel involved in the experiment;
5. Description of apparatus/equipment (including significant design- related documents to be managed as official records per the Records Management Subject Area);
6. Description of any material (purchased or collaborator-provided) to be used in the experiment that will require formal inspection and testing per the Inspections and Acceptance Subject Area;
7. The identification of any hazardous material that will require transfer between facilities and/or shipment off-site or from off-site to the Laboratory that are covered in the Transfer of Hazardous Materials Onsite Subject Area, Transfer of Radioactive Materials Onsite Subject Area, Transportation of Hazardous Materials Offsite Subject Area, and the Transportation of Radioactive Materials Offsite Subject Area;
8. Identification and evaluation of all hazards that will be present during setup, operation, and teardown of the experiment. You must have measures to control or mitigate these identified hazards:

   a) Biological;
   b) Physical (i.e., equipment hazards);
   c) Chemical;
   d) Radiological (including dose rates and beam/microwave intensities, as appropriate);
   e) Quantities and types of gasses, chemicals, radioactive material/isotopes, and fissionable materials;
   f) Working ranges of hazardous equipment (mechanical/electrical).

See the exhibit ESH&Q Considerations when Designing an Experiment and the BNL Hazard

See the exhibit ESH&Q Considerations when Designing an Experiment and the BNL Hazard Identification Tool in the Hazard Analysis Subject Area for additional information.

9. Environmental Aspects: Refer to the BNL Criteria for Significant Aspects within the Identification of Significant Environmental Aspects and Impacts Subject Area and identify any applicable significant environmental aspects. For each significant aspect deemed applicable, provide a detailed description. Contact your Environmental Compliance Representative for assistance;

10. The impact of the chemical and radiological inventory on the hazard classification of the facility where the experiment will be conducted and follow-up actions, including updating the Facility Use Agreement, as appropriate;

11. Any additional requirements due to the experiment being performed in an off-site location, e.g., WP&C Process, prophylactic vaccinations, travel permits/papers, out of country insurance coverage, traveling with hazardous materials. See the section Off-site Work.

12. Training and qualification requirements for all participants of the experiment;

13. Any certifications or permits both internal and external to the Laboratory;

14. Any industrial hygiene controls, monitoring, and/or personnel protective equipment;

15. A Waste Disposal Plan as appropriate. Identification of waste generation and efforts to minimize waste. **Note:** See your Environmental Compliance Representative to determine if the experiment would constitute the treatment, storage or disposal of a waste not described in BNL's Radioactive Waste Management Basis (RWMB) Document.

16. List of experimental process/operating procedures/protocols (e.g., experiment operating procedures, emergency procedures, equipment maintenance requirements; calibration requirements (see the Calibration Subject Area);

17. Decommissioning and Decontamination plan, including the identification of hazards, controls necessary to tear down the experiment and funding required to terminate the experiment;

18. The need for any security requirements or notifications (see the exhibit Security Checklist for further guidance);

19. The need for Operational Readiness Evaluations. See the Operational Readiness Evaluation (ORE) Subject Area.

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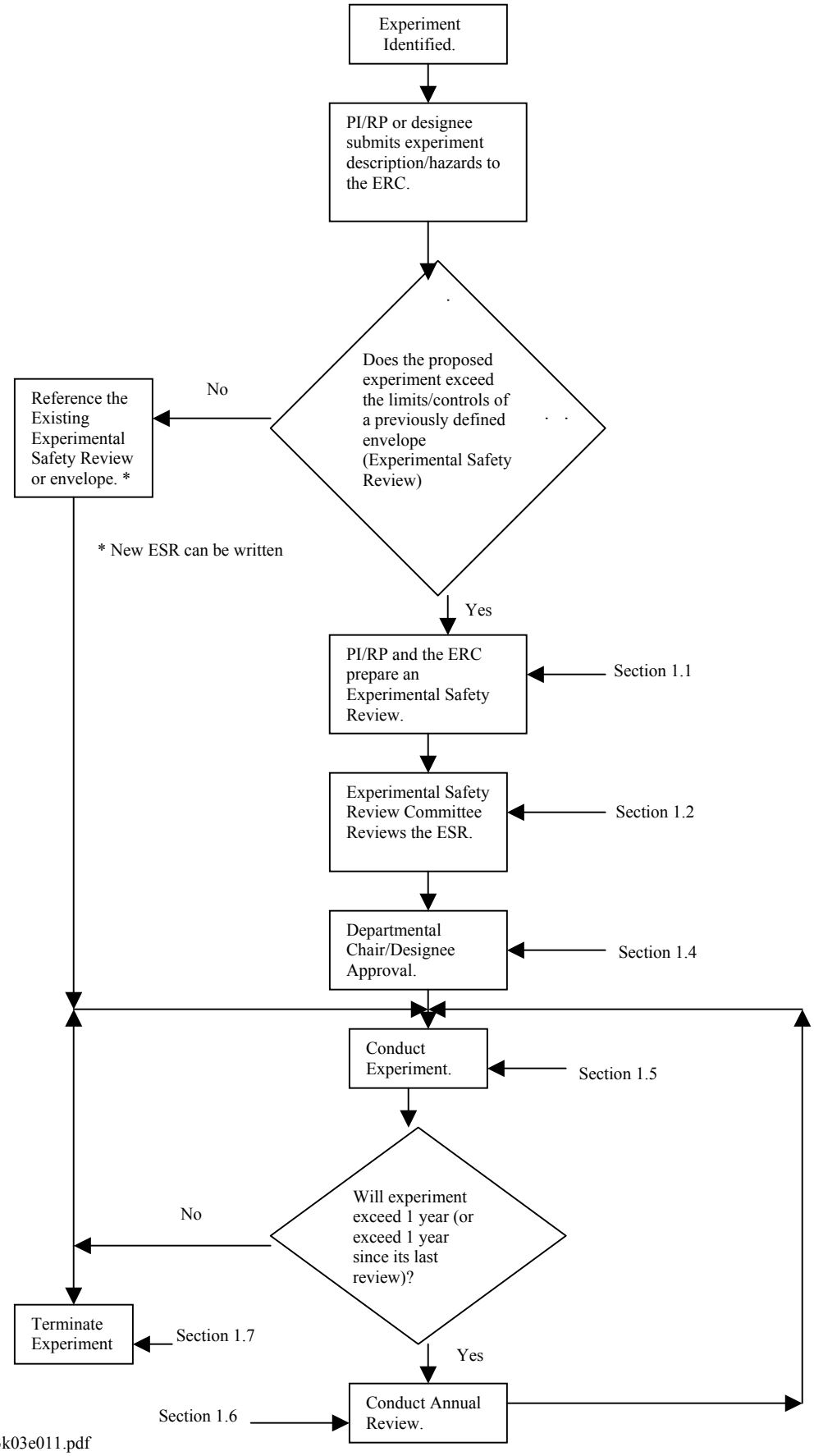
Send a question or comment to the SBMS Help Desk
Disclaimer

Experimental Safety Review Flowchart



Subject Area: ***Work Planning and Control for Experiments and Operations***

Guidance in Conducting Off-site Work

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

The following table provides some methods on how to approach assigned work that is not conducted on the BNL site, or controlled by BNL's Work Planning and Control Processes. Regardless of how you approach the work, always understand the following when off-site:

- Collect as much information as possible about the work you will be doing, and the site where you will be working. This information will help with planning.
- Be aware that when you reach your destination, work conditions may be different than you expected. If necessary, call your supervisor and/or ES&H staff for guidance.
- The resources of the Laboratory will still be available to you, e.g., your Experiment Review Coordinator (ERC), Work Control Coordinator, subject matter experts (SME), ES&H Staff, and your supervisor.
- Bring an emergency phone list with you: Security, your supervisor, SMEs per the work you will be doing, Work Control Coordinator, and/or ERC.
- If you are placed in an unsafe condition while off-site, attempt to stop the work and resolve the concern. If that is not possible, then you are responsible for remove yourself from the situation and not continue to work until the issue is resolved.

Work Location	Approach	BNL Reviews
Other Department of Energy Laboratories	1) Follow their Work Planning &Control (WP&C) Process.	None
Other U.S. Government Facilities	1) Follow their WP&C Process.	None
Other U.S. Research Facilities	1) Follow their WP&C Process. 2) Review work plan; train employees as needed.	Experiment Review Coordinator and Work Control Coordinator review the scope of work and determine if additional review is required.
Foreign Research Facilities	1) Within their WP&C process, identify the hazards and methods to mitigate those hazards. 2) See exhibits Personnel Safety During Foreign Travel and Medical Precautions While on Foreign Travel. 3) Provide additional training as needed.	1) Experiment Review Coordinator and/or Work Control Coordinator review the scope of work. 2) SMEs assist the Experiment Review Coordinator/Work Control Coordinator in identifying and mitigating hazards.
Commercial/Manufacturing Facilities (domestic)	1) Follow their WP&C Process. 2) Provide additional training as	Experiment Review Coordinator and Work Control Coordinator review the scope of work and

	needed.	determine if additional review is required.
Commercial/Manufacturing Facilities (foreign)	1)Within their WP&C process, identify the hazards and methods to mitigate those hazards. 2) See exhibits Personnel Safety During Foreign Travel and Medical Precautions While on Foreign Travel. 3) Provide additional training as needed.	1) Experiment Review Coordinator and/or Work Control Coordinator review the scope of work. 2) SMEs assist the Experiment Review Coordinator/Work Control Coordinator in identifying and mitigating hazards.
Aircraft/Marine	Contact the Chairperson of the Aviation and Marine Safety Committee.	N/A
Field Work (work done outside the confines or jurisdiction of an industrial facility or lab environment, i.e., drilling a well off BNL property)	Follow Appropriate WP&C Process (BNL's or host site's).	1) Experiment Review Coordinator and Work Control Coordinator review the scope of work and determine if additional review is required. 2) If the hazards with the work or experiment could adversely affect the environment, consider contacting the Community Involvement Office.

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Guidelines for Handling Guests and Visitors

This exhibit contains guidelines for Work Control Coordinators (WCC), Experimental Review Coordinators (ERC), and Principal Investigators/Responsible Persons (PI/RP) to follow when working with guests and visitors.

1) Ensure the individuals receive all appropriate training before performing any work.

2) Ensure that individuals are aware of all hazards in the facilities they will be working in.

3) Follow the Underage Workers (Minors) subject area.

4) It is the host's responsibility to ensure that their guests, visitors, or students are adequately supervised.

   Note: If guests, visitors, or students are left unattended, ensure they have the means to communicate immediately with people who can lend them assistance (house phones, intercom, commercial phones, cell phones, radio, etc).

5) All requests to perform work must be, at a minimum, screened per the sections on Experimental Safety Review and Work Planning and Control for Operations of this Subject Area (by the area WCC or ERC), to determine if an Experimental Safety Review or Work Permit is required.

6) Use your judgment in what work you allow guests and visitors to do. Many of our visitors and guests may be inexperienced in industrial settings; without proper oversight, this lack of experience could place them into jeopardy.

Job Safety Analysis

I. Purpose

This procedure establishes a standard method for developing and using Job Safety Analyses (JSA).

II. Scope

The JSA process is available for use by all BNL employees, users, contractors, and subcontractors to analyze any work or operation that may present hazardous situations.

III. Procedure

1. Select the Job to Be Analyzed

A key element in a JSA Program is to effectively select which jobs and operations need to be analyzed. Selecting jobs at random reduces the focus of the program and the safety benefits. The supervisor of the work crew or the operation is responsible for identifying jobs that require safety analysis. The following factors should be considered in selecting a job to be analyzed.

- **Frequency of Accidents:** A job that has repeatedly produced accidents or near misses is a candidate for a JSA. The greater the number of accidents or near misses associated with a job activity or an operation, the greater is the need for a JSA. The JSA can also be a response to a Lessons Learned action item.

- **Severity Potential:** Some jobs may not have a history of accidents but may have the potential for severe injury.

- **New Operation:** A new piece of equipment or a new operation may need to be analyzed to uncover hazards or to establish the correct procedures.

- **New Job:** New jobs created by changes infield conditions, new technology, or methods of operation have no history of injuries, but their accident potential may not be fully appreciated.

- **High-rated Jobs:** As per the Work Planning and Control for Experiments and Operations Subject Area jobs rated as high hazard must have a JSA due to the level of hazards and job complexities.

2. Break the Job Down

Before the search for hazards begins, a job should be broken down into a sequence of steps, each describing what to do. Avoid two common errors: making the breakdown so detailed that an unnecessarily large number of steps result, or making it so general that basic steps are not recorded.

As shown in the attached example, each step is recorded consecutively in the left-hand column of the JSA form. Each step describes what is done, not how. The JSA form illustrates step-by-step how a complex engineering project is executed and how the hazards are mitigated.

3. Identify Hazards and Potential Accidents

To effectively identify the possible hazards associated with each job step, the safety analysis should include personnel who are knowledgeable of the particular job or operation. It is not enough to look at the obvious hazards; look at the entire environment and identify every conceivable hazard, "what if" situations, and potential accidents that are within reason. The potential hazards are recorded in the middle column of the JSA form. Use an ES&H professional in developing the JSA.

4. Control Measures

Using the first two columns as a guide, decide what control measures are necessary to eliminate or minimize the hazards. Items listed to mitigate hazards could be personal protective equipment, safety permits, task certification, operational instructions, and so on. Be specific. State exactly what needs to be done to correct each hazard listed in the second column.

5. Using The JSA

JSAs developed for jobs, projects, or operational activities help uncover hazards and potential situations that may not have been identified without the step-by-step analysis. Listing the sequential project steps and worker's tasks also help identify coordination requirements. In conducting the JSA, the people involved in the analysis learn more about the job and enhance their overall safety awareness.

When a JSA is distributed, the supervisor's first responsibility is to explain its contents to employees and, if necessary, to give them further individual training. The entire JSA must be reviewed with the employees concerned so that they will know how the job is to be done - without accidents. The JSA will be available and maintained at the job location for employees performing the job.

Job Safety Analysis Example

JOB DESCRIPTION: Building 901 Tank Removals Support two 13.8-KV ductbanks using steel beams and remove two radiologically contaminated tanks from under the ductbanks. Survey and sample soil under each tank, remove surface soil that may be contaminated.	**DATE OF ANALYSIS:** February 24, 1999
SHOP: Electrical, Water Treatment, Site Maintenance, ESD Sampling Team Health Physics	**PERFORMED BY:** G. Flett and R. Lykins
REQUESTOR: G. Flett	**LOCATION:** Lawn area south of Building 901
EMPLOYEES OBSERVED: See Shops above	**FREQUENCY OF JOB:** One time only
PERSONAL PROTECTIVE EQUIPMENT (PPE): Hard hat required; See Radiological Work Permit	

Job Steps	Hazards/Potential Accidents	Control Measures
5. Hand excavate to expose top of tanks and overflow piping on south end of tank.	Cave-in potential Undermine adjacent ductbank Sudden rainstorm fills excavation	Slope side 1.5/1; competent person to be present onsite during activity. Determine depth and location of adjacent ductbank. Construct soil berm around excavation to prevent excessive runoff from entering the excavation.
6. Cut and remove 4-inch overflow piping	Interior radiological contamination	Cut pipe with pipe cutter; perform radiological survey; follow RWP for required PPE.
7. Excavate on north side of tanks to allow for tank removal.	Cave-in potential Undermine Bldg. 901 Foundation	Slope sides 1.5/1; competent person to be present onsite during activity. Soil at foundation base to remain undisturbed.
8. Place geotextile fabric and plastic sheeting into freshly excavated area, which will remain under tanks during removal.	Cave in potential	Slope sides 1.5/1; competent person to be present onsite during activity.
9. Drag tanks out from under ductbank onto geotextile fabric/plastic sheeting	Spread radiological contamination	Solidify sludge in tank with Radsorb or equivalent prior to moving.

Job Steps	Hazards/Potential Accidents	Control Measures
10. Lift tanks out of excavation and place in containers	Drop tanks Tank rupture/release of contents	Use BNL riggers with approved slings. If tank bottom is badly corroded, wrap geotextile fabric and plastic sheeting around tank and lift out of excavation with tank.

Subject Area: ***Work Planning and Control for Experiments and Operations***

Medical Precautions While on Foreign Travel

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

Medications

Personal medications should be carried in their original containers as dispensed by your pharmacist or purchased over-the-counter. Consider carrying copies of prescriptions for essential medications, as well as for corrective lenses for replacement of broken eyeglasses.

If you have special medical requirements, you should prepare a brief document describing symptoms, medications and procedures. Copies of the document should be left with a contact at home, placed in your luggage, and given to one of your traveling companions.

Personal Health

You should discuss health concerns as needed with your own physician and/or the staff of BNL's Occupational Medicine Clinic (OMC). A consultation appointment is particularly recommended for travel to Asia, Russia and the republics of the former Soviet Union, Eastern Europe, the Middle East, Africa, Mexico, Central America, and South America. You may receive immunizations, essential travel medications, and advisory information specific to the locale you will visit.

Employees who anticipate international work-related travel should call OMC for a travel appointment as soon as feasible before the travel date. OMC offers some region-appropriate immunizations. For further information regarding health conditions in other countries see the Centers for Disease Control.

Note: On request, OMC will prepare a "travel kit" of medications for you to take along on foreign travel. The kit includes over-the-counter-items as well as some items related to travel normally obtained by prescription, along with detailed instructions regarding the use of each item in the kit.

Health Insurance Coverage

Verify if your Health Insurance will cover you outside of the United States. Depending on which medical coverage plan you have elected, coverage may not be effective outside the continental U.S.

Note: The CIGNA plan provides for reimbursement of medical expenses, subject to procedures that require pre-approval even within the Unitied States. For participants in HMOs, obtaining alternative health coverage is recommended to cover the duration of foreign travel. Please contact the Benefits Office to obtain clarification of the extent of your coverage before travel.

Note: Several health-related insurance companies offer health coverage for foreign travel, to provide for the availability of adequate medical attention, or emergency medical evacuation to the nearest facility capable of

providing appropriate care. National Laboratories within DOE have contracted for such coverage from Medex Assistance, International SOS, and United Educators. BNL has contracted in the past with Medex for emergency medical evacuation from countries of the former Soviet Union. The service under the arrangement with Medex is limited to medical evacuation to a facility with western medical standards (currently a U.S. Air Force Base in Germany), when the insurer deems an evacuation is medically necessary. The insurer has sole authority for determining when an evacuation is medically necessary.

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Send a question or comment to the SBMS Help Desk
Disclaimer

Outline for Implementing Procedure

The section on Work Planning and Control for Operations is written as an "implementing procedure;" however, a Work Control Manager may elect to establish an implementing procedure to document specifically how their organization operates within the flexibility allowed by this section. This exhibit outlines what should be addressed in a departmental specific implementing procedure.

Proposed Outline for an Implementing Procedure

I. Introduction

Explain that this is an implementing procedure based on the requirements of the section Work Planning and Control for Operations in the Work Planning and Control Subject Area. The purpose of this procedure is to provide the specific methods used in applying the work control system.

II. Scope

Explain where the section Work Planning and Control for Operations applies; what groups or buildings are exempt due to administrative or routine nature of the work.

III. Responsibilities

Either refer to the section Work Planning and Control for Operations or repeat what is written and add any additional responsibilities as needed.

IV. Requirements

A. Work Control Managers and Work Control Coordinators

Outline how the Work Control Coordinators (WCC) will operate to meet Work Planning and Control for Operations requirements. Reference an attached list naming the Work Control Manager and Work Control Coordinators and their areas of responsibility, or show the website that has the current listing. Referring to the website is preferred since your procedure will stay current even when the WCC roster changes.

B. Logbook/Spreadsheet

Explain the recordkeeping responsibilities of the WCC and how work permit numbers are issued. Show what information must be recorded in the logbook or on the spreadsheet. The Department/Division should consider standardizing the logsheet across all groups.

C. Processing and Screening Work Requests

Explain how the work requests are specifically routed through the WCC. Does the WCC see all the requests for external services and internal work covered by WP&C for Operations: Is some work exempt from WCC review due to skill of the worker consideration? If so, what are the criteria for exemption from review? Reference the use of Screening Guidelines for

Work Permit Determination and Screening Guidelines for Work Planning & Control and Application of the Quality Graded Approach for the screening and categorizing of work requests. Describe and attach any screening criteria that have been developed specifically for that organization.

D. Filling Out the Work Permit

Refer to the section Work Planning and Control for Operations. If the Department/Division, however, is using the electronic work permit system (pilot program), this section will be extensive in explaining how the electronic system is used in processing the permit.

E. Work Permit Review

Name the Primary Reviewers by their title or by name. Explain how the reviews should typically be handled and reiterate the responsibilities of the Primary Reviewer and the need to involve ESH&Q personnel (as required).

F. Change Control

Describe the system used for controlling changes to the work scope while work is in progress.

Note: No attachments are needed unless there are Department/Division-specific criteria for work screening. Refer to the Work Permit Form and other exhibits in the Work Planning and Control for Experiments and Operations Subject Area.

Subject Area: ***Work Planning and Control for Experiments and Operations***

Personnel Safety During Foreign Travel

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

Travel Warnings

The traveler should check the U.S. Department of State web site. Concise information on foreign travel is available under the "Travel Warnings" and "Country Background Notes" sections. Also select "U.S. Embassies and Consulates" on the web site, and record the location and contact information for the location(s) you intend to visit during your travel; exchange this information with your colleagues for use in an emergency.

Counterintelligence Briefing

For visits to sensitive countries, the traveler should contact the BNL Counterintelligence Office to receive a pre-travel briefing that addresses varying local political or cultural conditions related to the intended itinerary. These briefings also cover information gleaned from other travelers' experiences that can be valuable to the traveler. Information on the briefings can be found on the BNL web site.

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Screening Guidelines for Work Planning & Control and Application of the Quality Graded Approach

	ESH &Q Risk Level			
ESH Category	**Negligible**	**Low**	**Moderate**	**High**
Quality Class (Optional)	**A4 - Negligible**	**A3 - Minor**	**A2 - Major**	**A1 - Critical**
ES&H Issues				
1. Personnel Injury	Negligible risk for injury	Minimum risk for injury	Potential for serious injury	Potential for fatality or severe injury
2. Radiological Work	Negligible potential for exposure	Work in controlled areas	Work requiring an RWP	Work requiring an RWP and ALARA review
3. Electrical Work	De-energized (discharged)	• Work on energized systems 50 volts or less (Range A) • Work on any electrical system after proper application of LOTO and zero energy checks	Work on energized systems greater than 50 volts but less than 600 volts (Range B & C) ES&H 1.5.0	• Work on energized systems 600 volts or greater (Range D) – ES&H 1.5.0 • Work requiring the disabling or jumpering out of safety interlocks – ES&H 1.5.3 Any work within 10 feet of a non-insulated energized line
4. Stored Energy (hydraulic, thermal, pneumatic, mechanical, etc.)	No stored energy	• Capable of being easily isolated; no disassembly required. • LOTO	Required to disassemble system or piping to isolate energy (i.e., - inserting blank flange)	
5. Confined space work	No confined space	Confined space (Class 1)	Confined space work (Class 2A and 2B)	Confined space work requiring permit (Class 2C) - Confined Space Subject Area
6. Excavation, digging, trenching, or concrete penetration	None	• Excavations where no personnel will be in the trench • Dig depth of less than 5 feet	• Excavations over 5 feet in depth with personnel using trench box • "Aggressive" concrete penetration	• Excavations over 5 feet in depth where personnel will be working in trench and using engineered protective system (i.e., - sloping or shoring) – • ES&H 1.18.0
7. Environmental Aspects/Impacts – refer to "Criteria for Significant Environmental Aspects" Note: Quality Class does not apply to this issue, the appropriate quality requirements are built into the Lab's environmental system documentation.	No environmental aspects associated with work	Work has an environmental aspect but does not meet significance criteria	Work has an environmental aspect that meets significance criteria	Work has an environmental aspect that meets significance criteria and has potential for (1) radiological release or (2) groundwater contamination or (3) regulatory violation
8. Work requiring respiratory protection	Respiratory protection not required		Air purifying respirator required	Air supplied respirator required (SCBA or air line) – ES&H 2.2.0

ESH Category	Negligible	Low	Moderate	High
Quality Class.	**A4 - Negligible**	**A3 - Minor**	**A2 - Major**	**A1 - Critical**
9. Non-ionizing Radiation	None	• Exposure <TLV • Work with class I, II, or IIIa lasers	• Exposure >TLV • Work with class IIIb lasers	• Pacemaker wearer or medical implant • Work with class IV lasers
10. Rigging and heavy lifting	None	Routine bucket truck, forklift, or crane work with trained personnel	• Lift is 75% or more of the rated capacity • Moving heavy loads by personnel other than riggers or qualified crane/fork operators	Critical lifts – ES&H 1.6.0
11. Elevated work	None	• No fall protection required • Work requiring fall protection equipment, but with established procedures and qualification training (i.e., - bucket truck use)	Work requiring fall protection equipment, (I.e., - harness, lanyard, etc.)	Work requiring a fall protection plan
12. Work with OSHA regulated chemicals (i.e., lead, heavy metals, etc.)	None	Below action level	Potential for exceeding action level	Potential for exceeding exposure level
13. Beryllium	None	Work with articles – required completion of BURF: send to SHSD	Machining prohibited (moderate and high risk work prohibited without written consent of BNL Laboratory Director and DOE BHG office)	
14. Other hazards identified in the1.3.5 and 1.3.6 review process (examples given)	Work in Biosafety Level 1	• Work with animal subjects • Noise level less than 85 dBA • Work in Biosafety Level 1/2 & 2	• Work requiring valve lineup instructions to properly isolate system • Asbestos abatement • Demolition work with potential legacy waste concerns • Work in extreme temperature conditions • Work with biohazardous materials • Work in Biosafety Level 2/3 • Work with human subjects • Noise level 85-100 dBA	• Work on pressurized or vacuum systems, dept. specific – ES&H 1.4.1 • Work on hydrogen or flammable systems • Work on shielding, dept. specific – ES&H 1.6.0 • Work in Biosafety Level 3 & 4 • Noise level >100 dBA
Programmatic/Quality Issues				
15. Stakeholder Perception	Negligible on overall BNL/DOE mission and program	Minor on overall BNL/DOE mission and program	Major on overall BNL/DOE mission and programs	Critical on overall BNL/DOE mission and program
16. Data Integrity	Negligible reduction in data quality or equipment output.	Minor reduction in data quality or equipment output.	Major reduction in data quality or equipment output.	Total loss/severe reduction in data quality or equipment output.
17. Downtime of a program.	Negligible, e.g. • Less than 2 days • 2% of program schedule	Minor, e.g., • 2 days or more but less than 4 days • 2% or greater but less than 10% of program schedule	Major, e.g. • 4 days or more but less than 3 weeks • 10% or greater but less than 30% of program schedule	Critical, e.g. • 3 weeks or more • 30% or greater of program schedule
18 Equipment dollar loss	Negligible, e.g. • Less than $10K Less than 2% of item/material or program cost	Minor, e.g. • 10K to 50K • 2% or greater but less than 10% of item/material or program cost	Major, e.g. • Greater than 50K to 250K • 10% or greater but less than 50% of item/material or program cost	Critical, e.g. • Greater than 250K • 50% or greater of item/material or program cost

Subject Area: ***Work Planning and Control for Experiments and Operations***

Security Checklist

Effective Date: **September 2003**

Point of Contact: Work Planning & Control POC

If you need any assistance, call Security at extension 4691 or 4496 to determine what (if any) requirements are needed to address the security concerns for work that involves or requires the following:

- **Access Controls** (for security reasons);
- **Nuclear Material Control and Accountability Issues;**
- **Classified Materials;**
- **Counterintelligence**;
- **BNL Equipment, Outside the Laboratory**, in a potentially unsecured area (concerned with protecting Lab equipment);
- **Foreign Visitors and Assignments** (See Guests and Visitors Subject Area);
- **Import/Export Controls**;
- **Physical Security or Property Protection** of a building or an area;
- **Personnel Security** issues;
- **New Construction** of a building or facility;
- **Information Security** issues;
- **Operational Security** issues;
- **Cyber Security** issues;
- Protection of **Valuable Materials**.

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Qualification Matrix

1.0 Purpose

This procedure provides a methodology for generating qualification matrices to justify skill of the worker tasks.

2.0 Scope

Organizations that use the Work Planning and Control for Experiments and Operations Subject Area to control internal work activities may use qualification matrices to justify skill of the worker tasks.

3.0 Procedure

The purpose for establishing a qualification matrix is to provide a better understanding of what "skill of the worker" means for each group. The matrices move the skill of the worker decision making from being expert-based (i.e., "I know it when I see it") to a more defined standards-based position. The matrices also clearly establish the activities that the Work Control Coordinator does not have to screen.

1. **Establish How Many Matrices will be Generated**

   The first step toward establishing the matrices is to determine how many are needed within a Department/Division. For example, the National Synchrotron Light Source (NSLS) Department has over fifty technicians in nine groups who provide services for various systems within NSLS. Therefore NSLS could have nine matrices that list the personnel for each group and jobs for which they are qualified to work as skill of the worker. The Chemistry Department has only nine technicians and therefore may only have one matrix to show who is qualified to do what activities.

2. **Proposed List of Skill of the Worker Activities**

   For each proposed matrix, a list of proposed skill of the worker activities is generated by a group of subject matter experts (i.e., supervisor and workers). The Work Control Manager or the area Work Control Coordinator should lead a brainstorm session with the appropriate personnel to list and discuss proposed skill of the worker activities. These activities may be categorized or shown by

   - Systems: i.e., qualified to work on certain systems
   - Tools/Equipment: i.e., use of machinery in a shop or certain tools
   - Materials: i.e., work with various epoxies, cryogens, etc.
   - Tasks: i.e., installing, removing, or fabricating whatever

3. **Establish Limitations on the Skill of the Worker Activities**

   After the group has agreed upon the list of skill of the worker activities, limitations should be established for the activities where reasonable boundaries are needed.

Examples of limits are shown below for tasks by technicians in the Chemistry Department.

- *Minor repairs to pressure regulators, and pressure testing to 3,000 PSIG gas or 5,000 PSIG liquid (Pressure Safety HP-HS5050).*
- *Spot welding of nonhazardous materials using a welder with a maximum stored energy capability of 300 watt/seconds.*
- *Equipment relocation of objects weighing up to 2,000 #, which require the use of a forklift (Forklift training HP-Q-001 & HP-1-001A).*
- *Handling cryogens, specifically liquid Helium and Nitrogen, for the purpose of filling vacuum traps and maintaining cryogen levels in solid-state detectors and superconducting magnets (Cryogen safety training HP-OSH-025 or demonstrated experience).*
- *Fabrication, modification, and repair/rebuilding of parts and equipment involving any nonhazardous material and accomplished using tools that the assigned personnel are qualified to operate safely (Machine Shop Safe Work Practices Training).*

Note: Four of these examples have training course requirements as part of the limitations.

4. **Determine which Workers are Qualified for Each Skill of the Worker Activity**

   The final step in establishing a qualification matrix is to determine which technicians and crafts are qualified for each activity listed. Draw up the matrix with the skill of the worker activities on one axis and the worker's names on the other axis. Put an "X" into each box to show qualification by the name and activity. The activities can be abbreviated or shown by number on the axis from the established skill of the worker list. A qualification matrix for a technician group with 10 skill of the worker activities defined by systems, tasks, materials, or tools would look as follows.

	Skill of the Worker Activity									
Personnel	1	2	3	4	5	6	7	8	9	10
T. Bell	X	X		X		X			X	
J. Doe		X			X		X		X	
T. Smith		X	X		X	X				
M. White		X	X		X			X	X	

   The qualification within any box can be shown as limited by putting an asterisk or indicator next to the "X" and then explaining the limitation in a footnote to the matrix. A common limitation is a trainee classification where certain activities must be done with a fully qualified person.

5. **Work Activities not Listed as Skill of the Worker**

The area Work Control Coordinator should screen all work activities not shown on the qualification matrix that are not covered by established SOPs or written work procedures.

6. **Administration of the Matrices**

   Each matrix must be dated and signed by the person who generated the matrix and approved by the area Work Control Coordinator (WCC), or by the Work Control Manager as applicable. The matrices must be updated as the personnel roster changes or individuals become qualified for additional skill of the worker activities. The matrices should be maintained in the WCC's logbook for convenient reference.

7. **Common Skill of the Worker Activities**

   If a group has several activities for which all personnel are qualified, it is permissible to list these activities as skill of the worker for all personnel and show the activities on a separate list if so desired. The matrix would then be used to show those tasks and jobs that only certain personnel are qualified to do without WCC screening.

   Each group is encouraged to list activities for which work permits will be required or considered. This will provide the WCCs with better screening guidelines specific to their area.

Self-assessment Aid for Planning and Control of Experiments

Self-assessment is a key element of the ISM Core Function "Feedback and Improvement" and is also a Laboratory requirement of the Integrated Assessment Program. The purpose of this exhibit is to present an aid for conducting self-assessments on planning and control of experiments. For each area of assessment, questions are presented to help direct the evaluation. At the end of each section, assessment comments are to be made on strengths and areas for improvement. Departments/Divisions can choose which sections to incorporate into their self-assessment criteria.

1. Scope of How Work Is Accomplished

Give a percentage estimate as to how work is accomplished within your Department/Division.

- Experimental Safety Review _____%
- Work Permits _____%
- Established work procedures (SOPs) _____%
- Skill-of-the-Worker _____%
- Formal project management _____%
- No work control process _____%

100 %

How many experimental safety reviews has this Department/Division approved in the last year? _____

2. Department/Division Experimental Safety Review Process

Objective: To determine if the Department/Division has established an appropriate implementation mechanism to systematically ensure that all proposed experiments and experimental modifications are formally reviewed.

Method: If a Department/Division-specific procedure exists, evaluate it against the section Experimental Safety Review of the Work Planning and Control for Experiments and Operations Subject Area. Also evaluate the R2A2s of key personnel against the requirements of this section.

2.1 Criteria

a) Does the Department/Division use the section Experimental Safety Review of the Work Planning and Control of Experiments and Operations Subject Area as an implementing procedure?

b) Does the Department/Division have appropriate mechanisms (e.g., organizational operating procedures, R2A2s) in place?

c) Are those mechanisms kept current per the Work Planning and Control for Experiments and Operations Subject Area?

d) Does the implementation mechanism clearly establish roles and responsibilities?

2.2 List strengths and areas for improvements.

3. Department/Division Experiment Safety Review Committee (ESRC)

Objective: To determine if an Experiment Safety Review Committee (ESRC) with the appropriate qualifications/expertise has been established.
Method: Evaluate the committee charge, charter (if one exists), and membership.

3.1 Criteria

a. Does the makeup of the committee represent expertise in the types of experimental hazards encountered?
b. Are subject matter experts used as necessary to supplement the committee?
c. Is the committee formally charged, and are roles and responsibilities clearly established?
d. Is there a tracking mechanism established to ensure that all committee recommendations are prioritized and tracked to completion?
e. Does the committee, or someone on the committee, evaluate ongoing experiments at least annually?
f. Does the committee perform field evaluations of the experiment to ensure that controls, as established in the review, are in place?

3.2 List strengths and areas for improvement.

4. Experiment Review Documents

Objective: To determine how thorough the experimental review documents are being completed.
Method: Evaluate a random sample of the experimental review documents of active experiments.

4.1 Criteria

a. Are there completed experimental review documents, or referenced safety reviews of similar experiments, for all active experiments?
b. Is the PI/RP (Principle Investigator/Responsible Person) actively involved in the development of the experiment proposal, identification of hazards/controls, and the review process?
c. Does the experimental proposal accurately describe the scope of the experiment?
d. Are hazards associated with the experiment adequately identified in the experimental proposal?
e. Have proper controls been established and implemented to address the hazards?
f. Was the experimental proposal formally approved and documented?

4.2 List strengths and areas for improvement.

5. Operational Controls/Operational Limits

Objective: Are necessary and appropriate controls established to ensure that the experiment is conducted safely and within the bounds of the Facility Use Agreement (FUA)?
Method: Examine a random sample of Experiment Review Documents and the corresponding FUAs.

5.1 Criteria
a. Do operational controls adequately control hazards?
b. Are established controls reflected in the FUA and kept current?
c. Are experimenters/users knowledgeable of the established controls?
d. Do experimenters know what to do if operational controls are exceeded?

5.2 List strengths and areas for improvement.

6. Experiment Approval

Objective: Determine if all experiments have the proper level of approval.
Method: Evaluate all current experiments and validate that they have been approved.

6.1 Criteria
a. Are all reviews documented in writing?
b. Do the Experimental Safety Reviews clearly state any operational controls and limits?
c. Have all concerns of the ESRC been implemented (verified in the field)?
d. Have higher hazard experiments been forwarded to the appropriate Laboratory-level committee for review?
e. Has the appropriate level of management signed off on the experiment review?

6.2 List strengths and areas for improvement.

7. Annual Review

Objective: To determine if the Department/Division is conducting an annual review of long-term and/or modified experiments.
Method: Identify all active experiments that have gone beyond one year, and verify that they have been re-reviewed in accordance with subsection 1.6 of the section Experimental Safety Review of the Work Planning and Control of Experiments and Operations Subject Area. Take a random sample of active experiments and conduct a field review to determine if any significant changes occurred that would affect the authorization basis and if they were re-reviewed.

7.1 Criteria
a. Is a mechanism in place to ensure that experiments that go beyond one year are re-reviewed?
b. Is a mechanism in place to ensure that all experiments that undergo significant modifications are re-reviewed?
c. Are changes as a result of the re-review adequately captured in the updates of controls and limits and further reflected in the FUA as required?

d. Are lessons learned, occurrence reports, and occupational injuries captured in the review process?

7.2 List strengths and areas for improvement.

8. Experimental Setup

Objective: To determine if hazards during the experiment setup were identified and controlled.

Method: Evaluate work permits and a random sample of approved experimental review documents.

8.1 Criteria

a. Were hazards of the experimental setup adequately covered either in the sections Experimental Safety Review or Work Planning and Control for Operations of the Work Planning and Control for Experiments and Operations Subject Area?

8.2 List strengths and areas for improvement.

9. Training and Qualification

Objective: To ensure that all personnel involved in experimental activities (experimenters/users) are adequately trained and qualified to conduct the experiment.

Method: Review the experimental review documents for training/qualification requirements and compare to the individuals' training records.

9.1 Criteria

a. Do all experimenters/users have the necessary training identified?
b. Is that training complete and current?
c. Are students and temporary users adequately trained?

9.2 List strengths and areas for improvement.

10. Feedback and Improvement

Objective: To determine if mechanisms for feedback and improvement to the experimental review process are identified and implemented.

Method: Review Experiment Safety Review Committee meeting minutes, or notes, and BNL Lessons Learned program data.

10.1 Criteria

a. Does the committee collect and use lessons learned data from prior experiments, occurrences, and injuries to improve the experimental review process?
b. Are issues related to any of the following forwarded to the PAAA Coordinator?
   - Any radiological work.

- Work performed in BNL nuclear facilities.
- Supervision of employees or contractors who work within a Radiological Controlled Areas or nuclear facility.
- Work performed by BNL staff that could affect the radiological or nuclear safety in a BNL nuclear facility or radiological activity.

10.2 List strengths and areas for improvement

Work Control Self-assessment

Self-assessment is a key element of the ISM Core Function "Feedback and Improvement" and is also a Laboratory requirement of the Integrated Assessment Program. The purpose of this attachment is to provide guidance for conducting self-assessments on the Work Planning and Control system for Operations. For each area of assessment, questions are presented to help direct the evaluation.

1. **How Work Is Accomplished**

   Give an estimate in percentage as to how work is accomplished within your Department/Division.

   - Experimental Safety Review _____%
   - Work Permit _____%
   - Skill-of-the-Worker _____%
   - Established work procedures (SOPs) _____%
   - Formal project management _____%
   - No work control process _____%

     _____
     100%

2. How many work permits have been generated by this Department/Division in the last six months? _____

3. **Department/Division Work Control Process**

   Objective: If a specific Department/Division procedure exists determine if it is up to date.
   Method: Compare the Department/Division procedure to the requirements in the section Work Planning and Control for Operations in the Work Planning and Control for Experiments and Operations Subject Area.

   3.1 Criteria

   a) Does the Department/Division use the section Work Planning and Control of Operations of the Work Planning and Control for Experiments and Operations Subject Area as an implementing procedure?

   b) If one exists, has the Department/Division work control procedure been updated as per the section Work Planning and Control for Operations of this Subject Area?

   c) Does the Department/Division Work Control Managers and Work Control Coordinators web site list all the correct Work Control Coordinators?

   d) Are the Primary Reviewers listed in a department/division document or roster?

e) If one exists, does the procedure clearly explain what work requests are or are not routed through the Work Control Coordinators?

3.2 List strengths and areas for improvement.

4. **Logbooks and Recordkeeping**

Objective: Determine how well the logbooks and records are maintained.
Method: Critique at least five or more logbooks.

4.1 Criteria

a) Are the logbooks adequately filled out? Look at five or more logbooks.

b) Are the work permits completed in the last six months on file?

4.2 List strengths and areas for improvement.

5. Work Permit

Objective: Determine how well the work permits are being filled out.
Method: Pull five to ten permits completed over the last six months from the files.

5.1 Criteria

a) Do the work controls match the hazards identified?

b) Did the proper people sign as the Work Control Coordinators and Primary Reviewer?

c) Were sections 1 through 6 properly filled out? What were the most common discrepancies (if any)?

d) Does the level of work planning appear to be adequate for the scope of the job?

e) Was there any feedback on the permits or attachments?

f) Did the workers sign off in Section 4, or an attachment, for the pre-job briefing?

5.2 List strengths and areas for improvement.

6. Skill of Worker Justification

Objective: Does the Department/Division reasonably justify the skill-of-the-worker for their staff?
Method: Review the documentation the Department/Division uses to justify skill of the worker for their staff.

6.1 Criteria

a) Approximately how many staff members in the Department/Division perform skill of the worker tasks? _____

b) Does each worker identified in item "a" have documentation justifying his or her skill of the worker?

Talk to five or six Work Control Coordinators; is it evident that they understand how to use their Department/Division's skill of the worker documentation?

6.2 List strengths and areas for improvement.

7. Primary Reviewers

Objective: Determine how well the review process is working.
Method: Interview two or three Primary Reviewers.

7.1 Criteria

a) Are the reviews being held in team settings or are the reviews done in series?

b) In the opinion of the Primary Reviewers, have the reviews been effective?

7.2 List strengths and areas for improvement.

8. Worker's Perception

Objective: Determine the worker's viewpoint on the work control process.
Method: Interview a nominal number of workers.

8.1 Criteria

a) Do they feel involved in the work planning process at the appropriate times?

b) Do they feel that the pre-job briefings are managed well?

c) Are they aware that they can ask for a work permit to be issued?

d) Are they asked to do jobs that they do not feel entirely comfortable doing?

8.2 Summarize worker feedback.

9. Work Planning Process

Objective: Determine whether the work control process has helped planning and coordination.

Method: Interview several planners (applicable to Departments/Divisions with established planner positions).

9.1 Criteria

a) Do the planners periodically access the Lessons Learned System for information that can be incorporated into their work planning?

b) Do the planners feel that the level of planning rigor is appropriate for the jobs they handle?

c) Has the work planning and control process been an improvement or of no consequence to their planning and coordination activities?

9.2 Summarize positive and negative comments

10. Feedback and Improvement

Objective: Determine if the feedback and improvement program is working.
Method: Review the feedback program and interview several Work Control Coordinators and first line supervisors.

10.1 Criteria

a) Does the Department/Division have a well-defined feedback program?

b) Is there any evidence of feedback from the workers or support staff?

c) Was it handled in a timely manner?

d) Are feedback issues related to radiological concerns or nuclear safety forwarded to the PAAA Coordinator?

e) Has any feedback information been forwarded to the Lessons Learned Program?

10.2 List strengths and areas for improvement.

11. Field Observations

Objective: Evaluate the application of the work permit during a job.
Method: Critique at least two jobs.

11.1 Criteria

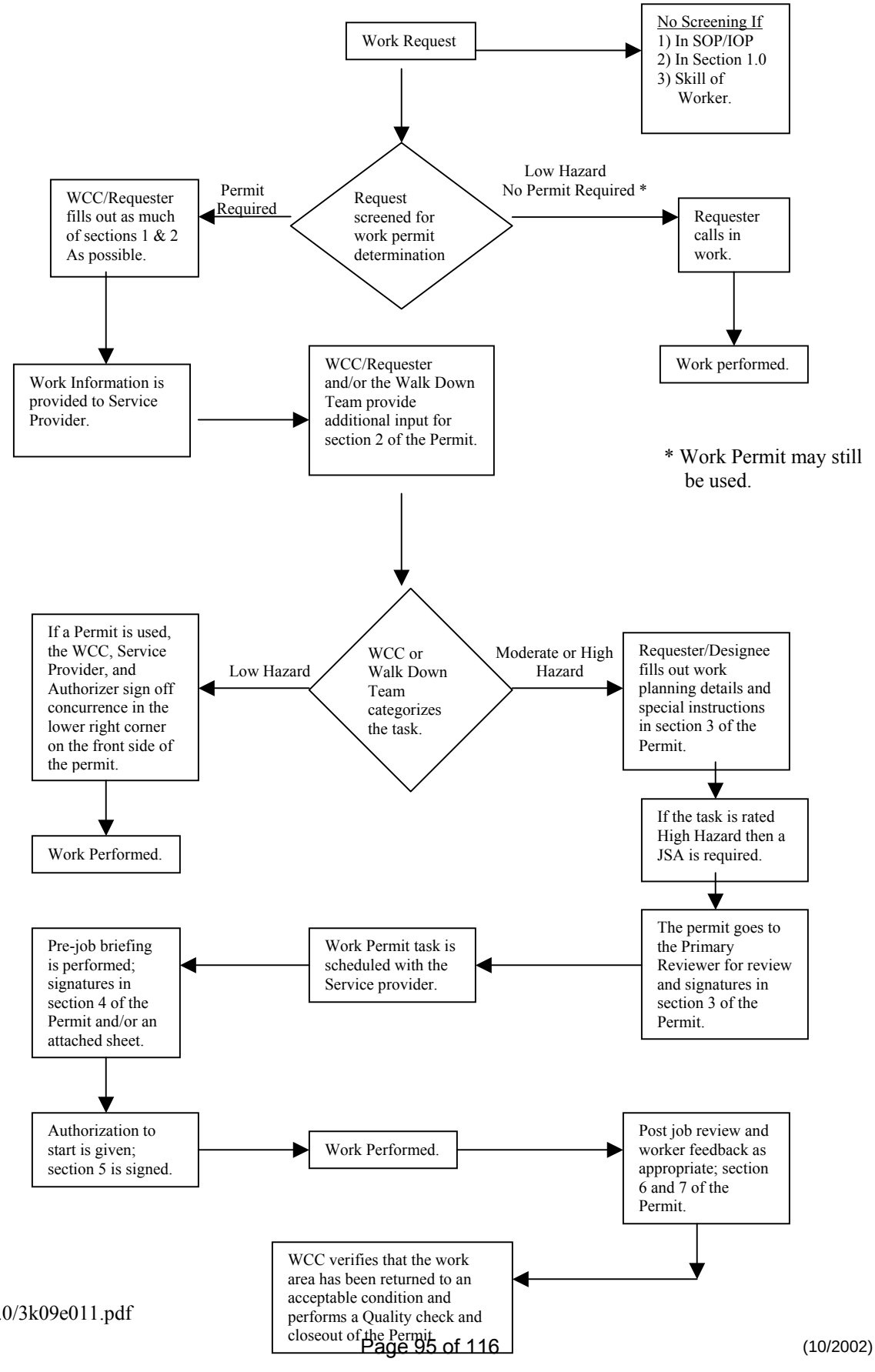
Evaluate the following items:

- Are the work controls in place?
- Did all the workers on the job receive a pre-job briefing of the hazards and sign off on the permit?

- Are the work instructions being followed?
- Are any work controls being used that were not identified on the permit?

11.2 Summarize observations.

Work Permit Flow Chart



Subject Area: ***Work Planning and Control for Experiments and Operations***

Work Planning and Control for Experiments and Operations Flowchart

Effective Date: **October 2002**
Point of Contact: Work Planning & Control POC

Work Planning and Control for Experiments and Operations Flowchart is provided as a PDF file.

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Send a question or comment to the SBMS Help Desk
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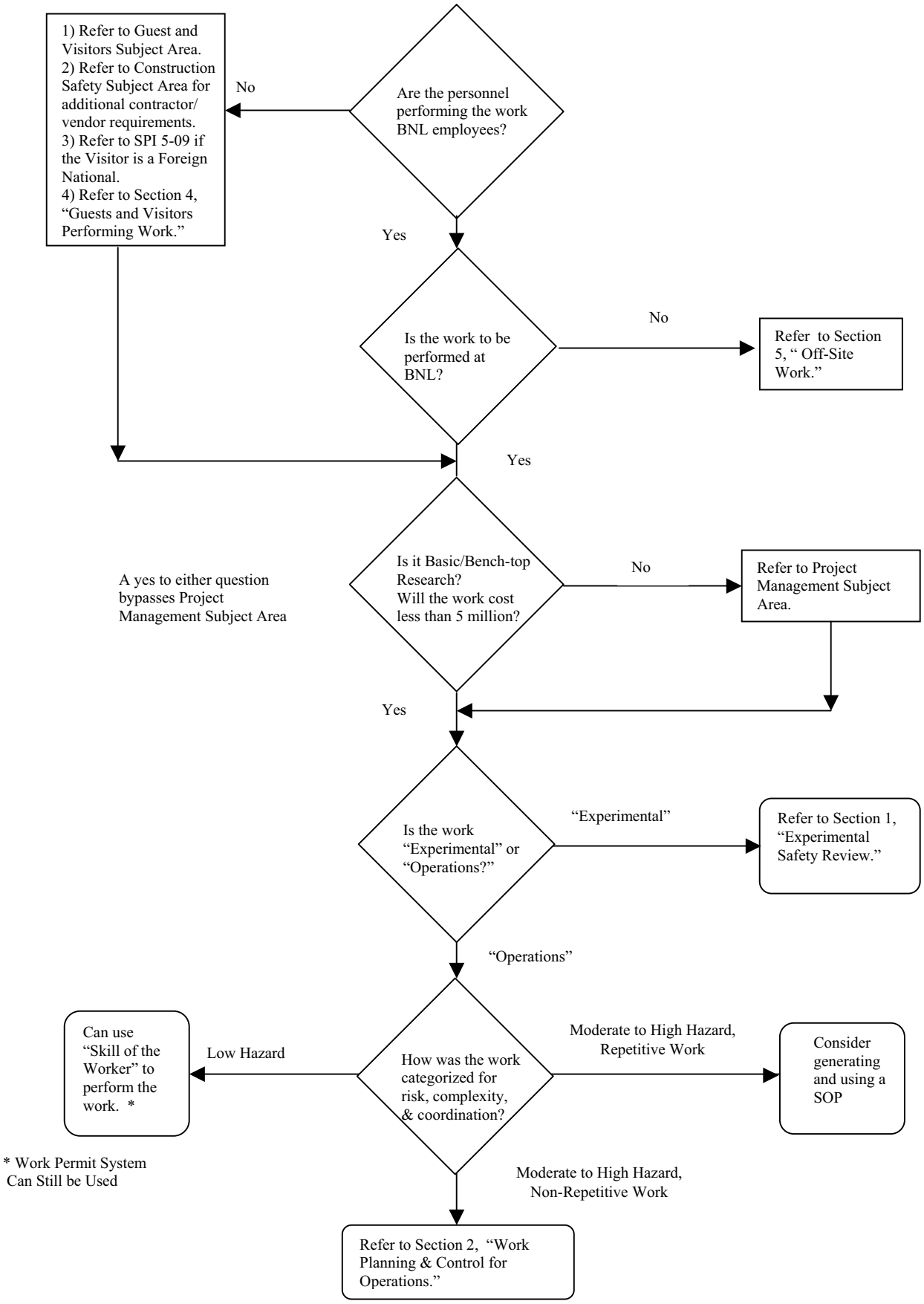
Work Planning and Control for Experiments and Operations Flowchart



EXPERIMENT SAFETY REVIEW FORM

REVIEW NUMBER (supplied by ERC):

PRINCIPAL INVESTIGATOR: **DATE:**

DEPARTMENT/DIVISION/GROUP:

EXT: **E-MAIL:** **LIFE NUMBER:**

Project Title:
Location(s):
Funding Source/Account Number:
Proposed Start Date and Duration:

SIGNATURES:

Principal Investigator:	**Date:**
Experiment Review Coordinator:	**Date:**
	Date:
	Date:
	Date:
	Date:
	Date:
Approval **Department Chairperson:**	**Date:**
Review/Approval Comments:	
Walkthrough Signature:	**Date:**
Expiration Date (max 1 yr.):	
FUA Change Required? ☐ **Y** ☐ **N**	**Fire Rescue Run Card Changes Required?** ☐ **Y** ☐ **N**
Has a NEPA Review been Performed for this Project? ☐ **Y** ☐ **N**	
Project Termination Acceptance Signature:	**Date:**
Comments:	

I. DEFINE THE SCOPE OF WORK

A. Description

Describe the experiment purpose/scope. Identify all apparatus that will be used and associated requirements. List special equipment (X-ray generators, lasers, etc.) that will be used during the project. Identify measurement and test equipment, apparatus operating conditions, and required maintenance procedures as appropriate. Include calibration frequency for formal calibration requirements. Attach supporting documents such as engineering calculations, drawings, and specifications.

Indicate if modification of facility is required. Include the setup and decommissioning phases of the experiment. The Work Permit Process/Form may better address the hazards and controls of the set-up and/or tear-down phases. Indicate if a Work Permit will be used.

B. Materials Used /Waste Generated

List materials to be used and wastes generated. Refer to the BNL Chemical Management System for a complete listing of the chemicals in your locations. Include samples, chemicals, controlled substances, gases, cryogens, radioactive materials, and biological material. You may use generic chemical class descriptions for commonly used materials (e.g., organic solvents, acids). List disposal methods. **Denote disposal method using the codes below.**

Materials Used & Wastes Generated	Disposal Method Type (Code below)	Estimated Quantity (provide units)		Estimated Annual Waste Generation
		Per Use	Total/Yr	

Note: Identify Age Sensitive materials or special handling requirements.

Disposal Method Codes:

Air Emissions	Liquid Effluents	Wastes
P=Point Source	**S**=Sanitary	**H**=Hazardous
F=Fugitive	**ST**=Storm water	**I**=Industrial (Non-hazardous waste e.g., oils)
	O=Other	**R**=Radioactive
		M=Mixed (Radioactive + Hazardous)
		RM=Radioactive Medical
		MW=Medical
		T=Trash

C. Waste Minimization/Pollution Prevention

Describe how you plan to minimize generation of the wastes described above, and identify pollution prevention opportunities. Consider ordering/using the smallest amount, using recycled materials, and substituting non-hazardous materials. The Pollution Prevention and Waste Minimization Subject Area

describes how to plan, conduct, and close out work activities to eliminate or minimize the impact of their activities on the environment.

II. IDENTIFY AND ANALYZE HAZARDS ASSOCIATED WITH THE WORK

In this section, indicate the hazards in each class. Include the setup and decommissioning phases of the experiment.

Physical Hazards (check all that apply) ☐ None			
☐ Cryogens	☐ Oxygen deficient atmosphere	☐ Noise > 85 dBA	
☐ Fall hazards (e.g., ladders, elevated platforms, towers)			
☐ Material handling equipment (e.g., cranes, hoists, forklifts)			
☐ Machine shop or nonportable powered tools use			
☐ Electrical hazards (exposed conductors, large batteries, capacitors, etc)			
☐ Confined space	☐ Trenching/soil excavation		
☐ Extreme temperatures	☐ Remote location		
☐ Other (specify):			
Pressure or Vacuum Systems (check all that apply) ☐ None			
☐ Compressed gases (lecture bottles, cylinders, gas lines)			
☐ Pressurized vessels or systems			
☐ Vacuum chambers or systems with >1000 J stored energy			
☐ Autoclaves			
☐ Other (specify):			
Fire Hazards (check all that apply) ☐ None			
☐ Open flames	☐ Welding, Brazing, Silver Soldering		
☐ Flammable gases/liquids/solids	☐ Other spark producing activity		
☐ Other (specify):			
Chemical Hazards (check all that apply) ☐ None			
☐ Carcinogens	☐ Highly acute toxins	☐ Reproductive toxins	☐ Corrosives
☐ Flammable liquids	☐ Flammable solids	☐ Strong oxidizers	☐ Oils
☐ Explosives	☐ Peroxidizables	☐ Pyrophoric materials	☐ PCBs
☐ Asbestos	☐ Pesticides/herbicides	☐ Controlled substances	
☐ Highly reactive materials		☐ Perchlorates	

☐ Toxic metals (e.g., As, Ba, Be, Cd, Cr, Hg, Pb, Se, Ag)		
☐ Other (specify):		
Ionizing Radiation (check all that apply)	☐ None	
☐ Sealed radioactive sources	☐ Windowless radioactive sources	
☐ Dispersible radioactive materials	☐ Neutron-emitting radioactive sources	
☐ Non-fissionable radioactive materials	☐ Fissionable radionuclides	
☐ Ionizing radiation-generating devices (x-ray sources, accelerators)		
☐ Other (specify):		
Nonionizing Radiation (check all that apply)	☐ None	
☐ Class II, IIIa, or IIIb (visible <15mW) lasers	☐ Class IIIb (nonvisible >15mW) or IV lasers	
☐ Dynamic magnetic fields >1G at 60 Hz or dynamic electric fields > 1kV/m at 60 Hz		
☐ Static magnetic fields < 5 G. No Exposure Form is required		
☐ Static magnetic fields > 5 G and < 600 G	☐ Static magnetic fields exposure. Attach Static Magnetic Fields Exposure Form when required.	
☐ Static magnetic fields ≥ 600 G		
☐ Radio frequency (RF) or Microwave sources exceeding 10 mW radiated output		
☐ Infrared sources > 10 W	☐ Ultraviolet sources > 1 W	
☐ Extremely low frequency (ELF) radio sources		
☐ Other (specify):		
Biological Hazards (check all that apply)	☐ None	
☐ Regulated etiological agent	☐ Recombinant DNA	☐ Animals
☐ Human blood/components, human tissue/body fluids		☐ Human subjects
☐ Other (specify):		
Offsite Work (check appropriate box)	☐ None	
☐ Reviewed or controlled by ES&H programs at the offsite location	☐ Requires additional controls (include in the next section)	

See Identification of Significant Environmental Aspects and Impacts Subject Area or your ECR if you need assistance completing the following table.

Significant Environmental Aspects (check all that apply)	☐ None
☐ Any amount of hazardous waste generation	
☐ Any amount of radioactive waste generation	

☐ Any amount of mixed waste generation (radioactive hazardous waste)
☐ Any amount of transuranic waste generation
☐ Any amount of industrial waste generation (e.g., oils, vacuum pump oil)
☐ Any amount of Regulated Medical Waste (including sharps, hypodermic needles, or syringes)
☐ Any atmospheric discharges that require engineering controls to reduce hazardous air pollutants or radioactive emissions, or are identified as a Title V emission unit, or require monitoring under NESHAP
☐ Any liquid discharges that require engineering controls to limit the quantity or concentration of the pollutant, or include radionuclides detectable at the point of discharge from the facility, or contain any of the chemicals listed on BNL's SPDES permit
☐ Storage or use of any chemicals or radioactive materials that require engineering controls – see Storage and Transfer of Hazardous and Nonhazardous Materials Subject Area
☐ On-site or off-site transportation of chemicals or dispersible radioactive materials
☐ Any use of once-through cooling water with a flow of 4 gpm – 24 hrs/day (10 gpm – 8 hrs/day, daily use of >15 gpm for >60 days) and discharging to the sanitary sewer
☐ Soil contamination or activation
☐ Any underground pipes/ductwork that contain chemical or radioactive material/contamination
☐ Other environmental aspects related to your work (specify):
☐ Process Assessment Form required (determined by ECR or other qualified person)

III. DEVELOP AND IMPLEMENT HAZARD CONTROLS

For each hazard identified in the previous section, describe how that hazard is controlled. Identify the **Engineering Controls (e.g., interlocks, shielding), Administrative Controls (e.g., procedures, RWPs), or Personal Protective Equipment (e.g., respirators, gloves; see the Personal Protective Equipment Subject Area**) that will be employed to reduce hazards to acceptable levels.

The Experiment Review Coordinator, along with the **Principal Investigator** (PI) and Building Manager, as appropriate, will evaluate this experiment for impacts that will require an update to the Facility Use Agreement (FUA), and or Fire/Rescue Run Cards.

The **PI** develops and implements hazard controls in consultation with, and using feedback from, the personnel who will be performing the work.

A. Physical Hazards/Controls

Hazard	Controls (Administrative, Engineered, Protective Equipment)

Note: Include maintenance, inspection and testing, and formal calibration, including frequency as appropriate.

B. Chemical Hazards/Controls

Hazard	Controls (Administrative, Engineered, Protective Equipment)

Note: Refer to the Working With Chemicals Subject Area for requirements regarding particularly hazardous chemicals such as carcinogens, reproductive toxins, and highly acute toxins, including postings, decontamination plan, and address above.

C. Environmental Hazards/Controls

Hazard	Controls (Administrative, Engineered, Protective Equipment)

Note: Identify the requirements from applicable waste management subject area (hazardous, radioactive, mixed, regulated medical). List all applicable environmental permits (Suffolk County Art. XII, Title V Emission Source, etc.) and the relevant controls required by those permits.

D. Radiation Hazards/Controls

Hazard	Controls (Administrative, Engineered, Protective Equipment)

Note: List sources/materials. Attach or refer to Radiation Work Permits.

E. Biological Hazards/Controls

Hazard	Controls (Administrative, Engineered, Protective Equipment)

Note: List additional approvals/permits/reviews required (e.g., BNL Biosafety Committee approval).

F. Offsite Work Hazards/Controls

Hazard	Controls (Administrative, Engineered, Protective Equipment)

Note: List the location of all off-site work and identify any off-site organization whose ESH requirements will be followed (e.g., other DOE Labs). Indicate additional controls (not specified above) that are needed.

IV. PERFORM WORK WITHIN CONTROLS

All work shall be performed within the controls identified within this document. It is the PI's responsibility to ensure that this document is kept up to date. The PI should consult with the ERC as appropriate to determine if changes to this document are significant enough to require a new review/document.

If a hazard assessment may be required for this experiment, the PI should contact the ES&H Coordinator and/or the ERC for assistance. The PI should document any hazard assessments performed for this experiment in Section VI.

A. Training

List all project personnel, indicating they are authorized and competent to perform the work described. List the training required for each individual. Identify any certifications or experiment-specific training

required. Indicate if any project personnel are minors (under 18 years of age). Contact your Training Coordinator and ES&H Coordinator as appropriate for assistance.

It is the responsibility of the PI to maintain a complete up-to-date list of personnel and their full training requirements, and to ensure that training and qualifications are maintained.

Name	Life/Guest #	Required Training (Course or JTA code)

Note: The BNL Training and Qualifications Web Site contains course offerings and descriptions, required training checklist, and employee training records.

B. OSHA/DOE Required Medical Surveillance

Indicate if potential exposure is in excess of trigger levels listed. Exposure evaluation and/or medical surveillance may be required. Additional training may be required for any indicated agent. See SBMS for additional information and controls on the hazards listed.

Regulated Hazard	Hazard Specific Training Trigger	Medical Surveillance Exposure Trigger
☐ Inorganic Arsenic	Any day above the OSHA action level (without regard to respirator use)	30 days/year above the action level (without regard to respirator use)
☐ Biohazards (CDC/NIH/WHO listed Agent)	None	See Subject Area for guidance
☐ Cadmium	Any day above the OSHA action level	30 or more days/year at or above the action level
☐ Lasers	Use Class IIIb or Class IV Lasers	Use Class IIIb or Class IV Lasers
☐ Lead	Any day above the OSHA action level	30 or more days/year at or above the action level
☐ Methylene Chloride	Any day above the OSHA action level	- 30 days/year at or above the action level - 10 days/year above the 8-hour TWA PEL or the STEL - Any time above the 8-hour TWA PEL or STEL for any period of time where an employee at risk from cardiac disease or other serious MC-related health condition and employee requests inclusion in the program

Regulated Hazard	Hazard Specific Training Trigger	Medical Surveillance Exposure Trigger
☐ Noise	Any day above the ACGIH TLV	Any time equal or greater then 85 dBA TWA 8-hour dose
☐ OSHA Regulated Chemicals *Acrylonitrile* *Benzene* *Benzidine* *1,3 Butadiene* *4-Dimethyl aminoazobenzene* *Ethylene oxide* *Ethyleneimine* *Formaldehyde* *Vinyl Chloride*	Any day above the OSHA PEL	- Routinely above the action level (or in the absence of an action level, the PEL) - Event such as a spill, leak or explosion results in the likelihood of a hazardous exposure
☐ Static Magnetic Fields	Worker who routinely works in magnetic field	- Any time at ≥ 0.5 mT (5 G) for Medical Electronic Device wearer - Any day at ≥ 60 mT (600 G) to whole body [8 hour average] - Any day at ≥ 600 mT (6000 G) to limbs [8 hour average] - Any Time at ≥ 2 mT (20 G) to whole body [ceiling] - Any time at ≥ 5 mT (50 G) to limbs [ceiling]

C. Emergency Procedures

Identify any emergency actions, procedures, or equipment that must be in place to insure personnel safety and environmental protection. Include the Building Local Emergency Plan, location of emergency shutoffs, and spill control materials.

D. Transportation

Identify materials, hazards, and controls for any on-site and off-site transportation of hazardous and/or radioactive materials. See relevant SBMS Subject Areas.

E. Notifications

The PI or designee should notify building occupants of any activities that might impact them or their work, and document this here. List external personnel/organizations that require notification related to experimental activities and/or to be notified of changes (e.g., a BNL Committee for review/approval, Occupational Medicine Clinic, or Fire/Rescue).

F. Termination/Decontamination

Describe any decommissioning plan, including decontamination of the area at termination of the experiment. Identify any hazards and controls, special precautions, or procedures. Include chemical and waste reconciliation. Indicate if a walk-down or an ERE will be scheduled to ensure the area is suitable for future projects. Indicate if Work Permit Form/Procedure will be used.

G. Community Involvement Issues

Identify issues that may require community involvement (see the Community Involvement in Laboratory Decision-making Subject Area) and describe the plan that addresses these issues. Attach the Community Involvement Checklist.

V. PROVIDE FEEDBACK ON ADEQUACY OF CONTROLS AND CONTINUE TO IMPROVE SAFETY MANAGEMENT

Provide comments on the review process, including the review form and communication. Identify any lessons learned or worker feedback contributing to modifications/improvements to the controls or process.

VI. ATTACHMENTS

Use this section to include any hyperlinks and/or additional documents, hazard assessments, figures, and tables that could not be entered into the previous sections of the form.

Attachment 1: Sample Signature Sheet

The PI is responsible for communicating the requirements in this Experiment Safety Review (ESR) to the project workers. One way to accomplish this is to have each worker read the ESR and sign an agreement form, such as the one below. This sheet is **not** submitted as part of the review process.

I have read this Experimental Safety Review document and understand the hazards associated with my work activities and the controls in place to mitigate those hazards. I understand the environmental aspects of my work activities and will continually work to minimize waste generated and look for areas of improvement. I am aware of the training requirements and will maintain my qualifications.

Print Name	BNL #	Signature	Date

Screening Guidelines for Work Permit Determination

The purpose of this checklist is to **help in determining if a job requires a work permit** due to ES&H hazards, system complexities, or work coordination needs. If the job already has an established work procedure or has been defined as a routine job due to the training and qualifications of the crafts person or technician, then the checklist is not needed. Check off items that apply to the job.

A. ES&H Permits Needed

- ☐ Confined space permit
- ☐ Cutting/welding permit
- ☐ Digging/core drilling permit
- ☐ Electrical working hot permit
- ☐ Fire protection impairment permit
- ☐ Job-specific RWP
- ☐ Dept./Division-specific permit_____

If only one permit is checked off and there are no other ES&H concerns, complexities, or coordination issues checked off in the following sections, then a work permit is not required. If two or more permits are checked off, a work permit is recommended.

B. Safety Concerns

Check off applicable safety concerns unless covered by a specific work procedure or qualified training.

- ☐ Asbestos – work will disturb or involve removing asbestos – containing material
- ☐ Beryllium – cannot produce airborne beryllium dust in any manner
- ☐ Biohazard – potential to be exposed to biohazardous substances (i.e., bloodborne pathogens)
- ☐ Chemical - using or exposed to hazardous chemicals without specific procedure or training
- ☐ Elevated work – will use scaffolding, harnesses, lanyards, or fall protection plan
- ☐ Explosives – must use work permit if no task specific procedure for explosives is utilized
- ☐ Fumes/Mist/Dust – work activity likely to result in an inhalation or dermal exposure to dust, fumes, or mist
- ☐ Heat/Cold stress – will be working under extreme temperature conditions
- ☐ Lasers – will be using a class III or IV laser on the job
- ☐ Material handling – moving heavy loads by personnel other than riggers or qualified material handlers
- ☐ Non-ionizing radiation – work will involve the use of non-ionizing radiation sources or devices other than welding equipment (i.e., microwaves, RF fields, etc.)
- ☐ Oxygen deficiency hazard – work will be in a potential ODH area
- ☐ Radiation/Contamination – work involving radiation or contamination not covered by an RWP
- ☐ Removing/penetrating walls – firewalls involved in work
- ☐ Rigging/critical lift – work involves a critical lift or exposes expensive equipment to potential damage

- ☐ Stored energy – potential for exposure to any electrical, mechanical, hydraulic, or pressure systems that are not controlled or protected from workers

- ☐ Operational safety envelope – work could impact the operational safety envelope as defined by the Facility Use Agreement

If no safety permits in Section A are required and only one safety concern in Section B is checked, then a work permit is not required, but ES&H precautions must still be taken. If two or more safety concerns are checked, then a work permit is recommended since the level of planning rigor has increased. Contact ES&H Coordinator or ESH&Q personnel if any questions on the safety concerns.

C. Environmental/Waste Concerns

- ☐ Work may increase storage of chemicals beyond limits of Suffolk County Article 12

- ☐ Rad. Materials may exceed area posted limits

- ☐ Work creates a new air emissions source (rad. or non rad.) or changes an existing air emissions source

- ☐ Liquid discharges of any of the chemicals listed on the BNL State Pollutant Discharge Elimination System (SPDES) Permit Chemicals exhibit.

- ☐ Potential to disturb protected areas or species (i.e., wetlands)

- ☐ Work will generate hazardous, industrial, mixed, radioactive, or regulated medical waste without an approved disposition path (Contract your Environmental Compliance Representative)

- ☐ Work needs to be evaluated for pollution prevention or waste minimization opportunities.

If any of the environmental or waste concerns are checked off, a work permit is recommended.
Contact your Environmental Compliance Representative if any questions on environmental/waste issues.

D. Complexity/Uncertainty Issues

- ☐ Shutdown of several systems is required to properly isolate the work area

- ☐ There are numerous major tasks/activities (i.e., 6 or more) involved in the job

- ☐ Work requires integration of regulatory controls or notification of regulatory agencies

- ☐ Work involves a large number of steps that require action or sequences of steps that may not be obvious

- ☐ Work is prone to rapidly changing conditions

- ☐ Work is infrequently done or it is a first time activity

- ☐ Equipment will be used outside of its normal operating range

- ☐ Person not experienced with new or specialized equipment or tools

- ☐ If work done incorrectly, could cause major system downtime or adverse public reaction

For one checkoff, work permit should be considered. For two or more, permit is recommended.

E. Work Coordination

- ☐ Work requires close coordination between multiple support and operational organizations
- ☐ Work has to be performed at the same time or in a certain sequence with other specific work requests or operational activities.

Work permit is recommended for any work coordination checkoffs unless job will be covered through another work planning procedure or document.

Subject Area: ***Work Planning and Control for Experiments and Operations***

Work Permit Form

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

The Work Permit Form is provided as a Word file.

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BROOKHAVEN NATIONAL LABORATORY

Work Permit # _____
Work Order # _____
Job# _____ Activity# _____

1. Work requester fills out this section. ☐ Standing Work Permit

Requester:	Date:	Ext.:	Dept/Div/Group:
Other Contact person (if different from requester):			Ext.:
Work Control Coordinator:		Start Date:	Est. End Date:
Brief Description of Work:			
Building:	Room:	Equipment:	Service Provider:

2. WCC, Requester/Designee, Service Provider, and ES&H (as necessary) fill out this section or attach analysis

ES&H ANALYSIS					
Radiation Concerns	☐ None	☐ Activation	☐ Airborne	☐ Contamination	☐ Radiation
Radiation Generating Devices:	☐ Radiography	☐ Moisture Density Gauges	☐ Soil Density Gauges	☐ X-ray Equipment	
☐ Special nuclear materials involved, notify Isotope Special Materials Group			☐ Fissionable materials involved, notify Laboratory Criticality Officer		
Safety Concerns	☐ None	☐ Ergonomics	☐ Transport of Haz/Rad Material		
☐ Adding/Removing Walls or Roofs	☐ Confined Space*	☐ Explosives	☐ Lead*	☐ Penetrating Fire Walls	
	☐ Corrosive	☐ Flammable	☐ Magnetic Field*	☐ Pressurized Systems	
☐ Asbestos*	☐ Cryogenic	☐ Fumes/Mist/Dust*	☐ Material Handling	☐ Rigging/Critical Lift	
☐ Beryllium*	☐ Electrical	☐ Heat/Cold Stress	☐ Noise*	☐ Toxic Materials*	
☐ Biohazard*	☐ Elevated Work*	☐ Hydraulic	☐ Non-ionizing Radiation*	☐ Vacuum	
☐ Chemicals*	☐ Excavation	☐ Lasers*	☐ Oxygen Deficiency*	☐ Other	
* Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? ☐ Yes ☐ No					
Environmental Concerns		☐ None	☐ Work impacts Environmental Permit No.		
☐ Atmospheric Discharges (rad/non-rad)		☐ Land Use	☐ Soil activation/contamination	☐ Waste-Mixed	
☐ Chemical or Rad Material Storage or Use		☐ Liquid Discharges	☐ Waste-Clean	☐ Waste-Radioactive	
☐ Cesspools (UIC)		☐ Oil/PCB Management	☐ Waste-Hazardous	☐ Waste-Regulated Medical	
☐ High water/power consumption		☐ Spill potential	☐ Waste-Industrial	☐ Underground Duct/Piping	
Waste disposition by:				☐ Other	
Pollution Prevention (P2)/Waste Minimization Opportunity:		☐ None ☐ Yes			
FACILITY CONCERNS	☐ None				
☐ Access/Egress Limitations	☐ Electrical Noise	☐ Potential to Cause a False Alarm		☐ Vibrations	
	☐ Impacts Facility Use Agreement		☐ Temperature Change	☐ Other	
☐ Configuration Control	☐ Maintenance Work on Ventilation Systems		☐ Utility Interruptions		
WORK CONTROLS					
Work Practices					
☐ None	☐ Exhaust Ventilation	☐ Lockout/Tagout	☐ Spill Containment	☐ Security (see Instruction Sheet)	
☐ Back-up Person/Watch	☐ HP Coverage	☐ Posting/Warning Signs	☐ Time Limitation	☐ Other	
☐ Barricades	☐ IH Survey	☐ Scaffolding-requires inspection	☐ Warning Alarm (i.e. "high level")		
Protective Equipment					
☐ None	☐ Ear Plugs	☐ Gloves	☐ Lab Coat	☐ Safety Glasses	
☐ Coveralls	☐ Ear Muffs	☐ Goggles	☐ Respirator	☐ Safety Harness	
☐ Disposable Clothing	☐ Face Shield	☐ Hard Hat	☐ Shoe Covers	☐ Safety Shoes	☐ Other
Permits Required (Permits must be valid when job is scheduled.)					
☐ None	☐ Cutting/Welding	☐ Impair Fire Protection Systems			
☐ Concrete/Masonry Penetration	☐ Digging/Core Drilling	☐ Rad Work Permit-RWP No			
☐ Confined Space Entry	☐ Electrical Working Hot	☐ Other			
Dosimetry/Monitoring					
☐ None	☐ Heat Stress Monitor	☐ Real Time Monitor	☐ TLD		
☐ Air Effluent	☐ Noise Survey/Dosimeter	☐ Self-reading Pencil Dosimeter	☐ Waste Characterization		
☐ Ground Water	☐ O_2/Combustible Gas	☐ Self-reading Digital Dosimeter	☐ Other		
☐ Liquid Effluent	☐ Passive Vapor Monitor	☐ Sorbent Tube/Filter Pump			
Training Requirements (List below specific training requirements)					
Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below:			If using the permit when all hazard ratings are low, only the following need to sign: (Although allowed, there is no need to use back of form)		
ES&H Risk Level:	☐ Low ☐ Moderate ☐ High		WCC:	Date:	

Complexity Level:	☐ Low	☐ Moderate	☐ High	Service Provider:	Date:
Work Coordination:	☐ Low	☐ Moderate	☐ High	Authorization to start	Date:
				(Departmental Sup/WCC/Designee)	

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

Work Plan (procedures, timing, equipment, and personnel availability need to be addressed):
Special Working Conditions Required:
Operational Limits Imposed:
Post Work Testing Required:

Job Safety Analysis Required: ☐ Yes ☐ No	Walkdown Required: ☐ Yes ☐ No

Reviewed by: Primary Reviewer will determine the size of the review team and the other signatures required based on hazards and job complexity. Primary Reviewer signature means that the hazards and risks that could impact ES&H have been identified and will be controlled according to BNL requirements.

Title	Name (print)	Signature	Life #	Date
Primary Reviewer				
ES&H Professional				
Other				
Other				
Work Control Coordinator				
Service Provider				
	Review Done: ☐ in series	☐ team		

4. Job site personnel fill out this section.

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments).			
Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:
Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow. Use feedback form or space below.			

5. Departmental Job Supervisor, Work Control Coordinator/Designee

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)			
Name:	Signature:	Life#:	Date:

6. Departmental Job Supervisor, Work Requester/Designee determines if Post Job Review is required. ☐ Yes ☐ No

Post Job Review (Fill in names of reviewers)			
Name:	Signature:	Life#:	Date:
Name:	Signature:	Life#:	Date:

7. Worker provides feedback.

Worker Feedback (use attached sheets as necessary)
a) WCM/WCC: Is any feedback required? ☐ Yes ☐ No

b) Workers: Are there better methods or safer ways to perform this job in the future? ☐ Yes ☐ No

8. Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of work area to work supervisor)

Name:	Signature:	Life#:	Date:
Comments:			

Instructions for filling out the work permit

Header Information
The "Work Permit#" line shall be filled in by whatever numbering sequence a given department or group wants to use. The Work Control Coordinator maintains a logbook or spreadsheet of work permit numbers issued. The other three number lines are provided for tracking purposes and are filled in as appropriate. The "Standing Work Permit" box is checked if the permit is being used as such.

Section 1 – Work Request
The work requester fills out the required information in this section. The name in the "Work Control Coordinator" line is the requester's WCC. The "Service Provider" line is the department doing the work.

Section 2 – Hazard Analysis
The work requester initially fills out this section identifying the location hazards, facility concerns, work controls, and specific training needs. The requester provides the work information to the service provider and schedules a walkdown of the job site. A Walkdown Team composed of the requester, service provider, and ES&H support personnel (*as needed*) may provide further input for Section #2. The service provider predominantly identifies the task hazards and appropriate controls.

Notes:
-For each subsection, a "NONE" or a hazard or work control box must be checked.
-The "Safety Concerns" items with an asterisk indicate work activities that may require Industrial Hygiene to investigate, and may then require OMC medical surveillance. If the workers are already on the protocol list for the activity or hazard, then OMC surveillance would not be needed and the "No" box would be checked. If not sure of the worker's medical status or the particular work activity, mark "Yes" and contact Industrial Hygiene to evaluate.
-When a job involves a significant change to the amount of chemicals or radioactive materials in a facility, the Building Manager must be notified to determine if the Facility Hazard Category has been affected as per the Facility Use Agreement.
-For guidance in determining if security concerns are applicable see "Security Checklist."
-Table 1 and 2 in the screening guidelines attachment provide additional definition to the ES&H issues.

Section 2 – Low, Moderate and High Hazard Determination
The bottom part of Section 2 is used by the WCC or Walkdown Team to make a final determination as to the rating levels (low, moderate, or high) for ES&H risk, complexity, and work coordination. A given task may be a skill of the worker job, but the complexity of the system or the work coordination involved can dictate a higher level of planning.

If the WCC or Walkdown Team decides that ES&H risk, complexity, and work coordination are all low, then the job is categorized as a low hazard and the work permit process can be terminated at this point. If a permit will be used for low hazard work, the Work Control Coordinator, the service provider (supervisor, craft, or technician), and an individual authorizing work must sign in the lower right hand corner of the front side.

If any of the ES&H risk, complexity, or work coordination rating levels are checked off as moderate or high, then the rest of the work permit form must be processed.

Section 3 – Work Plan
The work plan section is filled out predominantly by the work requester with input from the service provider and ES&H personnel as needed. The job site should be visited by the Walkdown Team. A written description shall detail the job and any precautions that need to be taken. Use attachments for detailed plans (i.e., drawings) and longer narrative if needed.

If the ES&H risk level is rated high, then a Job Safety Analysis, JSA, must be written and attached to the work permit.

Section 3 – Primary Reviewer
It is encouraged to review work permits in a team setting as opposed to circulation the permit for review and signoff in series. The team environment has proven to be more effective in achieving good ES&H reviews and in coordinating the required resources.

The Primary Reviewer is responsible for assembling ES&H and subject matter experts as needed for the review based on the ESH risks, job complexities, and overall coordination. If the Primary Reviewer is a member of the Walkdown Team, then the team signoff in the "Reviewed By" section can occur following the walkdown if desired. Following review and approval, the work permit is returned to the work requester for scheduling with the work provider.

Section 4 – Supervisor and Worker Signoffs
A pre-job briefing with the crew to review job hazards, permits, and coordination requirements. (Required for moderate and high hazards)

The supervisor and the workers sign the form (or an attachment) to indicate that they understand the hazards, the controls and the permit requirements.

Note: The workers must sign for themselves, it is not permissible for the supervisor to write their worker's names on the work permit.

Section 5 – Conditions Appropriate to Start Work
The affected department usually authorize the start of the job. Without this section, the workers could start any time without a final check with the department. The person signing this section verifies that the requirements designated on that permit *(work controls, etc.)* have been met, and that the job may proceed.

Section 6 – Post Job Review
The job supervisor or work requester determines whether a post job review is needed. In some cases, the review team may decide that a post job analysis would be beneficial for lessons learned and will request the review. If a review is requested, print the name of the reviewer(s) on the line and check off the "Yes" block. If no review is needed, check off the "No" block.

Section 7 – Worker Feedback
This section is provided for the workers to feedback comments on ES&H issues from the job or on how to improve the work efficiency. The WCM/WCC may request worker feedback by answering yes to Section 7(a); if 7(a) is marked yes, then it is up to the WCM/WCC /Supervisor to solicit (and document on the WP or attached sheet) feedback from the workers. Regardless of the answer to 7(a) workers are encouraged to answer Section 7(b).

Section 8 – Closeout
The original copy of the work permit is returned to the Work Control Coordinator who originated it initially. The Work Control Coordinator reviews the permit for consistency, signs off to close it out, and files it. The WCC provides feedback to appropriate personnel if any permit discrepancies occur.

Definitions: Work Planning and Control for Experiments and Operations

Effective Date: **October 2002**

Point of Contact: Work Planning & Control POC

Term	Definition
ALARA	The approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public, to levels as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. ALARA is a concept and a process that has the objective of attaining (and maintaining, if achieved) doses as far below the applicable limits of 10CFR835 as reasonably achievable.
basic research	Research that is conducted to acquire and disseminate new knowledge of a theoretical/experimental nature; it does not lend itself to the establishment of predetermined results.
bench top research	Research conducted in a laboratory environment where the researcher has over-all control of the experimental apparatus (i.e., there is no need to communicate between the researcher and a facility operator).
controls and limits	A specific set of criteria established for an experiment. They can include both physical and administrative items. They are clearly stated in the Experimental Safety Review, or referenced by the use of other procedures, in the Experimental Safety Reviews. Collectively they define the boundaries (safety envelope) by which the experiment must be operated. **Note:** Typically control and limits should be reserved for controlling situations that involve moderate or high risk of injury or significant property damage.
experiments	Processes and preparations necessary to conduct nonroutine tests or investigations of physical phenomena using equipment, materials or energy.
Experiment Review Coordinator (ERC)	Assigned by the Department Chair/Division Manager. The ERC is the person (or persons) within the Department/Division who assists the Principal Investigator/Responsible Person in generating Experimental Safety Reviews and also coordinates the review of experiments. ERCs are members of the Experimental Safety Review Committee (ESRC). The ERC serves as the interface between the operational groups and the experimental groups, and the ESRC and the experimental groups.
Experimental Safety Review Committee (ESRC)	A Departmental/Divisional level committee with the responsibility for reviewing experiments (and significant modifications to experiments) for the following: • ES&H concerns; • Ensuring appropriate controls for each experiment (during set-up, operations, and tear-down) are established; • Based upon ES&H concerns, recommending to the Department/Division approval or disapproval.

	Some Departments/Divisions may already have existing committees or committees with multiple responsibilities that may also perform the Experimental Safety Review. There is no need to change the make up or names of these committees; however, for consistency, ESRC will be used in this Subject Area. In cases where the scope and hazard levels are sufficiently low, an appropriately sized subcommittee of the ESRC may be used.
external work	Work that is performed by BNL or Non-BNL staff who are external to the facility or organization; these individuals are not as familiar with location hazards.
Facility Use Agreement (FUA)	A landlord-tenant contract that defines the operational safety envelope for each building and establishes an agreement among occupants and support services for conducting work within this framework. The FUA functions as an integrating reference document that links building specific operational criteria with Laboratory-wide management systems and information services.
internal work	Work that is performed by individuals who reside in the facility or organization.
Operational Safety Envelope	The conditions/boundaries by which safe operation is maintained within a process or facility
Principal Investigator/Responsible Person(PI/RP)	The person who takes responsibility for all the members of a team that carry out an experiment or experimental program at BNL. The PI/RP may or may not be a BNL employee, but they are able to act as a spokesperson for their experiment for the purposes of this Subject Area. The PI/RP is not solely responsible for the technical details and hazards associated with the experiment. This responsibility resides jointly with the PI/RP, ERC, ESRC and the processes covered by this Subject Area.
routine/repetitive experiments	Experiments that are • Repeated over time by appropriately qualified persons; • Have a well-understood set of hazards that have been reviewed; • Have established controls.
Significant Experimental Modifications	Any changes that would exceed the pre-established controls/limits approved by the Department Chair/Division Manager.
skill of the worker	The level of proficiency that allows a worker to perform tasks independently due to their level of training and documented experience. This concept applies to all staff from scientists and technicians to the tradespersons and laborers. It is applied to routine, low-hazard tasks that support fulfillment of a facility or group's function. The tasks can range from complex to simple day-to-day activities. Each organization determines their skill of worker tasks. Each organization is responsible for documenting/justifying their skill of worker concept (See Subsection 2.2).
work	Activities that involve the design, operation, maintenance, modification, construction, demolition, or decommissioning of facilities, systems, or experiments by BNL or non-BNL staff.
work permit	A document used to define the scope of work as per the work request, analyze the ES&H hazards, determine the work controls, plan the work, review and approve the plan, conduct a pre-job briefing, authorize the start of work, and solicit worker feedback. **Note:** At this time an electronic work permit is being piloted at the National Synchrotron Light Source (NSLS).

work rated as high-hazard	Work requiring the coordinated actions of one or more person(s) to prevent serious injury to staff, significant damage to equipment or structures, or releases of reportable quantities of potentially hazardous materials to the environment. See the exhibit Examples of Low, Moderate, and High Tasks.
work rated as low-hazard	Work requiring the attention of the average worker to prevent minor injury. Failure to correctly perform low-hazard work would not damage equipment or structures or release potentially hazardous materials to the environment, except as a result of gross negligence. See the exhibit Examples of Low, Moderate, and High Tasks.
work rated as moderate-hazard	Work requiring the coordinated actions of one or more person(s) to prevent any injury to staff, minor damage to equipment or structures, or a release of hazardous materials to the environment. See the exhibit Examples of Low, Moderate, and High Tasks.

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Disclaimer

Revision History: Conference Management

Point of Contact: Special Conference Administrator

Revision History of this Subject Area

Date	Description	Management System
September 2004 -- Minor Rev. 1.4	Brookhaven Site Office (BHSO) replaces Brookhaven Area Office (BAO).	Administrative Support
June 2000	This subject area was developed to provide the guidelines, requirements, and responsibilities for managing attendance at conferences and sponsoring conferences. The intent of this subject area is to minimize costs and attendance by DOE and DOE contractor employees at all conferences. It is a new subject area that was developed using the process for Standards-Based Management development.	Administrative Support

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