BROOKHAVEN NATIONAL LABORATORY
SBMS Interim Procedure

Interim Procedure Number: 2004-18001-001 Revision: 13 on 1-26-07

Title: Facility Risk Assessment (FRA)

Point of Contact: Pat Williams

Management System: Occupational Safety and Health

Effective Date: April 30, 2004 Expiration Date: December 15, 2007

Approved by (line management, Management System Steward): Jim Tarpinian

Approved by (Deputy Director, Operations): Michael J. Bebon

Applicability: All BNL Organizations Participating in OHSAS 18001 Registration

---

Table of Contents

1. Purpose 1
2. Definitions 1
3. Responsibilities 2
4. Scope 3
5. Procedure 3
   5.1. Review of Facility and Area Hazards and Risks 3
   5.2. Performing the FRA 4
   5.3. FRA Results 12
   5.4. Annual FRA Review 13
   5.5. FRA in Response to Accidents, Incidents, Non-Conformances, Corrective and Preventative Actions 13
   5.6. Area or Facility Changes 13
   5.7. Common Hazard Terminology 13

1. Purpose

1.1. This procedure establishes a standard method for developing, using and maintaining Facility Risk Assessments (FRA) forms that will meet the requirements of OHSAS 18001 Clause 4.3.1.

2. Definitions

2.1. Area-Specific Assessment – Area specific risk assessment is used to assess the majority of safety topics that exist within a given type of operational area or given type of operational room within a facility. For example, welding and brazing areas. Safety topics will likely be common to a specific area type. That is, if more than one area of the same type exists within a facility, then a single risk assessment is appropriate.

2.2. Control – in this context, a control is any engineered system, protective equipment or administrative arrangement that eliminates a hazard or reduces its likelihood of causing an injury or illness.

2.3. Occupancy or Use – the rate at which a specific area is occupied or item is used. There are five classes of occupancy or use: less than or equal to once per year, less than or equal to once per month, less than or equal to once per week, less than or equal to once per shift and greater than once per shift.

2.4. Facility-Wide Assessment – Some hazards may arise from activities or tasks not associated with a specific job. The facility itself and its general operations present certain exposures to hazards. For example, electrical equipment, access and egress, fire hazards, heat or cold conditions, tripping hazards, noise exposures, radiation exposures and chemical exposures. These types of hazards are addressed with a facility-wide risk assessment.

2.5. Hazard - a source of danger; a possibility of incurring loss or misfortune; "radiation is a health hazard."

2.6. Likelihood – the chances of an event that leads to bad consequences. The five classes of likelihood are: extremely unlikely, unlikely, possible, probable, and multiple. An event might be a slip or fall, unanticipated radiation, a dropped load from a forklift, etc.

2.7. Priority – in this context, the order in which the initial facility or area risk assessments are done. High priority facilities or areas are those that have a recent history involving a high severity injury (severity level 4 or 5), or a facility in which injuries are likely to occur (likelihood level 4 or 5), or a facility in which there is a recent history of DOE reportable occurrences. Assess and reduce the risks in these facilities or areas first. Medium priority is where hazards with potential for high severity (severity level 4 or 5), or occupancy is high (occupancy level 4 or 5), but injury is not likely (likelihood level 1, 2 or 3). Assess these facilities or areas next. Low priority facilities or areas are all remaining facilities or areas, and they would be assessed last.

2.8. Risk – in this context, risk is the product of the occupancy, likelihood and severity. Points for occupancy, likelihood and severity are based on a stepwise numerical system developed by Liberty Mutual Company. A specific range of point values for risk is associated with one of five descriptive classes of risk: negligible, acceptable, moderate, substantial and intolerable.

2.9. Severity – the bad consequences of an event. The five classes of severity are: first-aid, medical treatment, lost time, partial disability, and death or permanent disability.

3. Responsibilities

3.1. The Departmental/Divisional OSH Management Representative is responsible for ensuring that each relevant facility or area has a current assessment of the occupational safety and health hazards and risks. All significant risks must be adequately addressed.

The assessment may be done by a variety of means. An example would be to assemble a team of managers, supervisors, workers and ESH professionals to perform the assessment.

3.2. The Departmental/Divisional OSH Management Representative or his/her designate shall approve each facility or area risk assessment. In addition, the OSH Management Representative is responsible for assuring all new and modified facilities and activities have a FRA performed prior to operations.

4. Scope

4.1. OHSAS Clause 4.3.1 provides no instructions, guidelines or limitations on how to identify areas and facilities that may present health and safety hazards. Generally, it is recommended that all areas and facilities that may present hazards to the worker be considered for risk assessment. Remember to include areas or facilities used by non-employees.

5. Procedure

5.1. Review of Facility and Area Hazards and Risks

5.1.1. Develop a complete listing of all facilities and areas in use in your Division/Department. Use the example facility-wide assessment and area-specific assessment list shown in Table 1.

5.1.1.1. Make a "rough draft" estimate of hazards and risks for each area or activity on the list. See column four of Table 1. Look for hazards that are obvious and risks that are clearly serious.

5.1.1.2. Develop priorities based on previous experience, information on known physical items in the area that present hazards, and the occupancy of employees in the area. Draw on the personal experience of your risk assessment team. Key operational personnel may be aware of hazards that are not apparent from injury records. Their insights will help you set priorities, as well as identify additional hazards. New constructed areas that have no history should be examined carefully to establish a preliminary priority.

Table 1 Strategy to Determine the Priority of Facility Risk Assessments

Area or Facility	**Description**	**Priority**	**Reason**
Facility-Wide Assessments			
General Electrical Issues	Standard electrical installations and activities throughout the facility	Medium	Minor shocks have occurred the last few years from legacy wiring. Overheating occurs occasionally due to the inventory of components. Some open ATS items related to improving electrical safety. Many OSHA violations found by OSHA Team.
General Fire Issues	General fire protection throughout the facility; cover special areas separately	Medium	Fire protection systems are old but operable. Upgrades are needed and ADS forms are outstanding and awaiting funding. Fires are possible significant programmatic problems. Minor fires have occurred in the last few years. FHAs are currently being revised for C-AD facilities. BNL only had a single FP Engineer for many years until end of 2004.
General Radiation Issues	General radiation protection issues throughout the facility	Low	In general, radiation is not a significant health risk but is a compliance issue. Access controls provide protection against high hazard radiation.
General ODH Issues	General oxygen deficiency issues throughout the facility	Low	ODH analyses have provided a good approach to worker safety in the newer facilities.
General Housekeeping Issues	General housekeeping issues throughout the facility	Medium	Work is sometimes finished without area cleanup completed. Causes restricted walkways, slip hazards, increased fire loading. Tier 1 inspections cite this numerous times. Many OSHA findings related to housekeeping.
General Noise Issues	General noise issues in and around mechanical equipment rooms and compressor facilities	Medium	Some workers have been assessed by the Medical Clinic to have hearing losses not associated with normal aging. Community concerns near the BNL site have been recently addressed to reduce the compressor noise at RHIC.

Area or Facility	Description	Priority	Reason
General Confined Space Issues	Maintenance work in sewer, electrical, steam, potable water manholes, attics, crawlspaces and air handlers.	Medium	Air monitoring is done prior to entry into all confined spaces. Additional monitoring may be required in Class 2C spaces and controls such as lock/out of energy sources in steam manholes and blast blankets in electrical vaults.
General Material Handling Issues	Material handling throughout the facility; includes PE riggers and incidental rigging and transportation by staff	Medium	There has been an increasing number of material handling and transportation mishaps over the last few years. No significant injuries.
Area-Specific Assessment			
Siemens and Westinghouse Motor Generator Sets	928 and 911	Low	No injuries in the recent past. There was a massive mechanical failure of the Siemens MG set in the recent past, but no injuries.
Helium Reliquifier	1005E for conversion of He gas to liquid for storage	Low	Recently reviewed by safety committee.
Shops	Mechanical and electrical maintenance	Medium	Recent injuries. Improved training on machine operations is needed.
Offices	General offices with computer usage	Medium	Ergonomic injuries have been experienced.
STAR	RHIC experiment	Low	Reviewed by ESRC annually. User injury rates are extremely small.
PHENIX	RHIC experiment	Low	Reviewed by ESRC annually. User injury rates are extremely small.
PHOBOS	RHIC experiment	Low	Reviewed by ESRC annually. User injury rates are extremely small.
BRAHMS	RHIC experiment	Low	Reviewed by ESRC annually. User injury rates are extremely small.
NSRL Animal and Cell Labs	NASA Experimental Building	Low	Reviewed by ESRC annually. User injury rates are extremely small.
Building 912/U-Line/g-2 Area	AGS experiments	Medium	Roof leaks causing walking/working surface issues. A lot of work is taking place such as decommissioning of old beam lines in preparation for future experiments.
Warehouses/storage facilities	Storage of materials and movement of materials	Low	Not a lot of material movement.
Equipment Testing Areas	Permanent testing locations for C-AD equipment	Medium	Test areas have not been specifically reviewed in the recent past.
EBIS	Building 930A	Medium	Not reviewed in detail for a few years.
eCooler	Building 939	Low	Recent reviews by ASSRC and RSC.
Waste Yard	Building 960 area	Low	No injuries in recent past.
90 Day Area/Satellite Areas	Various locations	Low	No injuries in recent past.

Area or Facility	Description	Priority	Reason
Accelerators, Preinjectors, Collider	Booster, AGS, Linac. Tandem, RHIC tunnel and service/support buildings	Low	No injuries in recent past.
Locked Electrical rooms/Locked Electrical Caged Areas	930B, 1005E, 1007W, 928 basement, 919B, 911B relay room	Low	No injuries in recent past.
Cryogenic Refrigerator Room	1005R for RHIC He expansion as part of the refrigeration process	Medium	ODH 1 area. A lot of equipment under pressure. Cryogenic fluids. High ambient temperature in building in warm weather.
Cryogenic Compressor Room	1005H for RHIC He compression as part of the refrigeration	Medium	High pressure helium. Highest noise levels of all C-AD facilities.
Division Offices, Quality and Machine Storage, (Bldg. 462)	The Division's Main Office is located upstairs in building 462. It houses the Fabrication Section, the Administrative area as well as Clerical Area. The mail floor provides space for machine storage, Quality, film development and X-ray equipment.	Low	Ergonomic evaluations have been completed. New e-ray facility and development facilities.
Electron Beam Welding, 473 Fred	This facility is located in building 473. The Machine has the capability to weld a variety of dissimilar materials in a high vacuum environment with minimum of distortion.	Medium	Worker works alone in building with no monitoring of person's status. No fire-alarm pull station.
Heavy Machine Shop and Sheet Metal Shops, (Bldg. 479)	The central machine shop, sheet metal shop, welding, fabrication, machine maintenance and inspection.	Medium	Inherent risk in operations performed in building.

Area or Facility	Description	Priority	Reason
Oil Recycling Facility and Central Coolant Recovery (Bldg. 495)	BNL recycles coolant, also referred to as cutting fluid, which is utilized in various types of metal working machines at the Central Fabrication Services Division machine shops. Spent coolant is pumped from the metal working machines into drums and transferred to Building 495 for recycling. The coolant recycling process includes various filters, a centrifuge, two settling tanks and a recirculator. This process essentially filters metal particles from the coolant, removes tramp oils and then aerates the coolant to prevent anaerobic bacterial growth. Fresh coolant and water is added to achieve the desired characteristics. At the completion of the recycling operation, coolant is returned to the shops, as needed, for reuse.	Medium	Worker works alone in building with no monitoring of person's status.
Central Cleaning Facility (Bldg. 498)	The Centralized Degreasing Facility is utilized for cleaning high vacuum parts and other parts that require a high degree of cleanliness. The cleaning solutions are non-toxic and non-hazardous. Spent cleaning solutions are transferred to the Water Eater evaporator located in Building 495. Vapors from the surface of the tanks are drawn through an exhaust system to the outside air.	Medium	Worker works alone in building with no monitoring of person's status.
Storage (Bldg. 562, 486)	General storage	Low	Storage area, limited access.

Area or Facility	Description	Priority	Reason
Central Chilled Water Facility (Bldg. 600, 659)	Three floor structure. High noise environment, working around machines and with high voltage, working from heights. Machinery that starts automatically.	Medium	Operational troubleshooting requires rapid accent / decent to operating levels through the use of stairs. Hearing Conservation training and visual alarms and warnings used. Fluids (i.e., air, Freon, water and steam) under high pressure managed by design and process control to prevent over pressurization, in addition vent stacks are provided to prevent in advertent fluid releases and levels where people may be. Rotating assemblies on machines are shielded to protect humans from inadvertent contact with moving parts and part malfunctions. Fall protection is in place for the thermal storage tank. Additional fall protection is required for the water cooling tower.
Central Steam Facility (Bldg. 610, 636, 639)	Multi level structure. Working around boilers, high pressure steam, confined spaces, working with lubricants and fuels. Working from heights.	Medium	Operational troubleshooting requires rapid accent / decent to operating levels through the use of stairs and /or ladders. Fluids (i.e., air, Freon, water and steam) under high pressure managed by design and process control to prevent over pressurization, in addition vent stacks are provided to prevent in advertent fluid releases and levels where people may be. Rotating assemblies on machines are shielded to protect humans from inadvertent contact with moving parts and part malfunctions. Access platforms have been put in place to assist working from height... Confined space is controlled by permit. Refueling area has been designed to reduce spills by off loading tankers under suction and within a secondary containment structure.
Electric Substations (Bldg. 603, 631, 638, 629)	Working with high voltages, PCB potential and working from heights.	High	Lightening strike, and other weather conditions, can impact safety of substations. PPE, lightening arrestors, substation is grounded using a grid system. Substations are not entered for normal operations or servicing during extreme weather conditions. Lighting is inadequate in substations due to the age of the substations; portable lighting is provided as needed.

Area or Facility	Description	Priority	Reason
Sewage Treatment Plant, (Bldg. 575, 481, 563, 569, 580)	Working with chemicals and machinery. Biological and medical waste.	Medium	Drowning can occur in primary clarifies, modular aeration tanks and hold up ponds. Life rings are located in these areas. Access is restricted, especially in modular aeration tanks which are also gated... Farm equipment is also sited at this location for the cultivation of the filter beds. PPE is provided and training? Hazardous chemical training and PPE is provided. Radioactive sludge is handled and loaded into sludge drying beds for volume reduction and packaged for shipping. PPE and waste management, radiological and industrial hygiene support is provided. Rotating assemblies on machines are shielded to protect humans from inadvertent contact with moving parts and part malfunctions. Water and electricity are in close proximity to each other.
Water Treatment Facility (Bldg. 624, 566, 654, 655, 657, 916, 614, 618, 619, 634, 635, 637, 641, 642, 646)	Working with chemicals and machinery, Confined spaces.	Medium	Hazardous chemical training and PPE is provided. Water and electricity are in close proximity to each other. Ground fault, circuit interrupters, dykes and barriers to keep separation of electricity and water are in place. Drowning hazards exist in aeration tank and air filters. Railings and life rings are in place. Confined spaces controlled by permit.

Area or Facility	Description	Priority	Reason
Mechanical Maintenance Shops (Bldg. 452, 457, 964)	The facility includes shops and storage dedicated to maintenance operations (machining, milling and metal fabrication) for the mechanical engineering division of the Plant Engineering Department. Trade activities include plumbing, sheet metal, air conditioner servicing, insulation and steam fitting.	Medium	Hazards pertain to fixed equipment which has their own safety requirements in addition to Job Risk Assessments. This fixed equipment can present an obstacle and/or trip hazard. Material handling can be difficult due to congestion and equipment layout which is dictated by the footprint of the shop.
Site Maintenance Shops (Bldg. 326, 339, 397, 406, 412, 428)	Maintenance work on heavy equipment, Storage and staging of custodial supplies.	Low	Hazards pertain to fixed equipment which has their own safety requirements in addition to Job Risk Assessments. This fixed equipment can present an obstacle and/or trip hazard. Material handling can be difficult due to congestion and equipment layout which is dictated by the footprint of the shop. Air quality is controlled by exhaust fans. Routine testing is performed to assess air quality.
Electrical Utility Shops (Bldg. 528)	Staging for jobs in the field, work on motors	Low	Hazards pertain to fixed equipment which has their own safety requirements in addition to Job Risk Assessments. This fixed equipment can present an obstacle and/or trip hazard. Material handling can be difficult due to congestion and equipment layout which is dictated by the footprint of the shop.
Buildings Maintenance (Bldg. 452, 244, 405, 422, 455)	Working with power tools and electricity.	Medium	Hazards pertain to fixed equipment which has their own safety requirements in addition to Job Risk Assessments. This fixed equipment can present an obstacle and/or trip hazard. Material handling can be difficult due to congestion and equipment layout which is dictated by the footprint of the shop.
Offices (Bldg. 97, T650, 326, 134)	General offices with computer usage	Medium	Ergonomic injuries have been experienced.

Area or Facility	Description	Priority	Reason
Heavy Equipment Storage Areas (Bldg. 652, 96, 321)	General storage with lifting.	Low	Material and equipment storage can be difficult due to congestion and equipment layout which is dictated by the footprint of the shop. Lighting is poor during night time conditions.
General Storage Areas (Bldg. 339, 397, 406, 412, 428, 649, 571, 581, 586, 589, 650)	General storage with lifting.	Low	Material and equipment storage can be difficult due to congestion and equipment layout which is dictated by the footprint of the shop. Lighting is poor during night time conditions.
Fuel Off loading (Bldg. 651)	Delivery of fuel oil by distributors	Low	Fuel oil is delivered in a facility capable of capturing a oil spill from multiple vehicles at the same time. Trucks are pumped empty by the facility allowing greater control and less chance of fuel spill. Walking surfaces can be slipper when there is a spill resulting in slips and falls

5.2. Performing the FRA

5.2.1. BNL requires that Departments and Divisions use the data entry form in Table 2 to record the information gathered from the FRA process.

5.2.2. Use the following eight steps to perform FRA:

- describe the physical items or activities present in the area or facility
- identify the hazards associated with each physical item; there should be only one hazard listed in each row of the Table 2, however there can be as many rows as needed
- identify controls in place for each hazard
- estimate the Occupancy or Use of the area or facility using the information in the shaded area of Table 2
- estimate the potential Severity of an accident associated with each hazard
- estimate the Likelihood or chances of an injury for each hazard (given existing controls) using the information in the shaded area of Table 2
- identify possible additional controls needed for these hazards
- re-estimate the risk and the % risk reduction if controls are added

5.2.3. Model your FRA after the practical example that is shown in Table 3.

NOTE
Each hazard should occupy one line in the risk table. That is, the risk from each hazard is to be assessed individually. A single activity like "welding, soldering or brazing" must be entered three times in the table since there are three hazards associated with this activity, which are UV exposure, burns and fires. See the example in Table 3.

5.2.4. Classify the risk of each safety issue using the BNL risk information identified in the bottom of Table 2.

5.2.5. Any safety issue with risk identified as "intolerable" must be investigated and abated immediately. Unless specific exception is granted by the Department Chair / Division Head, work in the area will be suspended until the risk can be re-classified as no greater than "substantial."

5.2.6. Risks identified as "substantial" will require development and implementation of a written remedial action program.

5.2.7. Risks identified as "moderate" or below shall be addressed through the Department's/Division's normal OSH Management System objective-setting and planning processes.

5.3. FRA Results

5.3.1. As indicated in OHSAS 18001 Clause 4.3.1, use the FRA process to help determine:

- facility requirements for new, modified and existing facilities
- training needs
- development of controls

5.3.2. The FRA process must include some means of monitoring improvement actions added to reduce risk in order to ensure that actions are implemented on time and are effective. The use of the Family Action Tracking System (ATS) or equivalent is an acceptable system for this purpose.

5.3.3. Additionally, your Department/Division must consider the results of the FRA process and effects of controls when establishing annual OSH objectives. Facilities where injuries and illnesses have occurred during the year, as well as risk levels in the Substantial category, should be considered when setting annual OSH objectives.

5.4. Annual FRA Review

5.4.1. On an on-going basis, the OSH Management Representative is responsible for scheduling reviews of 1/3 the number of organizational FRAs annually so that all the FRAs are reviewed at a minimum of once every three years. The purpose of such reviews is to ensure the FRAs reflect the current jobs at the site.

5.4.2. The OSH Management Representative will assign a team to review facility and area hazards and risks annually.

5.4.3. The team will base its intensity of review of a particular facility or area on the level of risk assigned to hazards in prior FRAs.

5.5. FRA in Response to Accidents, Incidents, Non-Conformances, Corrective and Preventative Actions

5.5.1. As necessary, the OSH Management Representative shall schedule and assign appropriate personnel to conduct or update a FRA in conjunction with a Critique, Occurrence, near miss or non-conformance associated with a facility or area.

5.6. Area or Facility Changes

5.6.1. The OSH Management Representative shall schedule and assign appropriate personnel to review all changes and modifications to a facility. Where hazards have been introduced or remediated, they shall conduct a FRA of the area or facility under the Department's/Division's purview.

5.7. Common Hazard Terminology

5.7.1. The use of common hazard terminology is encouraged and it simplifies the risk assessment process. The following are common terms or phrases for hazards that are used by BNL's insurance carrier, Liberty Mutual. They are the leading causes of workplace injuries and are listed in order of cost of wage replacement and medical payments.

Overexertion – injuries caused by excessive lifting, pushing, pulling, holding, or carrying of an object
Falls on same level
Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling
Falls to lower level, such as falling from a ladder or over a railing
Being struck by an object, such as a tool falling on a worker from above
Repetitive motion
Roadway accidents

Being struck against an object – such as a carpenter walking into a doorframe, or cuts and skin abrasions from working in tight spaces
Becoming caught in or compressed by equipment
Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns

5.7.2. The following are common hazard terms or phrases that relate to common hazards at BNL.

Electrocution and electrical shock
Ionizing radiation exposure
Fires
Hazardous or toxic material exposures
Non-ionizing radiation exposure (rf, UV, laser)

Table 2 BNL Facility or Area Risk Assessment Form

Name(s) of Risk Team Members:	Point Value → Parameter ↓	1	2	3	4	5
Area/Facility Description Title: Area/Facility # (if applicable):	Occupancy or Use (A)	≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift
Area/Facility Description:	Severity (B)	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability
Approved by: Date: Rev.#:	Likelihood (C)	Extremely Unlikely	Unlikely	Possible	Probable	Multiple
Reason for Revision (if applicable):				Comments:		

			Risk with Controls in Place						Risk with Additional Controls in Place				
Physical Item or Activity	Hazard(s)	Control(s)	**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	Control(s) Added to Reduce Risk		**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	% Risk Reduction

Further Description of Controls Added to Reduce Risk:

*Risk:	0 to 20	21 to 40	41-60	61 to 80	81 or greater
	Negligible	Acceptable	Moderate	Substantial	Intolerable

Table 3 Example BNL Facility or Area Risk Assessment Form

Name(s) of Risk Team Members: E. Lessard, R. Karol, J. Scott	Point Value → Parameter ↓	1	2	3	4	5
Area/Facility Description Title: C-AD Area Specific Shops Hazards Area/Facility # (if applicable): All shops FRA 1	Occupancy or Use (A)	≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift
Area/Facility Description: Shops include vacuum labs, machine shops and tech shops.	Severity (B)	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability
Approved by: *E. Lessard* Date: 4-16-04 Rev. #: 1	Likelihood (C)	Extremely Unlikely	Unlikely	Possible	Probable	Multiple

Reason for Revision (if applicable): Welder's helper suffered arc eye when wearing normal UV safety glasses; UV entered eye from edge of glasses

Comments:

			Risk with Controls in Place					Risk with Additional Controls in Place				
Physical Item or Activity	Hazard(s)	Control(s)	**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	Control(s) Added to Reduce Risk	**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	% Risk Reduction
Machining activated materials	Ionizing radiation exposure	Shielding, fencing and barrier inspection, radiation surveys, facility specific training, formal job assessments, procedure, work planning Rad Worker Training, ALARA Committee review	2	1	3	6						
Processing materials, working with chemicals, plating	Hazardous or toxic materials exposure	Training for hazardous waste handling, Hazard Communication training, specific-hazard training such as for Be or asbestos handling, inventory controls	4	4	3	48						
Working with compressed air	Being struck by an object	PPE such as face shields, eye guards, ear plugs, gloves, aprons, overalls	3	3	3	27						
Machining materials	Becoming caught in or compressed by equipment	Equipment-specific training, blade guards, PPE such as face shields, eye guards, ear plugs, gloves, aprons, overalls	3	5	3	45						
Welding, soldering or brazing	Non-ionizing radiation exposure - UV	Work planning, welding training, barricades, face shields for welders, safety glasses for helpers	5	3	4	60	Requirements changed to require helpers wear goggles instead of safety glasses for better UV protection	5	2	3	30	50%
Welding, soldering or brazing	Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns	Work planning, welding training, gloves	5	2	2	20						
Welding, soldering or brazing	Fires	Work planning, welding training, fire watch	5	3	2	30						

Table 3 Example BNL Facility or Area Risk Assessment Form

Setting up machining equipment	Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling	Use of dollies to eliminate manual material handling tasks, use of portable lighting to increase visibility at job site, ergonomic reviews of work, effective supervision at the job site, training	5	4	2	40						
Setting up machining equipment	Falls on same level	Slip resistant footwear (e.g., steel toe sneakers), housekeeping rules	5	4	2	40						
Setting up machining equipment	Overexertion – injuries caused by excessive lifting, pushing, pulling, holding, or carrying of an object	Back safety training, use of squat lift technique, use of team lift, use of mechanical devices to assist in lift	5	4	3	60	Increase the number of ergonomic reviews of shops	5	4	2	40	33%
Further Description of Controls Added to Reduce Risk:												

*Risk:	0 to 20	21 to 40	41-60	61 to 80	81 or greater
	Negligible	Acceptable	Moderate	Substantial	Intolerable