If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

14.34.2 Occupational Safety and Health Operational Training for C-AD and SMD Shops

Text Pages 2 through 10

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

Approved: _____***Signature on File***_____ _____
Superconducting Magnet Division Head Date

E. Lessard

Occupational Health and Safety Training Package for Shops

This package has been designed to aid in the delivery of required job-specific training for the work activities identified in the Workplace Hazard and Risk Assessment for Shops, and for the specific hazards and controls identified in Facility Risk Assessments (FRAs) and Job Risk Assessments (JRAs).

Your position has been determined to have a potential to significantly impact the safety and health of yourself and others. Thus, C-A Department and SM Division Managements have prepared the questions and answers on the following pages for your specific work/processes.

This safety and health material is incorporated into your current job and procedure training. If you have specific questions about this information after you have read the material, contact the C-A Department ESSHQ Division Head, Ray Karol (karol@bnl.gov) or the SM Division ESH Coordinator, Ken Krasner (krasner@bnl.gov).

You may keep this material as a handout and use it as a reference aid.

This specific training course is linked to your job-training assessment (JTA). You must read and acknowledge this material as part of the qualification to perform work in the shops. Please fill out the Read and Acknowledgement form on the last page, print it and return it promptly.

Occupational Health and Safety Training Package for Shops

Shops Hazards:

- Ionizing Radiation
- Non-ionizing Radiation
- Hazardous or Toxic Materials
- Radioactive Materials
- Electrical Energy
- Explosive Gases and Liquids
- Oxygen Deficiency
- Kinetic Energy
- Potential Energy
- Thermal Energy
- Cryogenic Temperatures
- Natural Hazards

C-AD Contacts for Further ESSHQ Information:

Associate Chair for ESSHQ, OSH Management Representative,
EMS Management Representative, E. Lessard
Head of ESSHQ Division, General Building Manager, R. Karol
Environmental Coordinator, J. Scott
Environmental Compliance Representative, M. VanEssendelft
ESH Coordinator, Access Controls Physicist, Laser Coordinator,
Tier 1 Coordinator, A. Etkin
Radiological Control Division Representative, P. Bergh
Procedures Coordinator, L. DiFilippo
ISSM Point of Contact, Quality and Assessment Manager, D. Passarello
Self Evaluation Program, J. Maraviglia
Source Custodian, Work Control Manager, P. Cirnigliaro
Training Coordinator, Training Manager, J. Maraviglia
Training Records, A. Luhrs

SMD Contacts for Further ESHQ Information:

Environmental Compliance Representative, M. VanEssendelft
ESH Coordinator, ORPS Coordinator, Division Emergency Coordinator, K. Krasner
Facility Support Representative, P. Bergh
Quality Representative, R. Roberts
Training Coordinator, R. Roberts
90-Day Area Supervisor, T. Dilgen

Course Objective: Because your work activities have been identified as having significant potential to impact yours and others safety and health, this course has been designed to provide you with the job-specific information that you must know to protect yourself and others from hazards encountered in the shops.

1) What hazards are associated with your activities?

- External radiation sources are not a common hazard for shop personnel. Shops typically have lower level hazards, less than 5 mrem in an hour, due to the presence of activated materials. High levels of ionizing radiation can damage organs and the skin, cause cataracts, and cause cancer.
- Accidental exposure of workers to radioactive contamination is rare and may happen if working on activated material. Experience shows the majority of radioactivity will be firmly entrained in the materials and will not become airborne during most shop operations.
- There are a limited number of beta and gamma emitting sources available for use, which represent a low level external radiation hazard if handled properly. These are available to be loaned as needed. Care must be taken to ensure sources brought into the shops are not lost, as this might result in unnecessary exposure and widespread contamination if a source is damaged.
- Lead shielding in the form of bricks and blankets is sparsely found throughout shop areas. In any lead handling operation, routine industrial hygiene procedures must be followed. Lead is a neurotoxin, nephrotoxin and teratogen. Poisoning may also affect the blood, heart, and the endocrine and immune systems.
- Materials Safety Data Sheets must be used by personnel who work with hazardous chemicals. Typical chemicals include cleaning agents, solvents and water treatment chemicals.
- Welding gases are widely used and must be stored according to National Fire Protection Association codes. Gases stored in compressed gas cylinders must meet DOT specifications.
- The personnel risks associated with an ordinary combustible fire are considered low. The fire protection of some buildings is improved by the installation of sprinkler systems. Housekeeping is used to keep combustibles loading to a minimum. Emergency power and lighting are available in all parts of the complex and the maximum travel distance from any point to an exit is less than 300 feet.
- Electrical hazards leading to personnel injury include electrical shock and arc blast. High voltages and high currents are present in shops since BNL is an industrial facility. Electric arcs can cause fatal skin burns, hearing loss, lung damage and eye damage. Electric shock can cause damage to nerve tissue and the circulatory system, plus stop the heart.
- High direct current magnetic fields may be present in during magnet testing in some shops. These magnetic fields can interfere with pacemakers, and attract ferrous objects turning them into missiles.
- Some shop areas may contain high power rf systems that generate large fields of electromagnetic radiation in the frequency range of a few hundred kilohertz to a few hundred megahertz. These systems must be thoroughly shielded to prevent leakage radiation, thus minimizing this hazard. Use of RFI gaskets controls leakage of radio-frequency radiation from equipment. In addition, these areas must be protected by local barriers to restrict personnel access. Exposure to electromagnetic radiation in this frequency range at high power levels can cause tissue damage. The body absorbs this radiation and significant internal heating may

occur without an individual's knowledge because the body does not have internal sensation of heat. Tissue damage may occur before the excess heat can be dissipated.
- Heat sources such as soldering irons and vacuum heating blankets may exist in shops.
- Cryogenic liquids may be brought into shop areas. Skin contact with cryogenic materials due to spills or splashes may cause freezing or "cryogenic burns."
- Kinetic energy hazards are associated with motorized materials handling equipment, manual lifting and with the operation of hand and shop tools. Overexertion injuries can be caused by excessive lifting, pushing, pulling, holding, and carrying. Getting struck by tool or hitting other objects or people while moving equipment can cause injuries.
- Potential energy hazards are those associate with compressed gases and vacuum windows, slippery or elevated walking and working surfaces, as well as those associated with hoisting and rigging operations. Falls at the same level or to a lower level can cause severe injuries and death.
- Natural hazards are those associated with animals and insects. Insect bites and stings, animal bites and traffic accidents as a result of animals in the roadway are possible causes of injury.
- Noise hazards occur when personnel are exposed to noise levels greater than 85 db. Permanent hearing loss can result from excessive noise exposure.

2) What consequences may result if your operations were to impact safety and health?

- Not following the OSH rules could injure myself and others, incur regulatory penalties and cause extended accelerator shutdowns
- Injuries and illnesses can create loss of DOE, regulator and public trust

3) What benefits or positive effects would you notice with improved OSH performance?

- Prevention of injury/illness
- Safer, cleaner workplace
- Clear roles and responsibilities
- Improved relationship with DOE, regulators and the public

4) What role and responsibility do you have for these potential impacts and OSH performance?

My responsibilities are:

- To prevent work-related injuries, ill health and incidents
- To comply with C-AD and SMD occupational safety and health requirements
- Where appropriate, to provide input on safety and health to the Worker Occupational Safety and Health Committee, my supervisor and management
- To take action when controls fail
- To contact supervision if unsure of how to perform the work or if the procedures are unclear or incorrect
- To ensure that my required training is current

5) What specific controls at C-AD and SMD can be implemented to reduce the potential for work related injury/illness?

- All Hazards
  - Work Planning
  - Pre-Job Safety Meetings and Jobsite Walkdowns
  - Safety Inspections / Safety Reviews / ALARA Reviews
  - Manager Walkaround and Safety Observations
  - Trained and Qualified Workers
  - Housekeeping
  - Area Posting With Appropriate Signs
  - Warning Tags and Lights
  - Work Permits
  - Proper Lighting in the Work Area
  - Compliance with OSHA Requirements
  - Compliance with DOE Worker Health and Safety Program Rule, 10CFR851
  - Communications
  - Procedures
  - Inspecting Personal Protective Equipment Before Use
  - Effective Supervision at the Job Site
  - Accurate Drawings
  - Equipment Maintenance and Inspection
- Ionizing Radiation
  - Radiation Work Permits
  - Time, Distance and Shielding
  - Interlocks and Interlock Testing
  - Key Controls or Access Controls
  - Radiation Monitoring
  - Self-Reading Alarming Dosimeters
  - Fences and Enclosures
- Non-ionizing Radiation
  - Proper Eyewear for Lasers
  - Interlocks and Interlock Testing
  - rf monitoring
- Hazardous or Toxic Materials
  - Ventilation
  - Face Shields
  - Gloves
  - Safety Glasses
  - Leak Testing
  - Compliance with MSDS
  - HEPA Filters and Vacuums
  - Labeling
  - Secondary Containment
  - Spill Kits
  - Waste Controls

    - Use of Safe Substitutes
    - Use of Small Volumes
- Radioactive Materials
    - Radiation Work Permits
    - Contamination Controls
    - Waste Controls
- Electrical Energy
    - Working On or Near Energized Equipment Work Permits
    - Two-Man Rule Where Appropriate
    - Safety Watch Where Appropriate
    - Use of Shorting Bars and Grounding Sticks for Electrical Safety
    - Maintaining Electrical Flash and Shock Boundaries
    - Lockout Tagout
    - Voltage Rated Gloves
    - Clothing to Protect Against Arc Flash Hazard
    - Use of Equipment that Meets UL or Equivalent Standards
    - GFCIs
    - Kirk Keys
    - Grounding
- Explosive Gases and Liquids
    - Flammable Gas Monitors
    - Proper Containment and Piping
- Oxygen Deficiency
    - Oxygen Sensing Monitors
    - Exhaust Ventilation Fans
    - Self-Rescue Equipment
    - Confined Space Permit
- Kinetic Energy
    - Compliance with Traffic Rules and Traffic Control Signs
    - Frequent Work Breaks and Proper Posture to Prevent Repetitive Motion Injuries
    - Use of Dollies and Hand Trucks to Eliminate Manual Material Handling Tasks
    - Hard Hats
    - Safety Glasses
    - Safety Goggles
    - Hearing Protection
    - Gloves
    - Knee Pads
    - Elbow Pads
    - Ergonomic Reviews of Work Area
    - Steel-toed Shoes
    - Machine Guards
    - Barriers
    - Seat Belts
    - Noise Surveys
- Potential Energy
    - Fall Protection

    - Engineered Lifts
    - Inspecting Rigging Equipment Before Use
    - Knowing Proper Lifting Points on Load
    - Proper Scaffolding and Ladders
    - Wheel Locks
    - Magnetic Field Measurements
    - Railings
    - Smooth Non-Slippery Work Surfaces
    - Proper Lighting in Work Area
- Thermal Energy
    - Gloves
    - Fire Retardant Clothing
    - Fans
    - Water Breaks
    - Heat Stress Alerts
    - Air Conditioning
    - Cutting and Welding Permit
- Cryogenic Temperatures
    - Gloves
    - Face Mask
- Protracted/Irregular Hours
    - Workers Not Expected to Work More Than 16 Hours Straight
    - Take Breaks Every Few Hours
    - Allow at Least 8 Hours Between Work Periods
- Natural Hazards
    - Bug Spray
    - Housekeeping to Prevent Foraging by Animals and Insects
    - Awareness of the Possibility of Animals in Traffic Lanes
- Noise
    - Hearing Protection
    - Medical Surveillance
    - Noise Barriers

6) What C-AD and SMD procedures or programs reduce the potential for work related injury/illness?

- C-AD Building/Facility Information and Pictures
- C-AD Conduct of Operations
- C-AD Enhanced Work Permits
- C-AD Hazard Screening Tool
- C-AD Housekeeping Policy
- C-AD Material Handling Requirements
- C-AD Operations Procedure Manual
- C-AD Permits for Working On or Near Energized Conductors
- C-AD Supplemental Electrical Safety Standard
- C-AD Electrical Safety Implementation Plan

- C-AD Tier 1 Schedule
- C-AD Work Controls for C-A Staff
- C-AD Work Permits
- Facility Specific Training
- Glove Selection for Chemicals
- Management Review
- OSH Management System
- OSH Objectives and Targets
- SMD Operations Procedure Manual
- SMD Tier 1 Schedule
- WOSH Committee

7) How would you respond in an emergency to reduce the potential for injury/illness and what actions could be taken to mitigate the event?

For C-AD

- See C-A OPM 3.0, Local Emergency Plan for the C-A Department
- See C-A OPM Chapter 10, Occurrence Reporting
- Dial 2222 or 911 (if calling from a cell phone, dial (631) 344-2222)
- Assemble at Emergency Assembly Points

For SMD

- See SMD OPM 3.0, Local Emergency Plan for the SMD
- Dial 2222 or 911 (if calling from a cell phone, dial (631) 344-2222)

8) What occupational safety and health techniques have been or could be considered to reduce or eliminate the potential risks associated with working in the accelerators?

The following preventive and protective measures in the following order of priority:

- Eliminate the hazard/risk (e.g., do not use a broken ladder or do not use tools with frayed power cords)
- Control the hazard/risk at source, through the use of engineering controls (e.g., use interlocks) or administrative measures (e.g., use LOTO)
- Minimize the hazard/risk through the use of safe work systems, which include administrative control measures such as check-off lists and work permits
- If residual hazards/risks cannot be controlled by the above measures, then use appropriate personal protective equipment, including clothing

9) Are there any key OSH-specific competency requirements for my position?

A job training assessment (JTA) is performed for every job category. Specific OSH training is listed in your training record. Specific OSH courses available to address hazards in accelerators are listed in Section 4 of Workplace Hazard and Risk Assessment for Shops.

10) What is the function of the C-AD/SMD Worker Occupational Safety and Health (WOSH) Committee?

The WOSH Committee was formed to ensure full worker participation in work-related OSH issues. This Committee meets at least once per quarter and consists of worker representatives from all of the C-AD/SMD Sections and Groups. Each meeting reviews the latest injury data, performance indicators, critiques and occurrences, and worker feedback. The Committee also assists in the review of programs, work practices, hazard identification, risk assessments and procedures as requested by the Associate Chair for ESSHQ. The WOSH Committee procedure, C-A-OPM 9.8.1, describes the WOSH Committee policy and requirements in detail.

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date: March 11, 2008
to: Course Participant
from: J. Maraviglia
subject: OSH Training for C-AD/SMD for Shops Workers, Read & Acknowledgement

reference: Procedure: C-AD OPM 14.34.2

Please complete the information below indicating that you have read the reference document. Please return this completed form to ESSHQ Division, Ann Marie Luhrs, Bldg. 911A.

Thank you,
John Maraviglia

Name: _____ Life #: _____
Print

Name: _____ Date: _____
Signature

Please return this completed form to ESSH&Q Division, Ann Marie Luhrs, Bldg. 911A.