



## **Occupational Health and Safety Training Package for C-AD 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](#).

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

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 ESH&Q Division Head, Ray Karol (<mailto:rck@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 accelerators. 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

### Shop Hazards:

- Ionizing Radiation
- Non-ionizing Radiation
- Hazardous or Toxic Materials
- Radioactive Materials
- Electrical Energy
- Flammable or Combustible Materials
- Magnetic Field and Electromagnetic Radiation
- Kinetic Energy
- Potential Energy
- Thermal Energy
- Cryogenic Temperatures

### Contacts for Further ESHQ Information:

Associate Chair for ESHQ, E. Lessard

Head of ESHQ Division, R. Karol

Environmental Coordinator, J. Scott

Environmental Compliance Representative, M. VanEssendelft

ESH Coordinator A. Etkin

Radiological Control Division Representative, P. Bergh

Procedures Coordinator, L. DiFilippo

Quality and Assessment Manager, D. Passarello

Self Evaluation Program, A. Piper

Source Custodian, P. Cernigliaro

Tier 1 Coordinator, A. Piper

Training Coordinator, J. Maraviglia

Training Records, A. Luhrs

**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 accelerators.

1) What hazards are associated with your activities?

- External radiation hazard is not a common hazard for shop personnel. However, if shop personnel are required to work on activated material, work controls and job-specific radiation work permits are required.
- Accidental exposure of workers to 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. However if the material is dispersible because of cutting or sanding work or because the activated item is fragile, then consult with the FS Representative to determine the need for contamination controls.

- The C-AD has a limited number of beta and gamma emitting sources 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. Sources are not allowed to be taken into an uncontrolled area such as a clean shop nor away from the C-AD complex. The C-AD HP Office must be contacted if sources are moved within the complex.
- In any hazardous material handling operation, routine industrial hygiene procedures must be followed. For example, gloves must be used when handling lead bricks.
- In case of fire, some lead may be heated and released in smoke. Shop personnel should stay out of smoke if a fire occurs.
- Typical hazardous chemicals used in shops include cleaning agents and water treatment chemicals. Materials Safety Data Sheets must be used by personnel who work with hazardous chemicals. Personnel who work with hazardous chemicals must be trained in Hazard Communication.
- Large quantities of stored gas are not permitted in shop areas, and workers are limited to using 100 to 200 lb. cylinders inside of buildings. When used in shops, welding and flammable gases must be stored according to National Fire Protection Association codes. Gases stored in compressed gas cylinders must meet DOT specifications.
- Combustible loading in shops consists of beam diagnostic and testing equipment, shop tools such as drill presses and lathes, magnets, power cables and control cables. Keep the work area free of unwarranted combustible materials such as cardboard boxes or trash. See the [C-AD Housekeeping Policy](#). The personnel risks associated with the fire hazard are considered low. The fire protection of some buildings is improved by the installation of sprinkler systems. Emergency power and lighting are available in all parts of the accelerator complex and the maximum travel distance from any point to an exit is less than 300 feet.
- Electrical shock presents a high level hazard in shops. Regardless of the voltage involved, high current systems may create arcs capable of causing severe flash burns, direct burns, or molten metal splattering. Even though circuit breakers may actuate, the short-circuit capability of many systems is many tens of thousands of amperes and severe damage or injury can occur before the breaker trips. Lockout/Tagout procedures shall be used whenever possible when assembly, maintenance or testing is performed on equipment that has the potential for energy release. The Department requires that any supervisor, who ascertains the need for **NOT** applying LOTO to perform certain tasks, must write a procedure and a permit following [BNL ES&H 1.5.0](#).
- High direct-current magnetic fields may be present in accelerator shop areas during testing tasks. Limits of exposure are such that the whole body is not allowed in fields greater than 600 gauss on a daily basis (8-hour time-weighted average), and the extremities are not allowed in fields greater than 6000 gauss (8-hour time-weighted average). Other hazards associated with strong magnetic fields are reaction with heart pacemakers or other medical implants and the potential physical injury of carrying ferrous objects near a strong field. However, areas with strong magnetic fields must be fenced and posted with appropriate

warnings. Cardiac pacemaker wearers are not allowed to be exposed to fields greater than 5 gauss.

- 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 electronic equipment. In addition, these areas must be protected by local barriers to restrict personnel access.
- Heat sources such as soldering irons and vacuum heating blankets may exist in shops.
- Cryogenic liquids may be used in shops. 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 and with the operation of hand and shop tools.
- Potential energy hazards are those associate with compressed gases and vacuum windows, as well as those associated with hoisting and rigging operations.

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 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 C-A management
- To take action when controls fail
- To contact supervision if you are 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 C-AD specific controls, procedures or programs are implemented to reduce the potential for work related injury/illness?

- [C-AD Building/Facility Information and Pictures](#)

- [Conduct of Operations](#)
- [Enhanced Work Permits](#)
- [Facility Specific Training](#)
- [Glove Selection for Chemicals at C-AD](#)
- [Hazard Screening Tool](#)
- [Housekeeping Policy](#)
- [List of Noise Areas](#)
- [List of Oxygen Deficiency Hazard Areas](#)
- [List of rf and Microwave Sources](#)
- [List of Work Control Coordinators](#)
- [Management Review](#)
- [Material Handling Requirements](#)
- [OSH Management System](#)
- [Supplemental Electrical Safety Standard](#)
- [Tier 1 Schedule](#)
- [Work Controls for C-A Staff](#)
- [Work Permits](#)
- [WOSH Committee](#)

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

- 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](#)

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

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

8) Are there any key OSH-specific competency requirements for this 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 shops are listed in Section 4 of [Workplace Hazard and Risk Assessment for Shops](#).

9) What is the function of the C-AD 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 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 ESHQ. The WOSH Committee procedure, [C-A-OPM 9.8.1](#), describes the WOSH Committee policy and requirements in detail.

# Memo

*date:* May 13, 2004  
*to:* Course Participant  
*from:* J. Maraviglia  
*subject:* OSH Training for C-AD

## **Read & Acknowledgement**

*reference:* Procedure: C-A-TRN-OSH-SHP  
Revision: 01  
Revision Date: 5/13/04

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

Thank you,  
John Maraviglia

Name: \_\_\_\_\_ Life #: \_\_\_\_\_  
Print

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Signature

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