

DØ Hazard Awareness Training Handout

Version 3.0

March 1, 2008

Overview

This document is intended to inform you about some of the more common hazards encountered at DØ. Please read the entire document and then complete the quiz at the end. Return the completed quiz and signature sheet as indicated. This basic hazard awareness training is required for all personnel who intend to work at DØ. It is valid for two years. Note that there also are other facilities at Fermilab (e.g. SiDet) where work is being conducted by or for DØ personnel. The hazards in those areas may differ from the ones outlined here. Should you need to work in those areas as well, please make sure that you are aware of the hazards you might encounter there. Consult your supervisor if you have questions about hazards in those areas and to determine whether there are any additional training requirements.

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I. INTRODUCTION

This training document outlines hazards specific to DØ. “DØ” consists of the DØ Assembly Building (DAB), the DØ Collision Hall, DØ trailers, the Outback, and the C4 Pump House. The goal of this training is to advise you of these hazards and the proper precautions to take to prevent unsafe situations. This training is mandatory for anyone who enters the DØ detector area or works at DØ routinely. Wearing your identification badge is required at all times while in the DØ Assembly Building (DAB).

If you find a situation in which you need advice, training, review or a decision in regards to safety or safe operations, you should first go to your immediate supervisor. If you and your supervisor conclude that the matter goes beyond your own group, that you need assistance in resolving it, or that you need to arrange for safety training, you should contact the DØ Environment, Safety and Health (ES&H) Coordinator. If the matter is related to detector operations you also should inform the DØ Run Coordinator by contacting the DØ control room. Additionally, if you are unable to contact your supervisor, you should contact the DØ ES&H Coordinator. He may request assistance from other DØ groups and laboratory organizations to review and abate safety concerns or problems. If you are unable to reach the DØ ES&H Coordinator, you should contact one of the following: DØ Department Head, Deputy Department Head, DØ Technical Integration Coordinator, or DØ experiment spokesperson. In the event of an emergency, you should **call ext. 3131** from any Fermilab telephone.

Consult the DØ Emergency Call list for the individuals listed above. This list is available in the DØ Control Room.

ES&H materials referenced in this document can be consulted for guidance on ES&H issues. These materials can be found on-line at this URL:

http://www-esh.fnal.gov/pls/default/esh_home_page.page?this_page=10

PROGRAMS FOR CONTROLLING HAZARDS

The DØ Department programs for controlling the hazards that may be found within DØ facilities generally have three parts: (1) reviews to minimize hazards of new systems; (2) personnel training; and (3) documented operating and safety procedures or guidelines to follow. In addition, work activities performed by Fermilab employees shall be reviewed via a Job Hazard Analysis (JHA) before work is started (see *Fermilab ES&H Manual*, Chapter 2060). Reviews to minimize hazards in the design, construction, and operation of new systems are conducted by specific review committees or ES&H personnel. If you are involved in an operation that you feel should be reviewed, contact your supervisor. Training courses are conducted by supervisors, the DØ ES&H coordinator, the PPD ES&H Department, or the Fermilab ES&H Section, depending on the specific need. Written procedures and job hazard analyses are usually developed by those doing the work and their supervisors, in consultation with ES&H personnel when necessary.

A list of common hazards at DØ follows, along with the associated personnel training programs and operating procedures to minimize them.

1. Hazards Associated with Operating Machinery

Cranes and Forklifts

Improper use of certain equipment, such as cranes and forklifts, can endanger people working in the area as well as material being moved. People operating cranes and forklifts must complete operator training and renew this training every three years. Operators must warn others of approaching loads. Crane operators in the DAB high bay do this by using a bell. All personnel are prohibited from the area near or under any suspended load. Procedures for crane use can be found in the *Fermilab ES&H Manual*. Additional rules and guidelines can be found in the *DØ Machine Shop and Lifting Equipment Manual* located in the DØ Machine Shop.

Machine Shop Equipment and Power Tools

There is a machine shop on the third floor of DAB. Machines in this area present hazards due to moving parts. Power tool operations present similar hazards. People using shop equipment must be authorized to work in these areas by the DØ Operations Group. Work with some machines requires the use of Personal Protective Equipment (PPE). Any loose clothing or jewelry that might become entangled must be removed prior to operating these machines. Hair that might become entangled should be covered. All hammering, drilling, cutting, grinding, and power tool operations require the use of protective eyewear (e.g. safety glasses or goggles) with side shields that fit snugly to the face. In addition to glasses or goggles, grinding operations also require the use of a full-face shield. Some operations may require other forms of PPE (e.g., hearing protection, gloves). Manufacturer's recommended operating instructions are a good source of information on how to operate equipment safely. Additional guidelines

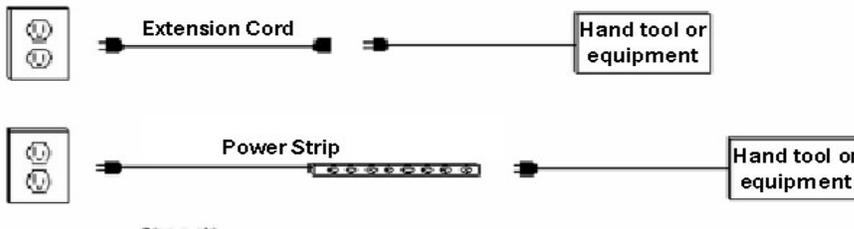
on the proper use of machine shop equipment can be found in the *DØ Machine Shop and Lifting Equipment Manual*.

2. Electrical Hazards

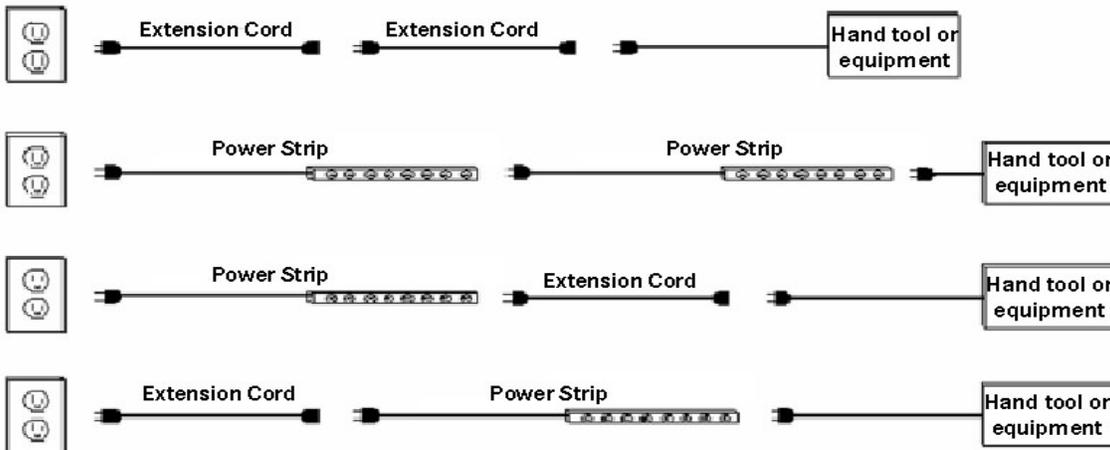
Many DØ detector components utilize potentially dangerous high voltages and/or currents. In addition, certain electrical devices/components may retain significant electric charge after their high-voltage sources are removed. These sources of energy can cause electric shock to personnel if work on these devices is carried out improperly. All DØ personnel are required to have Electrical Safety Orientation training, which is a brief orientation to the Fermilab LOTO program and NFPA-70E for unqualified workers. People performing service or maintenance work on or near equipment that could cause them injury if it were to become energized must lockout and tagout that equipment's energy source(s) and must have current Fermilab LOTO Level 2 training. Additional information about LOTO can be found in section 13 of this document. The DØ detector's high-voltage systems have unique guidelines for de-energization. Specific procedures exist for working on various sub-detector high-voltage systems.

An electrical hazard that is found in offices is 'daisy-chaining' of extension cords and power strips. Extension cords and power strips are designed to be used individually and not connected to others in series. This can become a fire hazard by creating an over-current condition. Below are examples of acceptable and unacceptable usages of extension cords and power strips. These are examples of configurations found onsite at Fermilab, however acceptable and unacceptable configurations are not limited to the examples. Contact the building manager if you have any questions.

Acceptable combinations of extension cords and power strips.



Unacceptable (Daisy-chain) combinations of extension cords and power strips.



3. Magnetic Fields

The DØ detector has a 2-Tesla superconducting solenoid installed in the opening of the central calorimeter. The Muon system also contains toroid magnets. During testing or operation, the DC magnetic field of the energized magnets could be hazardous to those working close by with tools or other objects susceptible to magnetic forces. The magnetic field could also be a hazard to those with pacemakers or other medical implants, if they are sufficiently close to the magnets. Access to the Collision Hall is restricted and special access procedures are in effect when the toroid is energized.

*Note that the solenoid may be energized during controlled accesses into the Collision Hall. The status of the solenoid is clearly indicated via red status lamps in the entranceway to the collision hall.

The control dewar level of the ventilation platform in the south east corner of the Collision Hall is posted as an exclusion area (because the power leads for the solenoid come through the shield wall at that level). Access to that area requires prior approval of either the DØ Department Head or the Technical Integration Coordinator.

4. Working at Heights

There are unusual places at DØ from which people or things have the potential to fall. These include ladders, scaffolds, personnel lifts, and the DØ detector's elevated access platforms. The physical condition of ladders and scaffolds should always be inspected prior to their use and must be used in accordance with any posted instructions and/or safety precautions. Personnel lifts are available in some areas to workers trained in their use. Work from elevated detector access platforms that have no railings requires training and the use of a body harness and lanyard. Hard hats must be worn whenever someone is working above you or during rigging activities. In addition, hard hats are required whenever you are working in the Collision Hall.

5. Radiation

The DØ Assembly and Collision Halls contain areas where radiation hazards associated with accelerator operations are present. Radiation fields can also be found near activated accelerator components, detector cryostats, and radioactive sources. Radiation dosimeter badges are required in the Collision Hall, when working with radioactive sources, and in the Utility Entry Room during accelerator operation or as posted. Temporary badges are available from the Communications Center (on the Ground Floor of Wilson Hall, x4251) and, in limited quantity, from the DØ Control Room. Permanently-assigned badges are located on racks in the 1st floor elevator lobby of DAB. Applications for permanent-badge service are available in the DØ Control Room.

People working at DØ must have current General Employee Radiation Training (GERT), as a minimum. If they enter radiation areas such as the Collision Hall, or work with radioactive sources or materials, they must have the more advanced Radiological Worker training, instead of GERT. All items removed from the Collision Hall are assumed to be radioactive and must be checked for radioactivity by the person(s) removing them. In addition, potentially activated or contaminated items must be surveyed by an authorized person prior to them being taken off the Fermilab site. Contact the DØ ES&H coordinator to request such a survey. Only personnel who have current Radioactive Source Training and Radiological Worker Training can sign out radioactive sources from the designated DØ "source monitors". The names of the source monitors are posted on the DØ radioactive source storage box.

If a female radiological worker knows or suspects that she is pregnant, she can notify the Fermilab Medical Office in writing and consult with the Occupational Medical Director and a radiation safety staff member to discuss options for minimizing her prenatal radiation exposure. This notification is voluntary and can be arranged with the assistance of the DØ ES&H coordinator.

Further information regarding Fermilab standards for radiological work can be found in the *Fermilab Radiological Control Manual*.

6. Sustained High Noise Levels

Extended exposure to certain areas within DØ facilities where high noise levels are common can cause hearing damage to people without proper hearing protection. The Cryo Pump Room and Room 503 at DAB, and the C4 Pump House have noisy pumps and/or compressors. These areas are posted accordingly and have the appropriate hearing protection available. Additional information on hearing conservation can be found in Chapter 5061 of the *Fermilab ES&H Manual*.

7. Chemicals

Small amounts of chemical materials, such as epoxies and solvents, are used or stored in certain areas. If handled incorrectly, some of these materials may become harmful. All hazardous (e.g., flammable, corrosive, reactive, or toxic) materials that are not in use must be stored in specially designated cabinets. Material Safety Data Sheets (MSDS's) containing information on all of these and other materials within DØ facilities can be found at the "Right-To-Know" Center, located in the 3rd floor lobby of DAB. Additional information regarding chemical hazard communication is outlined in Chapter 5051 of the *Fermilab ES&H Manual*.

8. Compressed Gas/Pressure Vessels

Many DØ detector systems and operations utilize compressed gases and pressure vessels that may become hazardous if ruptured or handled improperly. All gas cylinders must be properly regulated while used and capped while stored. They also must remain protected from falling down at all times, for example by securing them to a storage rack or other solid object. Additional requirements and procedures regarding compressed gas systems and pressure vessels can be found in Chapter 5031 of the *Fermilab ES&H Manual*.

9. Cryogenics

There are areas within some DØ facilities where cryogenics such as liquid helium, nitrogen, or argon are routinely present. A leak of these materials from systems of the accelerator or the DØ detector can cause local zones of oxygen deficiency. In addition, there may be areas where acute physical hazards associated with handling cryogenic materials, such as burns to the eyes and skin, are present. Under normal conditions, the DØ Assembly and Collision Halls are not considered to be Oxygen Deficiency Hazard (ODH) areas due to the high reliability of the ventilation systems. When cryogenic materials are handled, appropriate personal protective equipment (PPE), such as gloves and protective eyewear with side shields, must be worn. Additional information regarding the controls and procedures required of cryogenic and ODH areas are contained in Chapters 5032 and 5064 of the *Fermilab ES&H Manual*.

10. Confined Spaces/Limited Access Areas

Confined spaces

Confined spaces are locations in which hazards, such as poor illumination, difficult emergency escape and ODH, can be intensified. The confined spaces at DØ include the liquid argon sump pit, the groundwater sump pits, and all enclosed areas beneath the portakamps. A written permit and Fermilab confined-space training is required for access to any confined space. Additional policies and procedures regarding access to confined spaces can be found in Chapter 5063 of the *Fermilab ES&H Manual*.

Limited access areas

The DØ facilities contain other areas where various hazards can exist and access is restricted to authorized personnel only. All such restrictions are posted at the affected areas. Some of these are:

Collision Hall: Two forms of access to the Collision Hall exist. The less restrictive type of access is called a *Supervised Access* and is normally allowed only when the accelerator is not operating for an extended period. The more restrictive type of access is called a *Controlled Access* and is the normal mode of access during brief downtimes of accelerator operation when it is expected that the Collision Hall interlocks will be maintained. Keys for *Supervised Access* are issued from the DØ Control Room only to properly trained and authorized individuals. *Controlled Access* is made by following the DØ controlled-access procedure. Additional training is required before you can participate in a controlled access.

Additional Collision Hall access restrictions exist during times of major changes to the detector configuration, due to the increased hazards arising primarily from the absence of work platforms, railings, floor gratings, ladders, etc. Entrances to the Collision Hall are posted with the following signs "NOTICE - Major Configuration Change Underway - KEEP OUT". The technician team leader or designee responsible for the carrying out the configuration change must approve any other Collision Hall work during these times to insure that it can be done safely and without interference.

Muon Detector Trusses: In some places, the trusses have only one way in or out. They also have narrow stairs and ladders, low ceilings, and trip hazards that make quick escape difficult. People authorized to work in the trusses must wear a hardhat and enter or exit only at the lowest levels. Additional work rules in each EF truss are:

- no more than two people in each truss at one time
- the trap doors on each platform must always be closed after use or before proceeding to the next level
- items must not be held in hand while climbing the ladders

Detector Cryostat Gaps: The Tevatron beam pipe through the center of the detector contains beryllium and is extremely fragile. Any activity in the areas between the detector cryostats is restricted to authorized personnel only.

NO ACCESS: There may be areas at DØ that are posted "NO ACCESS". No entry to these areas should be attempted without explicit permission from DØ ES&H coordinator.

11. Emergencies

The following list summarizes the proper responses to the three different audible alarms that warn you of certain hazardous conditions at DØ facilities:

- Steady Alarm - This is a fire alarm and it means that smoke or fire has been detected in the area. Leave the area via the nearest exit and go to the designated assembly point. For the DØ trailers and DAB, assemble in the north parking lot away from the building(s) potentially involved. For the Outback, assemble in the DAB south parking lot (the one between DAB and the Outback).
- Whooper Horn - This is a hazardous atmosphere (i.e., ODH) or interlock alarm. If you hear these alarms at DØ, evacuate the area by the shortest route and assemble in the DAB 3rd floor high-bay.
- Sitewide Emergency Warning System (SEWS) - This is a verbal communication system broadcast throughout all areas of the laboratory. It is used to notify personnel when hazardous conditions exist and what protective actions to take. It is very important that you respond to its warning tones and messages and that you follow the transmitted instructions. If the nature of the message indicates severe weather, promptly go to the designated shelter for your area. These are: the 1st or 2nd floor fixed counting room shelter areas on the north side of DAB (Rm. 109 or 209), if you are in DAB or the trailers; the concrete shelter located just to the south of the Outback, if you are in the Outback. If you don't have time to get to the shelter area, seek shelter in the nearest ditch, away from cars, or get under something sturdy (e.g., desk) away from windows.

When evacuating any area, proceed to the designated assembly point and wait there until the 'all clear' signal is given. If you must leave and can't wait for the 'all clear', tell your supervisor or Emergency Warden. Rescue attempts will be made by the Fire Department if someone is unaccounted-for and believed to be in an unsafe area (e.g., burning structure, oxygen deficient area). If you notice that a fellow worker is missing during an emergency, immediately report this to an Emergency Warden or Fire Chief.

Call ext. 3131 in the event of an emergency situation, such as personnel requiring medical treatment for any reason. Stay on the phone until the emergency operator indicates that s/he has all of the necessary information, including your name, location and nature of the emergency. Do not attempt to bandage another person or clean any bodily fluids from another person's injury.

12. Environmental

An accidental release of some materials (e.g., oil, gasoline, diesel fuel) from certain equipment could become harmful if it is not promptly contained. Such a release can be considered harmful if it can potentially cause adverse effects to people or the environment. If you know or suspect that such a release has occurred or will occur, **call ext. 3131** to report a spill emergency. Designated personnel are trained to execute procedures designed to minimize the spread of accidentally released materials. In addition, the following materials are prohibited from disposal in trash cans and dumpsters:

All hazardous (e.g., flammable, corrosive, reactive, toxic) materials; degreasing agents (e.g., freon); uncured epoxy; ethylene glycol ("anti-freeze"); fluorescent light bulbs; oils; paints; pesticides; radioactive material, radiation signs and labels; scrap metal; NiCad, lead/acid, and lithium batteries; any free liquids (regardless of chemical nature).

Contact PPD ES&H personnel or DØ Building Manager for information about the proper disposal of these items.

13. Miscellaneous

The following describes some additional hazards and work rules which exist within DØ facilities:

- Only Lockout/Tagout (LOTO) Level 2 trained personnel are authorized to work on equipment that could become hazardous to them if that equipment were unexpectedly energized. LOTO requires the use of a designated red lock and a DANGER tag to isolate the hazardous stored energy source (e.g., electricity, gravity, springs). All LOTO activities in the DØ/DAB area must be recorded in the LOTO logbook located near the LOTO board in the 3rd floor lobby of DAB. Additional information about LOTO can be found in Chapter 5120 of the *Fermilab ES&H Manual*.

NOTE: The term "configuration control" applies to the lockout and tagging of equipment that could not jeopardize worker safety. The application of "configuration control" locks does not require LOTO Level 2 training or procedures and should be implemented with a (non-red) padlock and a CAUTION tag.

- Smoking at DØ facilities is permitted only outdoors and at least 15 ft. from the nearest indoor entrance.
- Tour groups with five or more people or any group with children (i.e., visitors under the age of 18) must be approved in advance by notifying the DØ tour coordinator. All tour groups must have an escort who is a Fermilab employee. Tour groups are restricted to the south DAB catwalk, the hi-bay display area, and the DØ control room, unless prior approval to visit other areas has been obtained. Tour groups passing through the hi-bay should remain in the yellow aisle ways and be alert to any rigging or loading activities that might be underway.
- All children must be continuously supervised by an adult and are allowed only in office areas.
- When it is expected that an operation or process (such as welding or brazing) may generate a *significant* amount of smoke, PPD ES&H personnel must be contacted to determine whether any affected fire protection systems should be disabled. In addition, if it is expected that an operation (such as soldering or vacuuming) will produce *any* smoke or dust in the detector area (Collision Hall or Assembly Hall, as appropriate) or the 1st floor of the Moveable Counting House, contact PPD ES&H personnel. Smoke detection systems in these areas are extremely sensitive and may need to be disabled to prevent false fire alarms or Halon discharge.
- Since janitorial personnel do not service some areas within DØ facilities, you must clean up after yourself.
- Large items, such as bicycles, chairs, equipment, and debris must be kept out of corridors and aisles and must be stored so that electrical panels are not obstructed. These items can make certain areas impassable, especially during an emergency.
- It is always preferred that people not work alone, especially in the Assembly Hall Pit or the Collision Hall. When this is impractical, workers should at least insure that another person, such as their supervisor, is aware of when and where they are working, and they should make arrangements to periodically check-in with that person. This is especially important for work during off-hours. Also note that for some types of jobs, explicit "two-man rule" requirements may exist.
- **Nothing** must be attached to or suspended from overhead sprinkler pipes.
- No foods or beverages are allowed in the Collision Hall or the Moveable Counting House.
- Extra caution should be exercised around all areas of the DØ detector. Many of these areas contain sensitive or delicate equipment that must not be disturbed.
- All new visitors working at Fermilab must register with the Users' Office (WH1E, ext. 3111) upon their arrival.
- All phones shall have an "IN ANY EMERGENCY DIAL 3131" sticker. Please contact the DØ building manager for these stickers.

III. DØ HAZARD AWARENESS QUIZ

Print

Name: _____ I.D.#: _____ Date: _____

FOR EACH QUESTION BELOW, CIRCLE THE BEST ANSWER, AFTER READING ALL THE CHOICES:

1. For whom is this training MANDATORY?
 - a. all Fermilab employees
 - b. all visitors
 - c. anyone who enters the DØ detector area
 - d. anyone who routinely works at DØ
 - e. c & d

2. What should you do if you find an unsafe situation?
 - a. ignore it
 - b. immediately inform the Fire Department
 - c. stop work and immediately inform your Supervisor or ES&H personnel
 - d. call the control room
 - e. none of the above

3. What should you do if someone you work with gets injured?
 - a. find a doctor
 - b. immediately inform the Fire Department
 - c. go to the designated shelter area
 - d. call ext. 3131
 - e. none of the above

4. What MUST you do to take a potentially radioactive object off-site?
 - a. frisk it
 - b. transport it in a Fermilab vehicle
 - c. ask permission of your Supervisor
 - d. you can NEVER take these items off-site
 - e. have it checked for radioactivity by an authorized person

5. Use of which of the following equipment requires specialized training/authorization?
 - a. all lasers
 - b. cranes and forklifts
 - c. certain machine shop equipment
 - d. a & b
 - e. b & c

6. What is the FIRST thing you should do when you hear a Fire Alarm at DAB?
 - a. call ext. 3131
 - b. immediately exit area and go to designated assembly area
 - c. call your supervisor
 - d. investigate cause of alarm
 - e. call the Fire Department

7. When MUST you wear a radiation dosimeter badge?
 - a. when area is posted as requiring one
 - b. when in the Collision Hall
 - c. when using a radioactive source
 - d. all of the above
 - e. none of the above

8. When is it permissible to work under a suspended crane load?
 - a. when you need to
 - b. never
 - c. anytime
 - d. if you are operating the crane
 - e. when near the loading dock

9. At DAB, what should you do if you hear an ODH alarm?
 - a. nothing
 - b. go to the Movable Counting House
 - c. immediately exit to North parking lot
 - d. assemble in the DAB 3rd floor "high-bay"
 - e. go to a designated shelter area

10. Where can you store a FLAMMABLE liquid (e.g. ethanol, acetone) overnight?
 - a. in a toolbox
 - b. in a filing cabinet
 - c. in a special cabinet designated for flammable liquid storage
 - d. anywhere, as long as it's labeled
 - e. c & d

11. If you are in the DØ trailers, what should you do when you hear the Site-wide Emergency Warning System?
 - a. follow the transmitted verbal instructions
 - b. go to the 1st or 2nd floor fixed counting rooms in DAB, if you are informed of severe weather
 - c. assemble in the North parking lot
 - d. call ext. 3131
 - e. both a & b

12. Who should you contact for information about proper disposal of hazardous or unknown chemicals?
 - a. DØ Building Manager
 - b. PPD ES&H personnel
 - c. your colleague
 - d. no one, just throw them out
 - e. both a & b

13. Which activities are not permitted in the Collision Hall?
 - a. smoking
 - b. drinking
 - c. eating
 - d. all of the above

14. You are working in the Collision Hall and you hear an alarm, but you are unsure what type. You should:
 - a. remain in the Collision Hall until the 'all clear' is given
 - b. call your colleague and ask what the alarm is for
 - c. evacuate the Collision Hall immediately
 - d. call 3131 immediately

IV. SIGNATURE PAGE AND TRAINING RECORD

This training is not valid unless the following information is completed:

"I have read the document "**DØ Hazard Awareness Training Handout**" and understand the hazards present at DØ facilities. Also, I agree to follow all of the listed work rules and emergency procedures."

Print your name: _____ Fermilab ID #: _____

Division/Section/Affiliation: _____ Department/Group: _____
(Home institution if a User)

Fermilab Phone #: _____ Mail Station: _____

E-mail address: _____

Your Signature: _____

Today's Date: _____ (This training will expire two years from this date)

Please complete the quiz and this form (pages #8-10) and return both to:

DØ Hazard Awareness, MS 355 or FAX 840-8602

or place them in the *DØ Hazard Awareness* mailbox located on DAB3 or in the designated forms slot near the Shift Captain's console in the DØ Control Room.

-----FOR ADMINISTRATIVE USE ONLY-----

Quiz score: ____ / 14 (score ≤ 10 = FAIL)

TRAIN group assignment: _____

Authorization: _____
(Must be signed by PPD ES&H personnel)