

**COLLIDER-ACCELERATOR DEPARTMENT
(C-AD)**

**COLLIDER
USER
TRAINING**

**Radiation Safety
Conventional Safety
Access Control**

INFORMATION GUIDE

Includes Equivalency for training courses:

- General Employee Radiation Training (GERT)
- Oxygen Deficiency Hazard (ODH), Class 0 Areas (the ODH-0 equivalency is for access to areas AT RHIC ONLY)

NOTE ! If after completing this training you are unsure of how to properly enter AND exit the Primary Area through the PASS gates, then get assistance since improper operation can cause programmatic delays

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COLLIDER USER TRAINING

LEARNING OBJECTIVES OR WHY TAKE THIS COURSE?

This course is required if you want unescorted access into experimental areas at the Relativistic Heavy Ion Collider (RHIC). Unescorted access requires you to have facility-specific knowledge. This training alone does not qualify you to perform work at your experimental area. As a minimum to perform work, you are also required to read & sign a work plan document specific to your experiment. Information about the work plan document may be obtained from your Experiment Spokesperson or from the Collider-Accelerator Department (C-AD) Liaison Physicist for your experiment. The document and the reading & "signing" is also typically available on-line.

Other additional training may be required depending on your work activities. Examples of what could require additional training and authorization are: operating electrical circuit breakers or disconnect switches, other electrical work, working at heights, handling compressed gas cylinders, entering confined spaces, performing LOTO (lockout/tagout), entering magnetic field areas, crane operation, use of a man-lift or aerial lift, entering high noise areas, entering Radiation Areas, entering areas that require a TLD (e.g. the Collider Tunnel), using machine shop equipment. These are examples and not an all-inclusive list. You should consult with your Spokesperson or Liaison Physicist regarding additional training. Enhanced Work Planning (Work Permit) may be required as well.

If you are a Shift Leader, Period Coordinator or Run Coordinator at your experiment, you are also required to complete additional training, including Read & Acknowledgements (R&A) of specific C-AD procedures. The R&A training will include Emergency Procedures for your experimental area. Information about this training may be obtained from your Experiment Spokesperson or from the Collider-Accelerator Department (C-AD) Liaison Physicist for your experiment. Information is also available on-line.

This course provides you with basic information about the access control system at the Collider, the physical and administrative controls that prevent accidental exposures to radiation in Primary Areas, Enhanced Work Planning, and certain conventional safety hazards. The course includes an approved equivalent for BNL courses:

General Employee Radiological Training (GERT), and for Oxygen Deficiency Hazard Class 0 (ODH-0) Training (the ODH-0 equivalent is for access to RHIC areas only).

A Controlled Area is a posted area established to protect individuals from exposure to radiation and/or radioactive materials. At C-AD, GERT does not allow you entry into Controlled Areas that require personal dosimetry (e.g.: Thermo luminescent Dosimeter - TLD). The practice at C-AD is that you complete BNL's Radiation Worker-1 training for access to TLD areas.

In addition to ionizing radiation hazards, experimental areas may contain hazards posed by:

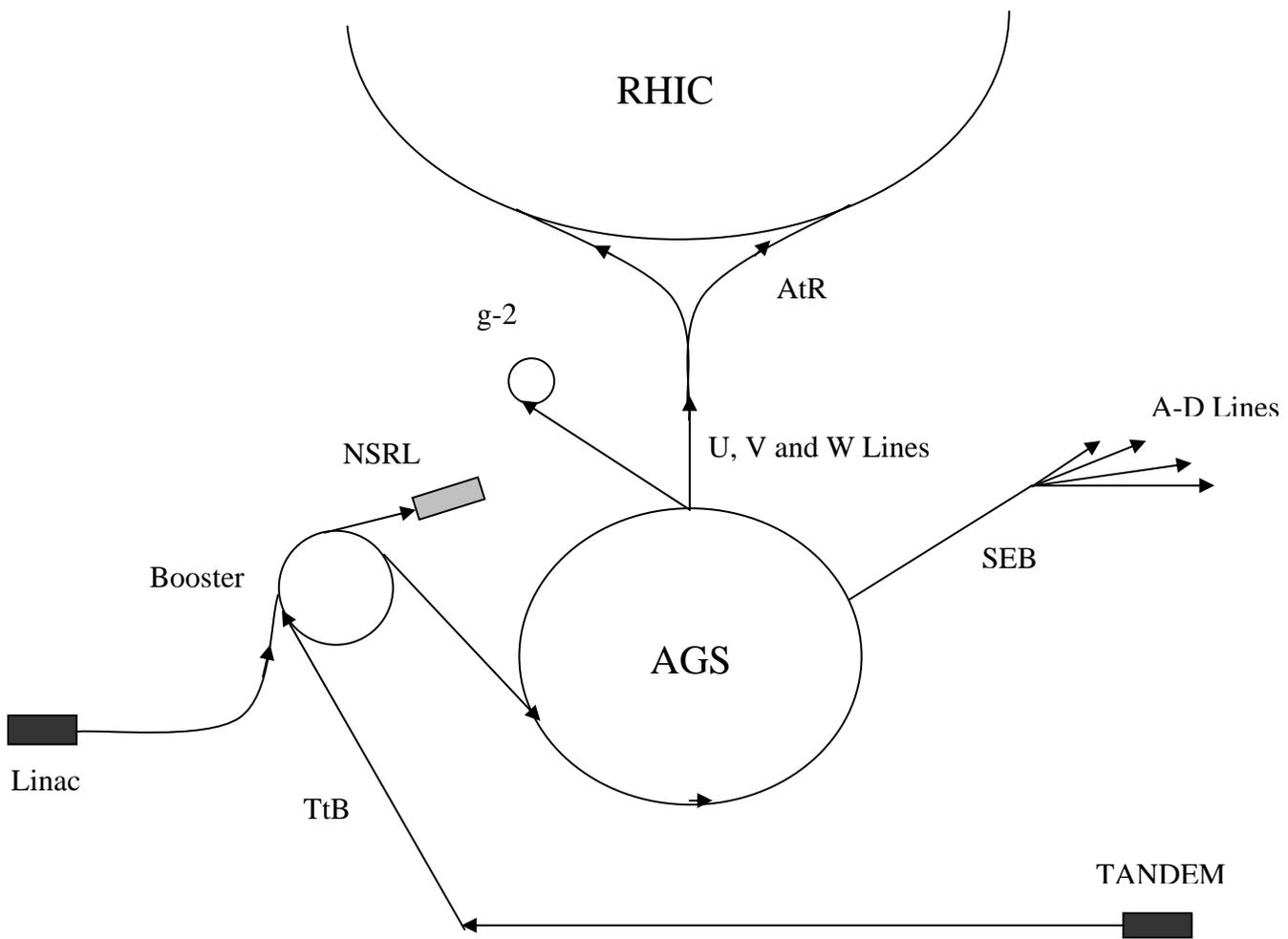
- heavy objects
- mechanical equipment
- overhead cranes
- heights
- magnetic fields
- electricity/electrical energy
- lasers

- high-voltage and high-current electrical systems
- hot and cold surfaces
- high noise
- oxygen deficiency from release of helium or nitrogen
- radio-frequency (RF) radiation
- contamination and oxygen deficiency from smoke and fire
- slips, trips and falls
- compressed gas

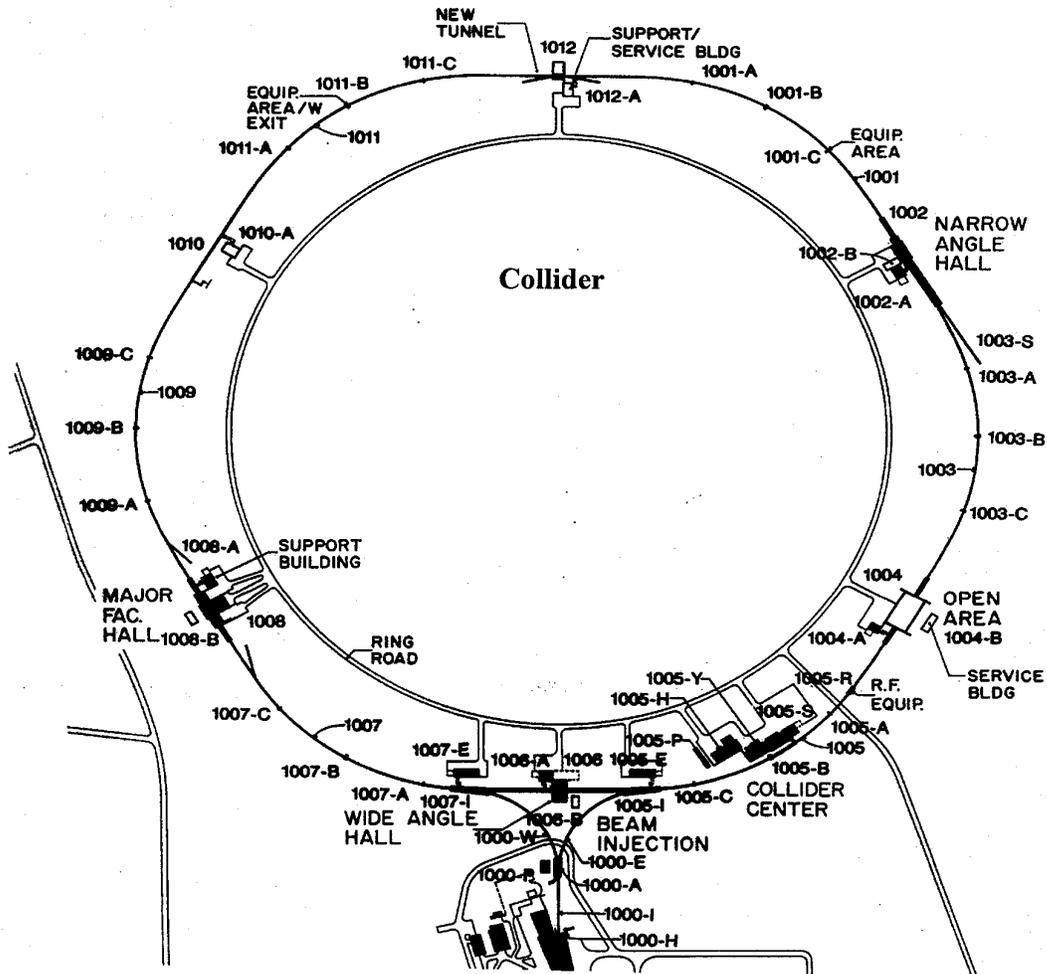
We strive to maintain an excellent safety record in such a complex environment without undue inconvenience to the User. With your help, over the last few years we have significantly reduced fire losses, personnel radiation dose, unusual occurrences, environmental releases and injuries. We can assure the continuity of this safety record only by having the active cooperation of each individual who has access to the experimental areas.

GENERAL FACILITY DESCRIPTION

The Collider-Accelerator complex includes the Tandem Van De Graaff, Linear Accelerator (LINAC), Alternating Gradient Synchrotron (AGS), and Booster accelerators, which deliver particles to the Relativistic Heavy Ion Collider (RHIC).



COLLIDER RING



The Collider portion of the complex currently has four main experimental areas.

STAR: Located in building 1006, at the 6 O'clock position along the collider.

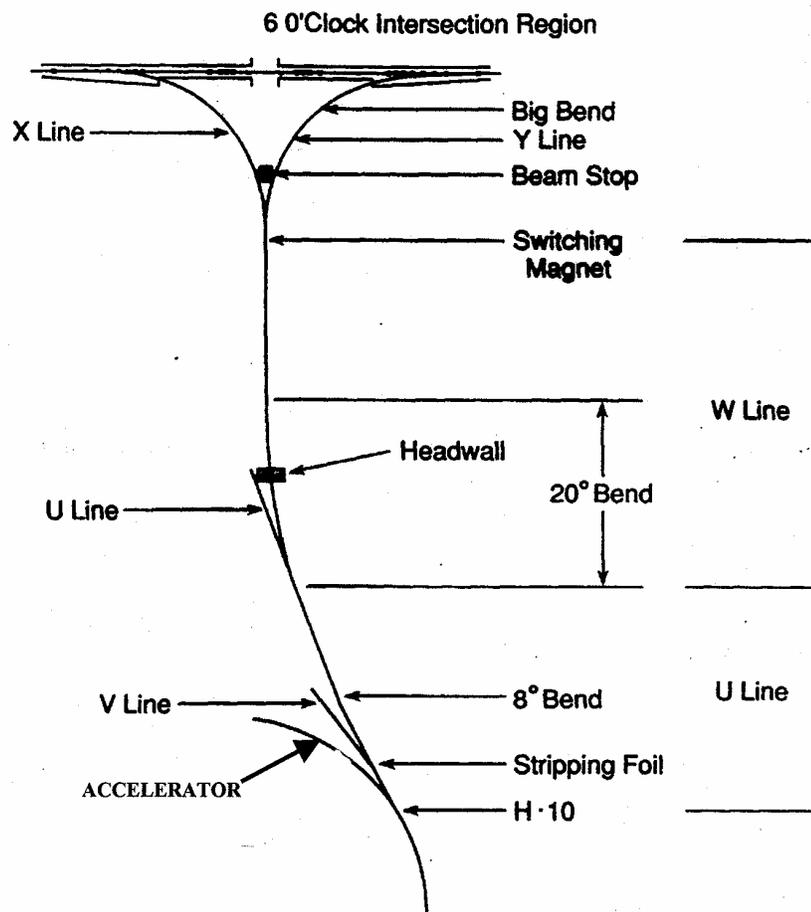
PHENIX: Located in building 1008, at the 8 O'clock position along the collider.

BRAHMS: Located in building 1002, at the 2 O'clock position along the collider.

PP2PP: Located at the 2 O'clock position along the collider.

Also, **PHOBOS** is located in building 1010, at the 10 O'clock position along the collider. However current plans are to not continue running this experiment.

ACCELERATOR TO COLLIDER TRANSFER LINE



C-AD CONDUCT OF OPERATIONS

The Collider-Accelerator Department (C-AD) is managed and operated under a "Conduct of Operations" agreement with the U.S. Department of Energy (DOE). This requires:

- Definitive lines of authority
- Written procedures for most operations
- Use of trained & qualified personnel where required
- Appropriate authorizations and work permits required before beginning a job

The Conduct of Operations agreement requires that you be familiar with these requirements.

During operating periods, responsibility for the safe and reliable operation of the C-AD complex resides with the on-duty Operations Coordinator (OC). The OC is the focal point for all questions or problems related to operations and can be reached at phone extension 4662 during operating periods. In an emergency, the OC can make the necessary notifications and arrange for assistance.

You can determine if the accelerators or Collider are in an operating or shutdown status by reading this information on TV monitors located throughout the C-AD complex. Also, control panels at access control gates to each experiment's Intersection Region (IR) will display a RED, YELLOW or GREEN light indicating an access control mode. The access control system will be discussed in more detail later. The system is known as PASS: Particle Accelerator Safety System.

During maintenance or shutdown periods, operational-related maintenance must be coordinated through the C-AD Maintenance Work Coordinator and must have the required authorization. Required authorizations are listed in the C-AD Operations Procedure Manual. Lead personnel are to be appropriately trained. If requested, you must satisfy C-AD requirements for authorization (e.g., to work on a system declared as "critical").

Contacts for RHIC Users include, but are not limited to:

Experiment Spokesperson
C-AD Liaison Physicist for the experiment
C-AD Liaison Engineer for the experiment
C-AD Environment Safety & Health Coordinator

RESTRICTIONS FOR MEDICAL REASONS

Your Responsibility

If you have some medical condition that could limit your activities here at BNL, it is your responsibility to inform your Experiment Spokesperson. Our intent is to protect your health and safety as well as the health and safety of the people around you. The BNL Occupational Medicine Clinic (OMC) performs periodic routine Physical exams for employees, but not for visiting guests/Users. Restrictions for employees are identified during the Physical exam. Examples of restrictions are: no work at heights above 5 feet, no work requiring color discrimination, can not enter high magnetic fields, must wear glasses, no heavy lifting ... etc. These restrictions are formally communicated to the employee's Department Chairperson, ESH Coordinator, Supervisor, and to the employee. However, for Users, it is your responsibility to notify your Spokesperson if a medical condition could restrict your activities here at BNL. The BNL OMC could then be asked to perform a Physical exam (full or partial) to either confirm a restriction or to clear an individual to perform an activity.

RADIATION HAZARDS

PROMPT RADIATION - The most significant source of radiation at the collider is prompt radiation. Prompt radiation occurs while the collider is in operation (when beam is on). Prompt radiation is found in the primary beam line and at the intersection region of each experiment. It is radiation occurring during beam-to-beam collisions or during collision of the beam with other matter; e.g.: beam pipe, beam stop, targets. Primary beam areas have interlocked enclosures designed to prevent personnel access when beam is on. These areas include, but are not limited to, AGS to RHIC (AtR) Transfer line, U and W lines, the Collider Tunnel and the experiment intersection regions. A fatal dose of radiation may occur as a result of exposure to prompt radiation in an area of primary beam or operating RF (radio frequency) systems. RF Storage and Acceleration Cavities located in the beam line at the 4 o'clock region is an x-ray hazard. **No occupancy is permitted in primary areas where beam is on or RF cavities are enabled.**

RESIDUAL RADIATION - Residual radiation exists as a result of material being activated from the accelerated beam, and exists even after the beam is turned off. Activation occurs from the beam colliding with material directly, or from secondary particles colliding with material or being absorbed into the material. This activation process can occur in the beam stop locations as well as other high interaction or beam loss areas. These areas are posted with radiological signs.

Experiment Reviews -

All experiments and experimental support equipment must be reviewed by the C-AD Experimental Safety Review Committee (ESRC). It is extremely important that once approved, an experiment may not be changed or added-to without re-review and approval. Contact your Liaison Physicist, Liaison Engineer or the ESRC Chairperson.

Unplanned changes or additions may result in last minute delays for review and approval.

Any material placed in or near the primary beam needs to be reviewed by the ESRC and the ALARA Committees for gaseous or particulate releases that could contaminate the area, the equipment or personnel, and must be reviewed for potential overheating.

GENERAL EMPLOYEE RADIOLOGICAL TRAINING (GERT)

This training (Collider User Training) includes an approved equivalency for General Employee Radiological Training (GERT).

GERT allows you unescorted access into **Controlled Areas**, including **Radioactive Material Areas** within Controlled Areas. At C-AD, this training **does not allow you to enter any area that requires a TLD** (thermo luminescent dosimeter). Such areas include **Controlled Areas** that indicate a TLD is required for entry (check postings), **Radiation Areas, High Radiation Areas, Airborne Radioactivity Areas, Contamination Areas, and Radiological Buffer Areas**. For example, most of the Collider tunnel is posted as a Controlled Area with TLD required. The C-AD practice of not allowing entry into a TLD area with just GERT may differ elsewhere at BNL. That is, some BNL departments may issue TLDs, and allow entry into Controlled Areas requiring a TLD, with just GERT. At C-AD however, in order to be issued a TLD and enter a TLD area

unescorted, the practice is that you successfully complete BNL's Radworker-1 Training, which is a higher-level training than GERT. A reason for this C-AD practice is that there are many posted "Radiation Areas" within the C-AD complex. For entry into posted Radiation Areas, a TLD and Radworker-1 training are required. Logging in to a Radiation Work Permit (RWP) is also required. With many Radiation Areas as well as Controlled Areas throughout the C-A complex, the C-A Department must avoid individuals mistakenly thinking that they may enter Radiation Areas simply because they have been issued and are wearing a TLD. Therefore, we do not issue TLDs without Radworker-1 training.

Maximum Expected Exposure: Individuals trained to the GERT level who are not issued personal dosimetry (e.g.: TLD) are not expected to receive in excess of 100 mrem/year. GERT trained individuals utilizing personal dosimetry (not the common practice at C-AD) may encounter radiation dose rates resulting a small potential for cumulative doses to exceed 100 mrem in a year, although this is not expected since access is restricted to posted Controlled Areas and Radioactive Material Areas.

RISK ASSOCIATED WITH RECEIVING IONIZING RADIATION DOSE

We know that receiving very large doses of ionizing radiation somewhere between 50,000 and 100,000 millirem in a short period of time may cause some people to experience nausea, vomiting, and diarrhea, which are all primary symptoms of radiation sickness. People receiving doses exceeding 100,000 millirem will experience more severe sickness and some people may even die from the exposure.

Through scientific research, ionizing radiation dose has been identified as a potential cause of cancer in humans. The National Academy of Sciences, National Council on Radiation Protection and Measurement, and the International Commission on Radiation Protection, estimate the average risk (to an adult) of fatal cancer from radiation in his/her lifetime is 4 in 10,000 per 1,000 millirem of radiation dose.

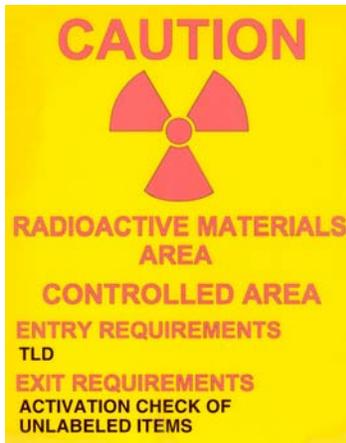
To put the risk of radiation-induced cancer into perspective, let's compare it with the risk we face of dying from cancer in everyday life. As a member of the general population in the United States you have roughly a 20% chance of dying from cancer from all causes combined. In other words, each of us has a one in five chance of dying from a cancer-related illness. By receiving an additional 1,000-millirem radiation dose from an occupational source, an individual's risk of developing a fatal cancer would increase from 20 % to 20.04%. This increased risk is well below the risk of dying from an accidental death, such as a car accident. Although the risk is very low, we continuously strive to reduce the potential for any radiation induced injury.

RADIOLOGICAL POSTINGS

Read all radiological postings carefully. They are used to alert personnel to radiation and radioactive materials. They indicate requirements for entry and exit of the area. The following are examples of typical postings encountered at the Collider complex.



During operation, the above posting is displayed at the entrances to RHIC Inner Ring Road. At the successful completion of this course, which includes GERT, you would be permitted past this posting. It indicates Controlled Area. It does not indicate that a TLD is required. During extended shutdown periods, this posting might be removed for convenience. (Note: The Collider Tunnel usually remains posted even during an extended shutdown period and does require a TLD. The experiment intersection regions (IRs), however, typically do not require a TLD. Please observe postings.)



Most of the RHIC tunnel is posted as shown above. The posting indicates a Controlled Area with a TLD required for entry. Without a TLD and without Radworker-1 training, you are not permitted into areas posted this way.

Activation Check Requirements: The above posting indicates "Activation Check" under Exit Requirements. Objects that are exposed to primary beam may become radioactive and are to be handled with special care to avoid excessive and unnecessary exposure. No items may be removed from experimental areas, or any areas posted with "Activation Check", without a Radiological Control Technician (RCT) first checking the item for radioactivity. However, items or material that you bring into an area posted "Activation Check" may be removed without an activation check if the item was never left in the area during beam operation and was in your purview while in the area. Check the postings for the area to see if activation checks are required.

PREGNANCY

Because the embryo/fetus is more susceptible to injury from radiation (compared to mature, developed cells), DOE and BNL have a policy which permits the worker to declare that she is pregnant and have the dose received by she and her developing fetus restricted. Any woman working in areas where she could be exposed to radiation or radioactive materials has the option of voluntarily notifying her supervisor in writing that she desires to reduce her radiation dose to protect the embryo/fetus. For a declared pregnant worker, Brookhaven National Laboratory has established an administrative control level of **350** mrem throughout the gestation period, to be received at a maximum rate of **40** millirem/month.

RADIATION LEVELS, AREA NAMES, AND TRAINING REQUIRED

Radiation Level	Area Name	Training Required (for unescorted access)
< 5 mrem per hour < 100 mrem per year	Controlled Area	GERT And Collider User Training (includes GERT for RHIC)
> 5 mrem per hour < 100 mrem per hour	Radiation Area	Radworker-1 Training And Collider Users Training
> 100 mrem per hour < 50,000 mrem per hour	High Radiation Area	Radworker-1 Training And Other designated C-A Facility-Specific Training

PERSONAL DOSIMETRY (Thermo luminescent Dosimeter Badge - TLD)

Although at C-AD you are not issued a TLD with Collider User Training/GERT, personal dosimetry is discussed here as part of the GERT qualification. The practice at C-AD is that you successfully complete Radworker-1 training to be issued a TLD.

The TLD **monitors** your exposure to beta, gamma, and neutron radiation. It offers **no protection** from radiation. TLDs are exchanged on a monthly basis. The TLD is the basis for the legal record of your occupational dose. Requirements for TLD use include:

- TLDs are worn when required by signs or postings, Radiological Work Permits, and when directed by Facility Support personnel.
- TLDs must be worn on the front of the torso, between the waist and the neck unless directed otherwise by Health Physics personnel.
- Either immediately following a job or at the end of the work shift, return the TLD to the badge board. Be careful to place it in the correct slot. Temporary ("TEMP") badges should not be placed in slots designated for permanent badges. Permanent badge slots have assigned numbers.
- If you leave BNL (employment is terminated or your guest appointment has expired), be sure to leave your TLD on a badge board, or turn your TLD in to Facility Support personnel (x4660 at C-AD) or to the individual who issued you the TLD.
- TLDs issued at BNL should not be worn at another facility and dosimetry issued from another facility should not be worn at BNL. The concern is that your dose should be recorded only once for any time period monitored.
- You must never use someone else's TLD and never lend your TLD for someone else to use. Violation of this policy can result in the most serious disciplinary actions.
- Persons successfully completing GERT may be issued a TLD at BNL, although the C-AD practice is that you have Radworker-1 training to be issued a TLD. Trained personnel receive a TLD with a blue or yellow band on the front of the badge. The color alternates monthly. A red band on the front of the badge identifies an untrained visitor TLD. Individuals wearing an untrained visitor TLD require escort in a radiological controlled area requiring dosimetry. If you encounter an unescorted untrained (RED-band TLD) visitor within a TLD area, immediately escort them out of the area. **DO NOT REMAIN IN THE AREA AS THEIR ESCORT UNLESS YOU HAVE BEEN PROPERLY APPROVED TO DO SO.**
- Never open or tamper with the TLD. If you suspect the TLD has been misused or damaged in any way, (such as having been put through the laundry cycle or been worn during a medical x-ray), you should notify Facility Support personnel (x4660 at C-AD) or the C-AD ESHQ Division Head (x5272, pager 4820).
- If while in a TLD area your TLD is lost, damaged, or contaminated, place your work activities in a safe condition, immediately exit the area and notify Facility Support personnel (x4660 at C-AD) or the C-AD ESHQ Division Head (x5272, pager 4820).
- Report any lost badge immediately.

Regarding the seriousness of proper use of personnel monitoring devices, the following is an excerpt from an article published in *BNL Radiological News*, May 2004 :

Recently there have been several noncompliances concerning the use of thermo luminescent dosimeters (TLDs) at Brookhaven National Laboratory (BNL) (i.e., worker wears another person's TLD, worker does not exchange TLD at month's end but wears it for many months). One of these issues resulted in BNL having to report the noncompliance in the Department of Energy's (DOE) Noncompliance Tracking System (NTS), which is the DOE system for reporting nuclear safety noncompliances. It is important that trained radiological workers and escorts follow the requirements for use of personnel monitoring devices.

MEDICAL TESTS THAT MAY IMPACT DOSIMETRY

A common test for evaluating the condition of the human heart is the Thallium (or Technetium) Stress Test, which injects a radioactive dye into the bloodstream. For several days following the test, there remains enough radioactive material in the body to affect the radiation dose being recorded on your TLD. This could also occur if you have had radioactive "seeds" implanted for radiotherapy. It is important that you notify your Facility Support Representative of any medical treatment or diagnostic procedures that you received which involved the use of radioactive materials being placed in your body. Otherwise, your TLD report could incorrectly indicate that you received an occupational dose.

PERSONAL DOSIMETRY RECORDS AND REPORTS

The BNL Personnel Monitoring Group maintains the data collected from TLDs. The Personnel Monitoring Group compiles and distributes personalized dose reports annually to all affected BNL employees. If you as a User require a record of your exposure, you must provide the Personnel Monitoring Group with a written request. A report will be sent to you within 90 days.

BNL's RADIOLOGICAL STOP WORK POLICY

Each individual who has received radiological safety training (GERT or Radworker-1) has the authority and responsibility to stop non-compliant or unsafe radiological work immediately. This policy is commonly known as the Radiological Stop Work Policy. If you believe that a serious deviation from BNL radiological requirements is occurring, inform the workers that you are issuing a Stop-Work order and tell them to stop work. A serious deviation is something that could create the threat of unplanned radiological exposures or releases. In most situations, a formal Stop-Work order is not needed. Supervisors do not need to invoke a Stop-Work Order in exercising their normal responsibilities to monitor work in progress and to ensure proper adherence to BNL practices.

If someone refuses to Stop Work, you should immediately bring this to the attention of your supervisor, or to the C-AD Environment, Safety & Health (ES&H) Coordinator (x4006, pager 453-5940), or to the C-AD ESHQ Division Head (x5272, pager 4820).

If a Radiological Stop Work Order is issued to you, you MUST:

- Stop working on the affected activity as soon as and as safely as possible.
- Place the workspace in a safe condition.

- Report to your supervisor and explain why the Radiological Stop Work Order was issued at your job.

Work is not to resume until safety reviews are performed and the responsible Department Chairperson or equivalent line manager authorizes work to restart.

BNL's RADIOLOGICAL AWARENESS REPORTING (RAR) PROGRAM

The RAR program provides an avenue of communication between daily work activities and management concerning deficiencies in the administration of the Radiological Controls Program. If you have a concern regarding radiological practices or a radiological deficiency, you may initiate a Radiological Awareness Report (RAR):

- Obtain an RAR Form from the C-AD Environmental Safety & Health Coordinator or Facility Support Representative (also available on-line via SBMS)
- Submit the completed RAR Form to your Supervisor

Your supervisor will submit to the RAR Coordinator.

If you have any questions regarding the RAR Program you may contact the RAR Coordinator at extension 4408.

RADIATION EXPOSURE CONTROL

People have always been exposed to radiation from natural sources. We are exposed to this radiation from our environment, from materials inside our bodies, and from certain man made sources such as medical x-rays and other medical procedures. The average radiation dose to a member of the general population in the United States is about 360 mrem/year. This amount is a combination of both natural background and man made sources of radiation. Natural background radiation is the largest contributor (about 300 mrem/year).

C-A EXPOSURE PHILOSOPHY

Radiation Exposure at C-A Must:

- Have a Net Benefit
- Be *As Low As Reasonably Achievable (ALARA)*

Once an experiment is configured and enabled, valuable scientific information is obtained. It is difficult to estimate the economic worth of this information. It is assumed that this research has a net benefit. Eating, drinking, or smoking in a radiological area increases the time spent in the area, and correspondingly the dose, without increasing the net benefit. Therefore eating, drinking, and smoking are prohibited in all Radiation and High Radiation areas.

ALARA STRATEGIES

The basic ALARA strategy on the part of the User revolves around reducing dose by the efficient use of time, distance, and shielding. Reduce the time spent in radiological areas, increase the distance from sources of radiation, and use shielding whenever possible. ALARA is also incorporated into design and operations. For example, the access control system at C-A prevents inadvertent entry into high radiation areas (Primary Areas) with beam on. Obey all signs and postings. **Do not enter** any area restricted for radiological purposes unless qualified or escorted.

Our greatest dose reduction at the C-A complex has come by the way of improvement projects. We have improved the reliability of the vacuum system, injection system, and extraction system. The redesign and use of radiation tolerant materials have resulted in fewer repairs of activated equipment, thereby reducing personnel dose incurred for maintenance.

PRICE-ANDERSON AMENDMENTS ACT (PAAA)

It is important to make you aware of the absolute requirement to follow all radiological requirements at C-A and BNL facilities. The Price-Anderson Amendments Act (PAAA) is a Congressional Act which provides the Federal Government the ability to impose enforcement penalties if you do not follow the requirements fully. If radiological requirements are violated, enforcement penalties may be imposed against Brookhaven Science Associates (BSA), or even against individuals. Personnel have been the subject of criminal investigations when found to willfully violate radiological requirements, such as removing a radiation barrier.

When signing documents related to radiation safety, an employee or User is essentially confirming that he or she will do his or her assigned work according to the rules. The signature does not mean that the individual is guaranteeing that the work will be carried out perfectly or that there is no potential for a violation. It does mean that the individual is performing his or her duties to the best of their ability and has made a good faith effort to comply with the radiation safety requirements. A "good faith effort to comply with the rules" means that the employee or User has familiarized him or her-self with the requirements that fall within his or her area of responsibility.

DOE has put nuclear and radiological safety requirements into the "Code of Federal Regulations" (CFR), Title 10 (Energy), Part 835. This is often referred to as: 10 CFR 835, Occupational Radiation Protection.

WARNING

It should be understood that any User who intentionally violates any radiological requirement, regardless of whether the User signs any document related to compliance, might be subject to criminal prosecution or other disciplinary action.

The intent of the Price-Anderson Amendments Act is to protect the health and safety of workers and the general public.

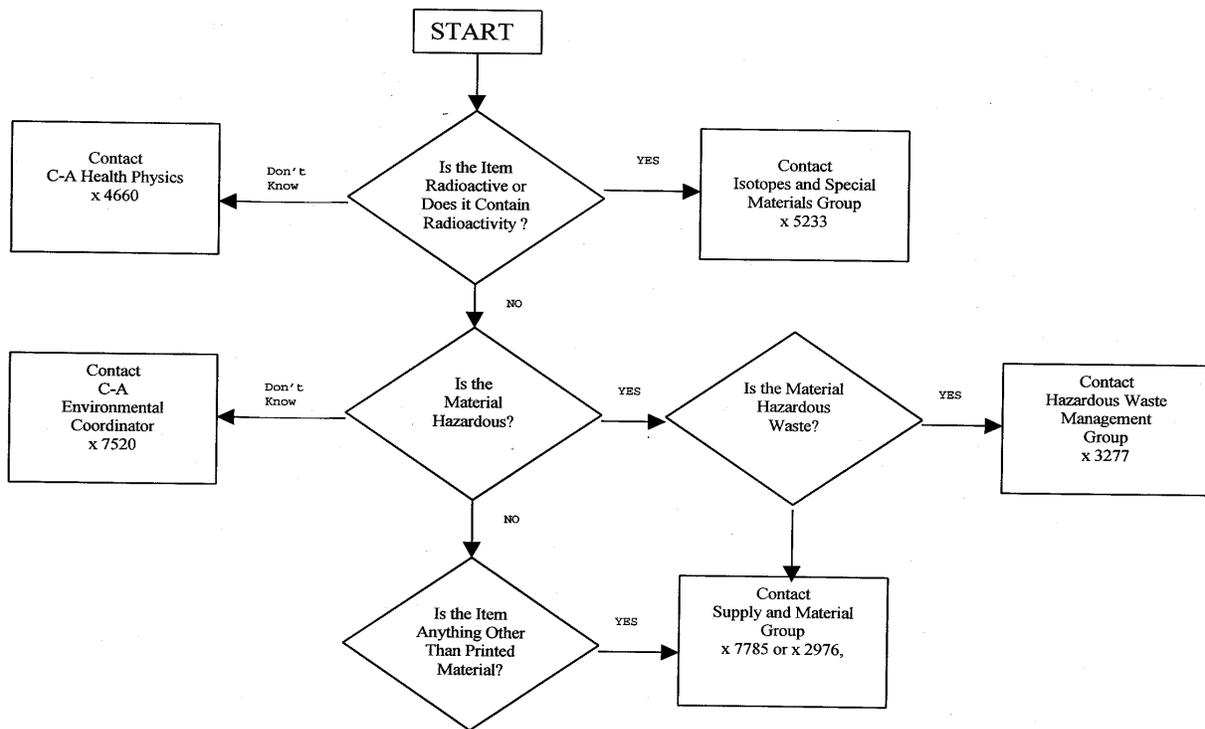
DELIVERIES TO C-AD FACILITIES

BNL and C-AD must prevent outside delivery personnel from inadvertently entering areas that they are not qualified to enter while attempting to find the recipient of a package. For example, an untrained delivery person entering an area controlled for radiation protection could receive unnecessary exposure and the occurrence could be a PAAA violation. To prevent this type of incident, the C-A Department requires that, during normal working hours, deliveries for the C-A complex be made to Building 100. Arrangements can be made with the C-AD Main Control Room (MCR) (x4662) for off-hour deliveries. You must make such arrangements in advance. When the delivery is made to Bldg 100 or to the MCR, personnel there will then contact you, the addressee. Under no circumstances are deliveries to be made to other buildings in the C-A complex without approval of the C-A ESHQ Division Head (x5272, page 4820).

When placing an order or having any delivery made, inform the vendor or addresser to address the package to Bldg 100 (or MCR under rare circumstances). In addition, it is important that you inform the vendor or addresser to also put your name on the package so that Bldg 100 or MCR personnel have a way to contact you. Packages arriving without a name will be sent back.

SHIPPING OFF SITE

IF YOU ARE SHIPPING MATERIAL FROM THE C-A COMPLEX TO OFF SITE, THEN ASK YOURSELF THESE QUESTIONS.



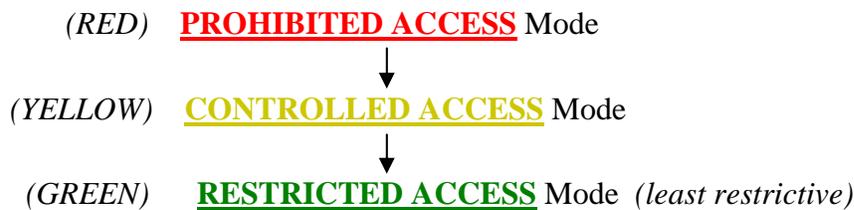
Particle Accelerator Safety System (PASS)

NOTE ! If after completing this training you are unsure of how to properly enter AND exit the Primary Area through the PASS gates, then get assistance since improper operation can cause programmatic delays.

The Particle Accelerator Safety System (PASS) located within the Collider portion of the C-AD complex is designed to control access to primary beam areas and to detect excessive radiation levels outside shielded areas via radiation monitors (chipmunks). Additionally, the system detects Oxygen Deficiency Hazard (ODH) conditions, activates alarms, activates ventilation equipment, and secures some electrical equipment. The system includes the many locked gates that lead to primary beam areas. The gates control or limit access to the primary beam areas. Entry through the gates is with the use of an access card or key. PASS gate entries require **one card or key for one person only! Each person must enter with his or her own card or key.** (Unless special escort procedures are followed.) More than one person entering under one card or key is considered a serious violation of procedure, and is subject to disciplinary action. If there is a need to escort an untrained individual (who doesn't have their own key) into a gated area, contact the C-AD ESHQ Division.

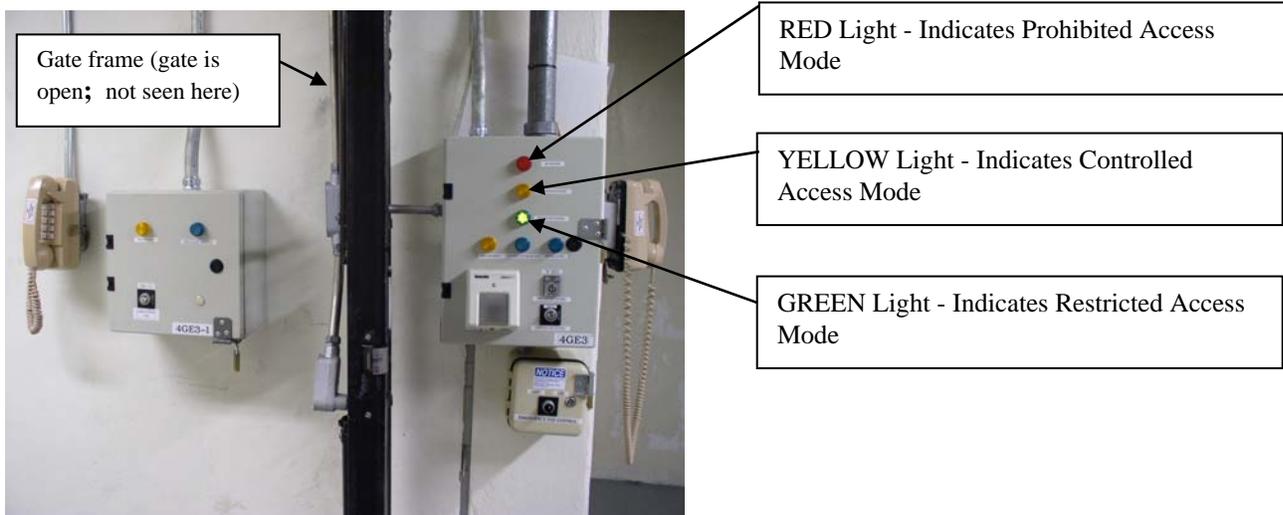
ENTRY MODES AND STATUS INDICATORS

There are 3 basic entry modes that the facility (or a particular gate) may be in:



ENTRY and EXIT CONTROL PANELS

Control panels are located at entrances and exits of the PASS gates. Entry through the gates requires use of an Access Card Key (during Restricted Access Mode) or metal Key (during Controlled Access Mode). A system of lights on these boxes indicates the machine's operational access status or the access control mode of that particular gate. A typical gate is shown below, although Experimenters/Users usually enter and exit the gate which leads to their own experiment's Intersection Region (IR).



GREEN LIGHT - RESTRICTED ACCESS

To enter place access card on card reader, get small green light on reader, open door. To exit, turn knob to open door (card not required to exit).

Card Reader:



Access Card:



YELLOW LIGHT - CONTROLLED ACCESS

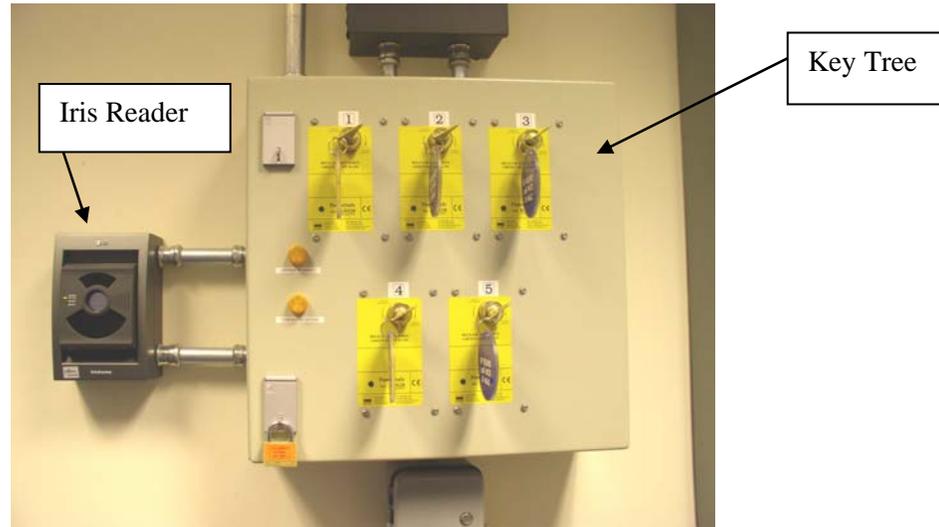
To enter, confirm accessibility to the area with the experiment Shift Leader. For IR entry, obtain a key from the key tree for your experiment. Key trees are located at each experiment. In order to obtain a key from the key tree, you must first have your iris registered. To register your iris, contact your Experiment Spokesperson, Liaison Physicist or supervisor. The C-A Department ESHQ Division performs iris registrations. During Controlled Access Mode, each individual entering the area is being accounted for; unlike during Restricted Access. The procedure for entry into, and exit from, the IR during Controlled Access Mode is described below (next page).

RED LIGHT - PROHIBITED ACCESS

No access is allowed. Beam is already on or is imminent.

IR Entry procedure during Controlled Access Mode

Note: You must first have your iris registered. To have your iris registered, contact your Experiment Spokesperson, Liaison Physicist or supervisor. The C-AD ESHQ Division does the iris enrollment.



1. Look into the iris reader located at your experiment key tree location with either eye (both irises are usually registered) and center your eye in the box outline on the mirror. Stand so that your eye is approximately 3 to 9 inches away.

Note: The iris reader will speak instruction back to you if you are too far or too close. You may adjust the tilt of the iris reader to suit your height.

2. Place your right hand on the next sequentially available key in the key tree.

Note: You must place your hand to remove the next sequentially available key.

When accepted, the iris reader voice will say “Identification Completed.”

Then, remove the key from the key tree by turning the key to the left (counter clockwise) and pulling.

Note: You have about 2 seconds to remove a key after being identified by the iris reader, which should be ample time.

3. Take the key to the control panel at the gate to the Intersection Region (IR) of your experiment.

Observe that the YELLOW Controlled Access light is on; 2nd light from the top.

4. **Place the key in the gate key switch.**
5. **Contact the Main Control Room (MCR). A phone or intercom is located at the gate. Identify yourself to the MCR operator by giving your name and ask for a release (opening) of the gate.**

Note: The MCR operator is observing you and the gate area remotely by camera.

6. **Turn the key in the gate key switch (clockwise) with simultaneous release from MCR.**

Note: Simultaneous release means that while you have the key turned clockwise and held there, MCR is pushing a button. You will then hear a click on the gate at which point the gate is “released” and you can remove the key.

7. **Remove the key, open the gate, and take the key with you into the Intersection Region (IR).**

Caution: Each person entering must obtain a key from the key tree. More than one person entering under one key is a serious violation of procedure, and is subject to disciplinary action.

8. **To leave the area, contact the Main Control Room (MCR) using the phone (or intercom) located on the IR side of the gate and ask the operator for a release (opening) of the gate.**

Note: Failure to contact the MCR will require the MCR to re-sweep the area which will result in unnecessary delay.

9. **Open the gate and exit. You do not need to use your card key to exit.**

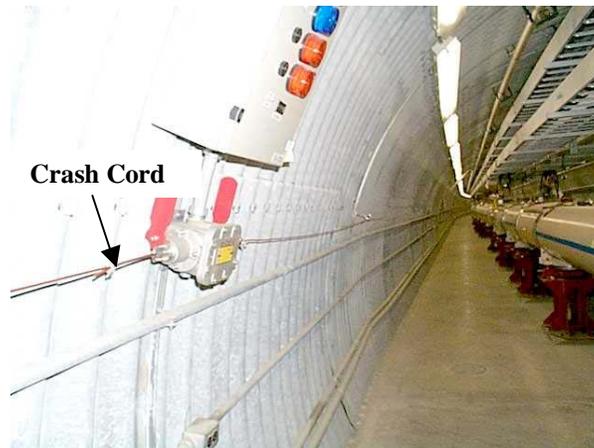
Caution: In an emergency, open the gate and exit without waiting for a release from MCR.

10. **Return the key to any empty key switch in the key tree and lock in the key by turning it to the right (clockwise).**

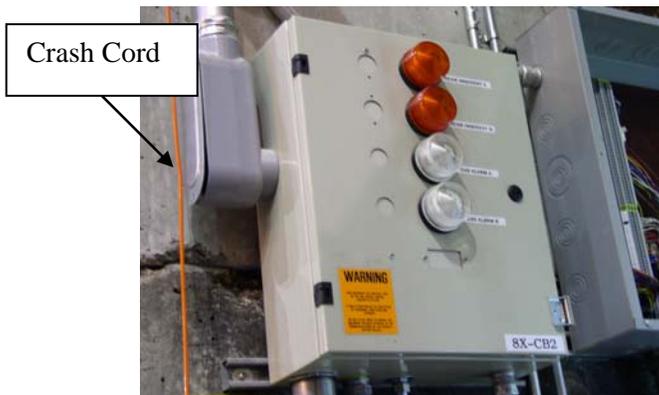
Note: Keys do not have to be returned to their original key switch location. They may be returned to any available key slot in the key tree.

11. **Stand in front of the iris reader and look into the camera with either eye to log out. You are logged out when the camera voice says “Identification Completed.”**

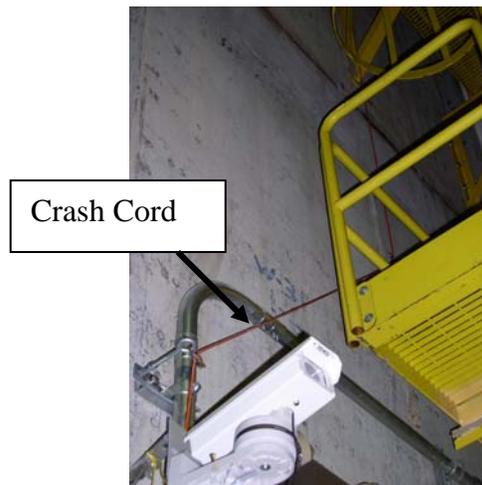
BEAM IMMINENT ALARM & CRASH CORDS



Crash Cord and Lights in the Collider Tunnel



Example of Crash Cord in IR



Example of Crash cord in IR

In the Intersecting Regions (IRs) of the Collider experiments, in Experimental Halls, and in the Collider Tunnel, there are Orange Crash Cords and Orange Strobe Lights. If you are in any of these areas and an orange strobe light goes on and an audible alarm is heard, this is a signal that beam is imminent. If you observe the visual or audible warning signals then you must pull a crash cord or open any exit/entry gate from the inside. **Do not panic**, you have time, 60 seconds minimum before beam is on. Exit the area. Pulling the crash cord or opening the gate will interrupt normal operations and prevent beam from entering the area. After exiting the area, call the MCR (x4662) and inform them of the incident.

Do not tamper with crash cords. Do not hang tools or clothing on the crash cords, this may stretch them out causing reset errors. Do not block access gates open. Any modifications to the PASS system (such as an access gate) must be pre-approved by the C-A Access Controls Group.

GOLDEN RULES FOR RADIOLOGICAL AREAS AT C-A

- Do not climb over or defeat barriers regardless of machine status
- Do not ignore signs, labels, alarms or warning tags, regardless of machine status

For entry into posted areas that indicate a TLD is required, it is C-AD practice that Users complete BNL's Radiation Worker I Training Course. You must complete the training, obtain and be wearing a TLD *prior* to entry into these areas.

SEALED RADIATION SOURCES



Beta, gamma and neutron sources produce radiation levels that may travel many feet in air. The radiation level drops rapidly as the inverse square of distance from the source. This is because most sources are point-like objects. Federal rules define sealed sources as any radioactive item manufactured for the sole purpose of using the emitted radiation. A common example of a sealed source is an instrument calibration source. If you are not sure about the definition of a sealed source, then contact the C-A Health Physics Office (x4660) in order to make a determination regarding the rules.

If you are using a radioactive source in your work, you may be required to complete a BNL training course (currently web-based): Sealed Rad Source Control for Source Custodians.

When not in use, sources should be stored in shielded containers. Many experimental areas have two or more source boxes, like the one shown above. If you are using a source in your work, then the following rules apply, even if you obtained the source from another BNL Department or Division:

Contact the C-A Source Custodian (x5636).

- Have all sources inventoried and leak-checked every six months by the C-A Health Physics Office (x4660).
- Notify BNL's Isotopes and Special Materials (I&SM) Group prior to shipping a source to or from BNL. Contact I&SM Group at 631-344-5233.
- Complete the *Sealed Radiation Source Inventory Form* and keep it with the source.
- The Health Physics Office must be contacted if sources are to be relocated.

If you are responsible for a sealed source, then DOE Orders require that you keep track of it in a way that can be audited by the Federal government.

ELECTRICAL SAFETY

This Collider User Training does not alone qualify you to work on electrical equipment or circuits that are connected, e.g. powered through circuit breakers, disconnect switches and/or fuses. Additional training and authorization is required.

This training does not alone qualify you to work on-or-near energized equipment or conductors. Additional training, personal protective equipment (PPE) and a special work permit (Energized Electrical Work Permit) are required.

(Your Low Hazard / Skill of the Craft training for your specific experiment delineates the type of "low hazard" work, with its associated hazards, that Users may perform at an experiment.)

During operation of circuit breakers or disconnect switches there is a potential for arc flash. Operation of circuit breakers or disconnect switches is considered working on-or-near energized conductors and additional training and authorization is required, as well as PPE, even for relatively low voltage such as a 120 Volt breaker.

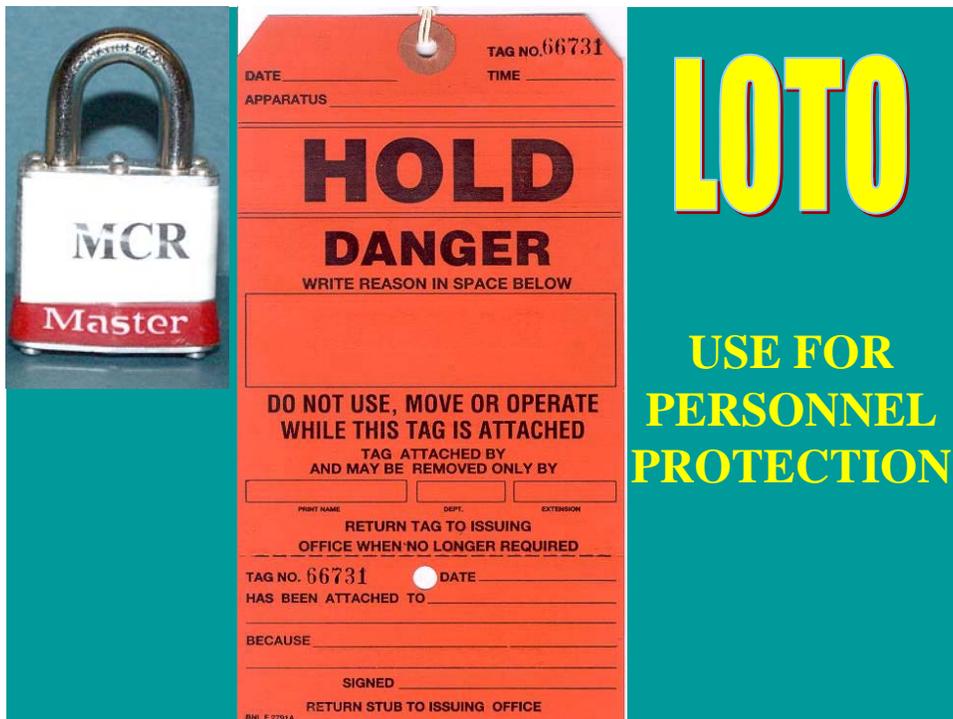
NOTE: The training and PPE requirements at the Collider-Accelerator Department, which includes RHIC, may be different and more conservative than the Laboratory-wide requirements.

If you have questions regarding the electrical safety requirements for your specific situation, then stop and please refer to contacts available to you, which include: the C-AD ESH Coordinator (x4006, pager 453-5940), C-AD Work Control Manager, C-AD ESHQ Division Head, C-AD Electrical Systems Head/Chief Electrical Engineer. Other contacts if you have questions are your experiment Shift Leader, experiment Work Coordinator or the experiment Liaison Physicist. The C-A Department Operations Procedures Manual (OPM) may also be referred-to for C-AD requirements.

FLASH HAZARD

A flash hazard is present when the potential exists for electrical equipment to arc, producing a shock hazard as well as possible sparks and molten metal spray. For example, this can occur during operation of a circuit breaker or switch, or in situations where electronic components and connections are exposed during testing. If a conductive tool is dropped into these areas a flash event may occur. Care is required in these areas to prevent any inadvertent electrical contact. The potential for electrocution is well known, but arc flash hazard may not be as well known.

LOCK OUT / TAG OUT (LOTO)



This Collider User Training alone does not alone qualify you to place or remove locks or tags. Lockout/Tagout (LOTO) is used at the Laboratory for personnel safety from energy sources. These sources include electrical energy, potential or kinetic energy, pressure or any energy source that could injure personnel if left uncontrolled. It is recognized by the presence of a red tag or a lock, and it requires that you obey specific OSHA requirements. In some cases, the equipment cannot be locked and only the red tag is used. In most cases, however, LOTO boots or other commercially available locking devices can be added to the device to enable complete LOTO. Contact the C-A ES&H Coordinator (x4006, page 453-5940) if you need more information regarding LOTO.

LOTO may also be used to isolate materials, the release of which could impact the environment.

To prevent accidental electrical shock, radiation exposure or other hazards from different sources of energy, the LOTO is generally only to be removed by the individual who attached it. However, if the individual who attached the LOTO is not available, a committee of three employees may be formed to authorize removal. The membership of the committee must be as designated in the C-AD Operations Procedures Manual (OPM). These persons will be familiar with the area or equipment under the LOTO and they shall determine if it is safe to remove the red tag and lock. Contact the MCR (x4662) or the C-A ES&H Coordinator (x4006, page 453-5940) if you need to have someone else's LOTO removed. A similar procedure is used for Radiation Safety (RS) LOTO.

All personnel who must work on electrical circuits that are connected and are controlled by circuit breakers, disconnect switches and/or fuses, must LOTO the circuits. OSHA, BNL and C-AD require that all workers performing these tasks be trained in LOTO and be authorized. If you or your co-workers fall into this category of needing to perform LOTO, then assure you are properly trained and authorized. Use contacts available to you such as the C-AD ESH Coordinator (x4006, pager 453-5940), your experiment Shift Leader, experiment Work Coordinator, experiment Liaison Physicist, the C-AD Training Manager or the C-AD Work Control Manager. This Collider User Training does not allow you to place or remove locks or tags. Additional training and authorization is required.

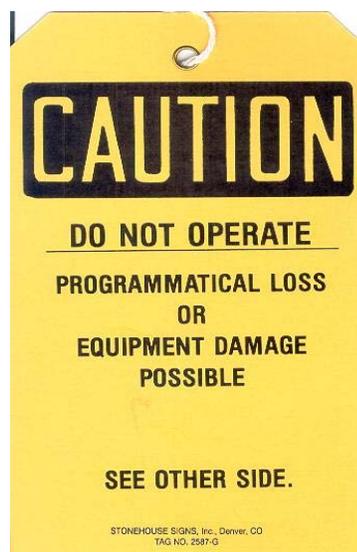
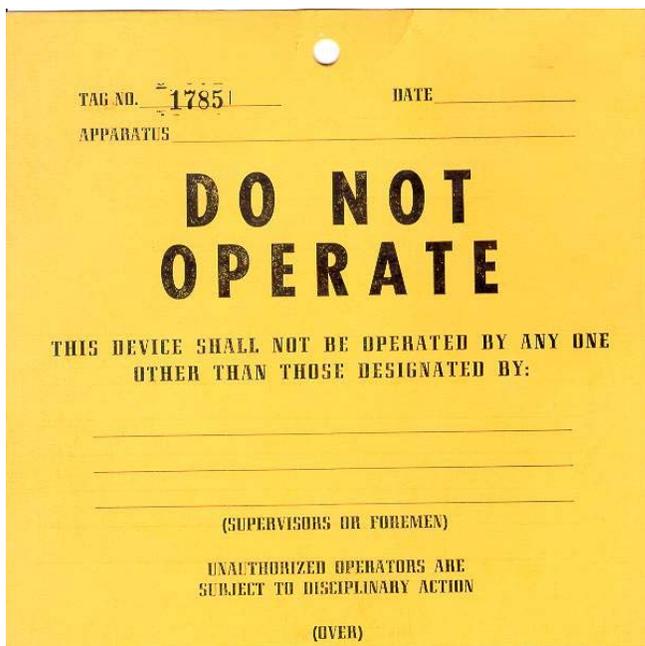
RADIATION SAFETY LOCK OUT / TAG OUT (RS LOTO)

Liaison Physicists, Liaison Engineers, Access Controls Group staff, Operations Coordinators (OC), members of the Radiation Safety Committee, and certain other personnel perform RS LOTO. They must follow a specific procedure in order to lock out and tag out equipment or beam lines for radiation protection. Equipment or beam lines are generally locked out during barrier modifications or barrier removals, or whenever the PASS system alone does not provide the required protection. This lockout is required in order to limit beam parameters such as polarity and intensity, or whenever a beam line is not authorized to operate. **DO NOT** alter or otherwise tamper with equipment that bears the RS LOTO tag.

YELLOW TAGS

Used for EQUIPMENT PROTECTION or to prevent PROGRAMMATIC DISRUPTION.

Yellow “Do Not Operate” and “Caution” Tags at C-AD are used to protect machines or apparatus/systems. If personnel protection is involved, LOTO (Red Tag) is used. Do not operate equipment or a device, such as a valve, breaker, switch, etc., that has a yellow tag attached unless properly authorized to do so. Do not remove a Yellow Tag unless properly authorized to do so.



CHIPMUNKS AND RADIATION SURVEYS



Radiation monitor - Chipmunks

During a running period, radiation surveys are updated periodically, and continuous area monitoring is performed by instruments called Chipmunks. Most of these instruments alarm in the Main Control Room. During shutdowns, surveys are done initially, and whenever a job specific RWP (Radiation Work Permit) is used, or when deemed necessary or appropriate by the C-AD Health Physics Group. Records of the surveys are maintained by the C-AD Health Physics Group. Survey data is normally attached to the permits and copies are maintained at the job site.

Chipmunk readings are also recorded continuously and maintained in a database for later retrieval and review. In addition to alarming in the Main Control Room, Chipmunks are capable of alarming locally and are stationed at fixed locations in order to monitor high occupancy areas and other areas of interest.

Retrospective exposure rates for any area of interest can be determined by the staff at the C-AD Health Physics Office.

The Chipmunk is set up like a street light with red, yellow and green indicators. A chipmunk will display a red blinking light for radiation levels greater than 20 mrem/h, and a yellow blinking light for levels approximately 2.5 to 20 mrem/hr. Normally, chipmunks operate in the green range indicating nominal radiation levels. If you observe a chipmunk indicating in the yellow or red range, leave the immediate area, alert your collaborators to leave the immediate area, and then contact the Main Control Room (x4662) for instructions. Notify them of your Chipmunk location if you know it (Chipmunks locations are numbered locally). Note: In some cases, when running high-energy proton beam for example, it may be expected that a chipmunk will be indicating slightly in to the yellow near a target room at some locations of the Collider-Accelerator complex.

There are over 100 chipmunk monitoring devices in use at this time. They have pre-designated alarm set-points, and some have interlock set-points, established by the Radiation Safety Committee. Main Control Room Operators are trained to respond to alarms and interlocks and investigate the cause, even if it means interrupting the physics program. Do not move or tamper with chipmunks.

SECURITY SYSTEM ORANGE TAGS

Devices that are part of the security system (PASS) must remain correctly connected and located. (The term “Security System” here is synonymous with Particle Accelerator Safety System, PASS). In order to help ensure that personnel do not disconnect or alter these devices without following the approved procedure, the Access Controls Group will identify devices with an **orange warning tag**. In the experimental areas, these tags alert personnel that the device is critical to safety and the operation of the PASS System. **Do not move** these devices since relocation will compromise their effectiveness. Contact the Main Control Room if these devices are inhibiting your work.

- Program disruption and/or electrical shock may occur by overlooking an orange warning tag.
- Tags and signs are often placed only on the front of equipment. Look at the front of equipment



RADIATION SAFETY SERVICES

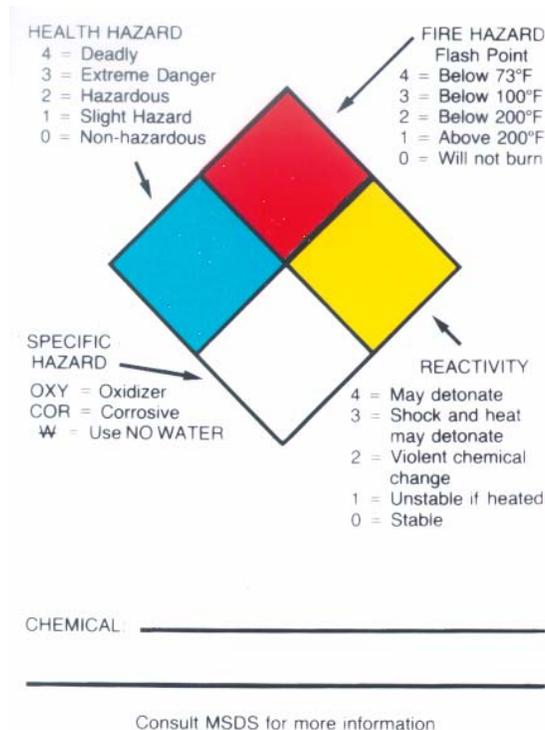
- Contact the C-AD Health Physics Office; Telephone x4660

The Radiological Control Division provides the C-A Department with radiation safety services. They provide dose records, radiation surveys, Radiological Control Technician (RCT) coverage for high-dose jobs, and review of RWPs for ALARA. They also assist in interpreting abnormal radiation levels.

During running periods, RCT coverage is provided on all shifts. During shutdown, services are provided from 8:30 a.m. to 4:30 p.m., Monday through Friday. Assistance is obtained by contacting the Health Physics Office (x4660), or by contacting the C-A Main control Room (MCR) at x4662. The MCR can then contact an RCT by radio.

Special shifts for RCTs may be pre-assigned allowing for specific round-the-clock coverage when needed during a shutdown.

INFORMATION ON HAZARDS YOUR RIGHT TO KNOW



You have the right to know about potential health and safety hazards in your workplace, and whenever the potential for exposure to hazardous materials exists. You will be provided with specific safety and health information by the ES&H Coordinator. Contact the ES&H Coordinator at x4006, pager 453-5940. The ES&H Coordinator can provide you with information on the Laboratory's policy on hazard information, and on how to obtain and interpret Material Safety Data Sheets (MSDS). Some of the information that can be found on an MSDS is the name of the chemical, manufacturer, hazardous ingredients, physical characteristics, fire and explosion hazard data, reactivity data, health hazard data, precautions for safe handling and safety control measures.

National Fire Protection Association (NFPA) diamonds appear on containers and on various structures that contain hazardous materials indicating the degree of hazard for the materials.

The ES&H Coordinator can also provide information on how to select and use protective equipment, and explain the labeling system used on chemical containers.

HIGH NOISE AREAS



Update: Hearing protection required **at all times** with equipment on, even if posting indicates for occupancy greater than 5 minutes.

Disposable ear plugs are located at the entrances to high noise areas.

If entering a posted high noise area, as a minimum you are required to:

- wear hearing protection

AND

- complete a BNL web-based training course (before entry) which informs you how to correctly wear the hearing protection

Medical surveillance (hearing test) may also be required prior to exposure depending on the decibel levels and planned length of time in the area.

CHEMICAL SAFETY

For your safety, purchased chemicals are inventoried by the Laboratory prior to delivery for end use. If you bring un-inventoried chemicals on site you must contact the ES&H Coordinator (x4006, pager 453-5940) to have these chemicals inventoried and bar coded prior to use. Purchased chemicals must be ordered through the BNL Purchase Order System. Credit cards may not be used to order chemicals.

CONFINED SPACE RECOGNITION

A confined space is a space that: (even if not posted “Confined Space”)

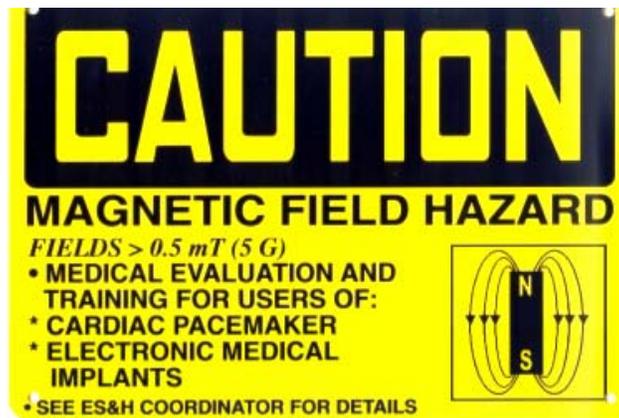
1. Is large enough and so configured that personnel can bodily enter and perform assigned work,
2. Has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits), and
3. Is not designed for continuous personnel occupancy.

If you are entering a space with these characteristics, even if the area is not posted, and:

- you are not sure of the regulatory or safety requirements for entry, or
- you are not sure of the requirements for working within the space, or
- you are introducing any hazard

THEN contact the ES&H Coordinator prior to entry.

MAGNETIC FIELD SAFETY



Where magnetic fields are present, the area is posted. Shown above is the lowest level BNL posting for magnetic fields; greater than or equal to 5 Gauss (0.5 milli Tesla). The next highest posting is typically 600 Gauss. 5 Gauss is posted on doors of assembly buildings, experimental areas, the Collider tunnel and other areas throughout the C-AD complex. Additional training or medical approval is not generally required to enter areas posted as shown above (5 Gauss posting). However, if you use/wear an electronic medical device or implant such as a cardiac pacemaker or insulin pump, medical approval is required even for these lower level areas. The BNL Clinic and your personal physician can determine the magnetic field strengths that can adversely affect your medical device or implant.



East Face of the STAR Magnet. Posting on fence indicates high magnetic field.

Use extreme caution with iron and steel objects when working around magnets with large gaps such as spectrometer magnets. The magnetic field can cause these objects to become dangerous projectiles. Be sure that magnets are not energized or that a magnet safety plan is followed before free access is allowed to the area. Remember that the field may be effective at a surprisingly long distance.

LASER SAFETY

Lasers must be registered with the BNL Laser Safety Officer. This includes higher hazard class lasers (Classes IIIb and IV) as well as lower hazard class lasers (Classes II and IIIa). Examples of Class II or IIIa lasers include alignment lasers, and devices incorporating pointing lasers.

Use of higher class lasers, Classes IIIb and IV, requires additional Laboratory training as well as completion of a Laboratory Standard Operating Procedure (SOP).

Classes II and IIIa lasers require a permit.

Make sure you are aware of the safety requirements established for lasers in your area.

If you have questions regarding lasers, you may contact the C-AD Laser Coordinator, Asher Etkin, on x4006.



Lasers located at STAR



MAGNET COOLING WATER

Magnet cooling water systems may incorporate electrical buses. The water systems operate under pressure and require special training to work on. Depending upon the location in the C-A complex, some magnet cooling water systems may have a radiation field associated with them. These are clearly labeled and should not be handled without proper training and authorization.



STAR Magnet Cooling System

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Department safety policy states that each workplace should be created and maintained in a manner that minimizes safety and health problems. For some jobs it may not be practical to eliminate the hazards completely and protective clothing and/or equipment is required for safety. Plan your work in advance. Consider whether PPE may be needed. Contact the C-A ES&H Coordinator (x4006, pager 453-5940) for reviews and approvals whenever PPE is to be used, or if you have questions on PPE requirements.

HARDHAT POLICY

You are required to wear a hardhat:

- ❖ When people are working overhead
- ❖ When overhead cranes are operating above you
- ❖ At all times at a construction site

SAFE FOOTWEAR

You must wear footwear that is appropriate for the area and activities in which you are involved. The footwear should fully enclose the foot and provide stable footing for walking on uneven surfaces. Safety shoes are required where there is a potential hazard from falling, rolling or piercing objects or when heavy objects are handled. Safety shoes are also required for some electrical work activities, such as working on-or-near energized conductors.

It is especially important to remember this during warm weather when people might otherwise choose footwear more for comfort than for safety.

FRAGILE EQUIPMENT

Many experiments at the C-A complex employ devices and equipment that are fragile such as vacuum windows, scintillation detectors, prototype detectors, electronic cards, connectors and cables. All of these devices require proper training and authorization prior to performing work on them. All Collider experiments have beryllium beam pipes installed. This material is fragile, and toxic. Protection is provided to prevent physical damage.

Care is always required in experimental areas to prevent damage to fragile components of the experiment.

WORK PLANNING and HAZARD SCREENING at C-AD and the GREEN WORK PERMIT

WORK PERMIT # _____	
ILR / Work Order # _____	Construction Job # _____ Tracking # _____ Account # _____
1. Work requester fills out this section STANDING WORK PERMIT <input type="checkbox"/>	
Requester: _____	Date: _____ Ext: _____ Dept/Div/Group: _____
Other Contact person (if different from requester): _____ Ext: _____	
Start Date: _____	Estimated End Date: _____
Description of Work / Problem: _____	
Building: _____	Room: _____ Equipment: _____
2. Work requester, work provider, and ES&H (as necessary) jointly fill out this section or attach analysis	
Hazard Analysis	
RADIATION CONCERNS <input type="checkbox"/> NONE <input type="checkbox"/> CONTAMINATION <input type="checkbox"/> RADIATION <input type="checkbox"/> OTHER <input type="checkbox"/> Activation <input type="checkbox"/> Airborne <input type="checkbox"/> Special nuclear materials involved (ES&H 3.7.0), notify Group Leader, Isotope Special Materials Group (ISMG) <input type="checkbox"/> Fissionable materials involved (ES&H 3.7.0), notify Laboratory Criticality Officer (DAT)	
SAFETY CONCERNS <input type="checkbox"/> NONE <input type="checkbox"/> Adding / Removing Walls or Roofs <input type="checkbox"/> Excavation (ES&H 1.18.0) <input type="checkbox"/> None <input type="checkbox"/> Asbestos <input type="checkbox"/> Flammable (ES&H 4.10.2) <input type="checkbox"/> Non-ionizing Radiation <input type="checkbox"/> Biohazard <input type="checkbox"/> Fumes/Mist/Dust <input type="checkbox"/> Oxygen Deficiency <input type="checkbox"/> Chemicals <input type="checkbox"/> Heat/Cold Stress (ES&H 2.5.0) <input type="checkbox"/> Pressurizing Fire Wall <input type="checkbox"/> Confined Space (ES&H 2.2.4) <input type="checkbox"/> Hydraulic <input type="checkbox"/> Pressurized Systems (ES&H 1.4.1) <input type="checkbox"/> Cumulative (ES&H 5.1.0) <input type="checkbox"/> Lasers (ES&H 2.3.1) <input type="checkbox"/> Rigging/Critical Lift (ES&H 1.6.0) <input type="checkbox"/> Cryogenics (ES&H 1.5.0) <input type="checkbox"/> Lead <input type="checkbox"/> Tools <input type="checkbox"/> Electrical (ES&H 1.5.0) <input type="checkbox"/> Magnets Field <input type="checkbox"/> Vacuum <input type="checkbox"/> Elevated Work <input type="checkbox"/> Material Handling (ES&H 1.6.0) <input type="checkbox"/> OTHER _____	
ENVIRONMENTAL CONCERNS <input type="checkbox"/> NONE <input type="checkbox"/> OTHER <input type="checkbox"/> Hazardous materials will be released to the air via a non-modified ventilation system, hood, or stack (ES&H 6.1.4 and 6.1.5) <input type="checkbox"/> New hazardous materials will be released via the liquid effluent system to the sewage system or an impoundment (ES&H 6.1.2 and 6.1.3), notify Regulatory Compliance Engineer, E.P.O. (ES&H Services) for permits <input type="checkbox"/> Acutely hazardous chemical	
Waste Generated <input type="checkbox"/> NONE <input type="checkbox"/> Clean Waste <input type="checkbox"/> PCD <input type="checkbox"/> Hazardous Waste <input type="checkbox"/> Radioactive Waste <input type="checkbox"/> Mixed Waste Waste disposition by: _____	
Work Controls	
WORK PRACTICES <input type="checkbox"/> NONE <input type="checkbox"/> Back-up Person/Watch <input type="checkbox"/> Containment <input type="checkbox"/> Job Survey <input type="checkbox"/> Scaffolding - requires inspection <input type="checkbox"/> Barricade <input type="checkbox"/> Exhaust Ventilation <input type="checkbox"/> Lockout/Tagout (ES&H 1.5.1) <input type="checkbox"/> Time Limitation <input type="checkbox"/> Other: _____	
PROTECTIVE EQUIPMENT <input type="checkbox"/> NONE <input type="checkbox"/> Ear Plugs <input type="checkbox"/> Goggles <input type="checkbox"/> Lab Coat <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Coveralls <input type="checkbox"/> Ear Muffs <input type="checkbox"/> Goggles <input type="checkbox"/> Respirator <input type="checkbox"/> Safety Harness <input type="checkbox"/> Disposable Clothing <input type="checkbox"/> Face Shield <input type="checkbox"/> Hard Hat <input type="checkbox"/> Shoe covers <input type="checkbox"/> Safety Shoes <input type="checkbox"/> OTHER _____	
PERMITS REQUIRED <input type="checkbox"/> NONE <input type="checkbox"/> Digging/Cut Drilling (ES&H 1.18.0) <input type="checkbox"/> Impact Fire Protection Sys. (ES&H 4.2.0) <input type="checkbox"/> Confined Space Entry (ES&H 2.2.4) <input type="checkbox"/> Electrical Working Area (ES&H 1.5.0) <input type="checkbox"/> Rad Work Permits (BNI, Rad/Con Manual) <input type="checkbox"/> Cutting/Welding (ES&H 4.3.0) <input type="checkbox"/> Dept/Div Specific Permit	
DOMESTIC MONITORING <input type="checkbox"/> NONE <input type="checkbox"/> O ₂ /Combustible Gas <input type="checkbox"/> Self-igniting Detonator <input type="checkbox"/> Heat Stress Monitor <input type="checkbox"/> Passive Vapor Monitor <input type="checkbox"/> Sulfur Tube/Filter Pump <input type="checkbox"/> Noise Survey/Instrument <input type="checkbox"/> Real Time Monitor <input type="checkbox"/> TLD <input type="checkbox"/> OTHER _____	
Training Requirements (List below any location specific training requirements)	
Based on analysis above, the Review Team determines the job hazard category: JOB HAZARD CATEGORY: <input type="checkbox"/> LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH Job Safety Analysis (JSA) Required? <input type="checkbox"/> Yes <input type="checkbox"/> No If job is low hazard and skill-of-the-craft, the back side of the permit does not need to be filled out. Sign for concurrence. Work Control Coordinator _____ Life # _____ Work Provider _____ Life # _____ FILE COOL	

All work at C-AD must be screened for Environment, Safety & Health (ES&H) hazards by a qualified Work Planner. The Work Permit (Green Form) contains a large number of ES&H items to consider and is used as a screening tool. The work planner determines the hazard category of the work to be done: Low, Moderate or High Hazard. For all Moderate and High Hazard jobs, it is required that the Work Permit be completed (this is called "Enhanced Work Planning"). The hazard categories are generally described as follows:

Low-Hazard Work is work requiring the attention of the 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.

Moderate-Hazard Work: Work requiring coordinated actions to prevent injury to personnel, minor damage to equipment or structures, or release of hazardous materials to the on-site environment.

High-Hazard Work: Work requiring coordinated actions to prevent serious injury to personnel, significant damage to equipment or structures, or releases of reportable quantities of potentially hazardous materials to the off-site environment.

Additional details and specific requirements for work planning for experiments and Users are located in C-A OPM 2.29, "C-A Procedure for Enhanced Work Planning for Experimenters." **Users are required to complete the Low Hazard / Skill of the Craft training for their experimentant.** This indicates they have read and understood the Skill of the Craft work planning incorporated at their experiment. This work planning document delineates the type of "low hazard" work, with its associated hazards, that Users may perform at an experiment. It is the Experiment Spokesperson's responsibility to ensure that all work is planned in accordance with the intent of the C-AD work planning policy.

REMOVING DAMAGED EQUIPMENT FROM SERVICE

If any equipment presents an immediate hazard that could reasonably be expected to cause serious injury or environmental harm, then you must remove it from service (e.g., broken ladders, frayed slings, defective power cords, leaking tanks).

ACCOUNTABILITY FOR FOLLOWING THE RULES

You are responsible for following C-AD rules and procedures for which you have been trained. If you cannot follow the rules and procedures in order to perform your work, you must seek to have the rule or procedure officially changed to suit what is needed. Rules and procedures shall be followed even if staffing levels are low. Do not violate safety requirements to get the job done.

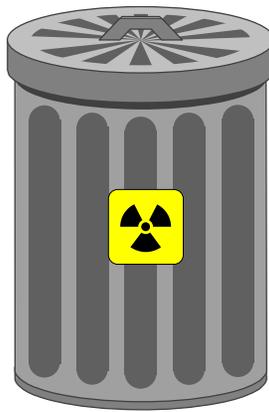
This policy applies to C-AD staff as well as Users and will be enforced everywhere.

WASTE DISPOSAL

CAUTION:

Improper disposal of radioactive or hazardous waste may result in fines, criminal prosecution, and facility shutdown. Contact the C-A Environmental Coordinator (x7520) for information on any waste. The C-A Environmental Coordinator is familiar with rules, permits, authorizations and analysis requirements necessary for proper disposal.

Contact the Environmental Compliance Representative (ECR - x2905) prior to establishing any airborne, liquid or solid radioactive- or hazardous-waste-stream.



Removing waste from the Laboratory is complex and costly. Your cooperation is necessary in order to control waste according to Federal, State, and Suffolk County regulations. Additionally, the regulations of the States receiving waste from C-A must also be followed.

Information on proper disposal of waste is contained in BNL's Standards Based Management System (SBMS) and in C-AD procedures (Operations Procedures Manual (OPM) Chapter 8).

All chemical containers must be marked as to contents, even water containers. All bags or packages of waste must be marked indicating the contents and where the waste came from.

- Do not place clean materials in radioactive waste bins
- Do not place radioactive materials in the green 3-yard bins used for clean waste
- Substitute reusable materials where possible in order to reduce waste
- Use minimum quantities of materials
- Segregate wastes
- Do not leave unnecessary items in primary areas since they may become rad waste

Each person is responsible to ensure that they handle, accumulate or dispose of waste by using adequate and proper controls and documentation. Waste generators at the C-A must check all waste to ensure that it is not radioactive. Generators of hazardous or radioactive waste at the C-A should minimize the amount of waste they generate by substituting re-usable materials where possible, using minimum quantities of materials, and segregating different wastes to allow for reclamation.

Hazardous waste is subject to time limits and volume limits that must be strictly adhered to. Generally, accumulation of more than 55 gallons at a satellite accumulation area is not allowed. Once the waste is moved to the C-A Hazardous Waste Trailer, a 90-day clock starts. The waste must leave the C-A complex within this 90-day period. Containers must be appropriate for the type of waste being collected and be dated and labeled. Your cooperation in this area is important in order to maintain C-A's good reputation in the surrounding community.

Activated lead is an example of mixed waste. It is both hazardous and radioactive. Do not put mixed waste in radioactive waste cans. Another example of mixed waste is activated oil.

Do not throw clean metals into waste cans used for ordinary clean waste. Non-radioactive metals should be re-cycled. Metals in our clean waste stream are a problem since the Brookhaven Town Landfill will refuse BNL's clean waste if they find metal in it.

Question: You need to throw out empty cans of a liquid chemical that you used to clean equipment. You realize the liquid itself required special handling, but the containers are now empty and dry. What do you do?

Answer: Initially treat the container as hazardous waste and contact the C-A Environmental Coordinator (x7520) to learn the proper disposal technique.

SPILLS

The C-A Department is required to report spills; internally, externally, or BOTH. C-AD must report to outside (external) agencies on spills that impact the environment. Reporting must be made within certain time constraints so it is important that you notify appropriate people of a spill promptly. Even minor events, such as spilling any amount of oil in an outdoor area, require reporting. The rules are such that we must *consider* reporting spills of any type or size. For any spill, notify your Experimental Spokesperson and/or the Liaison Physicist.

If you spill any hazardous or industrial material outdoors on the ground, or anywhere inside and the spill is beyond your control, call x2222 or 911 to report the spill. Then call the C-AD Main Control Room (x4662), the C-AD ESHQ Division Head (x5272) or the C-AD Environmental Coordinator (x7520) as soon as possible. Do not leave a message on an answering machine as notification.

When reporting a spill, give your name and information on the spill location, type of material and approximate amount as best you can.

For further information on spills, see BNL's SBMS subject Area "Spill Response".

COMPRESSED GAS SAFETY

Note: If you will be working with compressed gas cylinders, complete BNL web-based course Compressed Gas Safety (TQ-COMPGAS1).

All compressed gases are hazardous due to high pressure. Because of the different hazards associated with different gases, it's important that cylinders be properly labeled. When a cylinder is delivered to the gas warehouse, an experimental area or a job site, it should have:

- **content identification,**
- **DOT label,** and
- **a valve protection cap.**

UNDER NO CIRCUMSTANCE should the means of identification be removed from a cylinder. The valve protection cap should remain in place until the user has secured the cylinder to a fixed support at the point of use and is ready to attach a pressure regulator to withdraw the contents.

The personnel at the BNL Gas Warehouse will attach a Cylinder Status Tag on the cylinder when it is received. Tear off the bottom of the Cylinder Status Tag and write name of assigned user on tag indicating the cylinder is in use.

GENERAL RULES FOR CYLINDER HANDLING

Note: If you will be working with compressed gas cylinders, complete BNL web-based course Compressed Gas Safety (TQ-COMPGAS1).

- Do not drop cylinders or permit them to violently strike each other.
- Do not roll cylinders in a horizontal position.
- Do not drag cylinders.
- Do not handle cylinders with oily hands or oily gloves. This is especially important when handling oxygen and other oxidizers.
- If hoisting is necessary, use a suitable cradle or platform.
- Do not lift a cylinder by its cap.
- Keep cylinder caps on the cylinder whenever they are not in use.
- Transport cylinders using a cart or hand truck designed for that purpose.
- Whenever placing a cylinder in service, check the hydrostatic test date.

COMPRESSED GAS CYLINDER SAFE STORAGE



- Storage areas should be dry, cool, and well ventilated, and where practical, fire resistant.
- Gases of different types are to be grouped by type and non-compatible types should be separated. Flammable gases shall not be stored with oxidizing gases.
- Cylinder storage areas are to be prominently posted with the types of gases stored.
- Charged and empty cylinders should be stored separately.
- Cylinders should be arranged so that old stock can be removed first with a minimum handling of other cylinders.
- Cylinders should not be stored at temperatures above 125 °F, (51° C) or near sources of heat.
- Cylinders should not be stored near highly flammable or combustible materials.
- When cylinders are being moved on a cylinder cart, they must be secured to the cart.

FIRE OR OTHER EMERGENCY

In your work area, make a mental note of the following that may be in your area:

- Exits
- Fire Alarm Pull Boxes
- Crash buttons
- Crash cords
- Postings
- Emergency exhaust, if any
- Telephones
- Plectrons (radio controlled electronic alerting devices)

Some examples of plectron locations (locations may change over time):

1005S 1st Floor	1006D
1005S 2nd Floor	1008D
1002D	

Question: You need immediate help in an emergency. What do you do?

Answer: Pull a fire alarm box (if there is one in the area) and call x2222 or x911. This is the preferred method for contacting the emergency response team.

Fire Alarm Pull Box



In any emergency, you may (and are encouraged to) pull a fire alarm box; it does not have to be a fire. Also, call 911 or 2222 (from a cell phone: (631) 344-2222). Fire alarm boxes are located throughout the complex; at the experimental halls, and in the Collider tunnel. This is the best method to simultaneously alert the C-A Main Control Room (MCR) and the BNL Fire/Rescue Group. Pulling a fire alarm box and telephoning 911 or 2222 brings the Fire/Rescue Group to your specific alarm-box location within about two minutes, and appropriate additional personnel can be summoned quickly.

The accelerator tunnels are restricted spaces. If fire should break out, then smoke could quickly impair visibility, and asphyxiation from contained gases can occur.

In the Collider tunnel, vertical and horizontal emergency exits alternate and are located throughout the tunnel. At the experimental intersection regions, there are multiple horizontal exits. All exits go to the inner ring road.

If you hear a Fire Alarm Bell evacuate the area after placing equipment in a safe operating mode, and go to the Outdoor Assembly Area. A fire alarm bell has a metal "clanging" sound. Main Control Room (MCR) personnel must remain on station if they have emergency duties, but will evacuate during imminent danger situations. Indoor and Outdoor Assembly Areas are posted on building entrance doors.

Once outside a smoky area, report to the Local Emergency Coordinator (LEC) or the Department Emergency Coordinator (DEC) if they are present. They will be wearing hats (like baseball caps) marked DEC or LEC. Do not chat with the Fire Captain or other emergency response personnel in the area. Obey the directions of the Fire Captain, DEC or LEC.

Summary of Alarm Signals

Orange Strobe and Audible Alarm:

Pull crash cord or exit through ("crash" through) the Primary Area access gate, exit the area, contact MCR.

Beam is Imminent

Blue Strobe and Audible Alarm:

For Helium (RHIC), exit the area through horizontal exit, stay low. Move away from any vapor cloud or "wooshing" noise.

Oxygen Deficiency Event

Yellow Strobe and Audible Alarm (two-tone horn):

Exit the area, report to outdoor assembly area.

*Combustible/explosive
or Flammable Gas Leak*

For example, the STAR and PHENIX experiments use flammable/explosive gas

Fire Alarm Bell (the typical metal "clanging" bell sound):

Exit the area, report to outdoor assembly area

Fire

DO NOT RE-ENTER buildings/areas. Wait for further instructions from the Fire Captain, Local Emergency Coordinator (LEC), Department Emergency Coordinator (DEC) or the C-AD ESH Coordinator.

Indoor and Outdoor Assembly Areas are posted at building entrances.

BNL SITE SIRENS

- If you hear a continuous site-wide siren for five minutes, go to the Indoor Assembly Area. Assembly areas are posted on building entrance doors.
- If you hear a pulsating site-wide siren, then evacuate the BNL site.

The site evacuation plan covers C-A as well as other facilities on-site.

The site sirens are tested each Monday at noon. You will hear the sirens being tested.

FIRE SAFETY

The fire safety program at BNL emphasizes prevention through the design of buildings and automatic protection. If you suspect a fire, pull the fire alarm box and telephone 2222 or 911, Fire Rescue Group. Alert everyone in the area and evacuate as required. If you think you can combat the fire without putting yourself in danger, a fire extinguisher may be effective. **Never let the fire get between you and your escape route.** Use a fire extinguisher only if you are trained and it can be done safely. Only use a fire extinguisher if you're confident in your ability to put out the fire safely. Determine what is burning and select the appropriate fire extinguisher. Fire extinguishers are classified according to their ability to handle specific types and size fires. If you have any doubts, let firefighters handle the situation.

ACTIONS FOLLOWING AN INJURY/ILLNESS

If there is a medical emergency involving an injury or an illness such as a heart attack or other illness or injury for which immediate medical attention is wanted, then pull a fire alarm box (if one is in the area) and call x2222 or x911. From a cell phone, dial (631) 344-2222.

Unless an injury is very minor:

Never transport the injured person to the Clinic yourself, wait for the Fire Department to arrive with the EMT (Emergency Medical Technician) and ambulance. Make sure you pull the Fire Alarm box to immediately let the Fire/Rescue Group know of the location of the problem. Follow-up immediately with a call to 2222 or 911 or on a cell 344-2222 to let the Fire/Rescue Group know it is an injury so the EMT/ambulance are dispatched to the scene (they usually don't send the ambulance for a fire only).

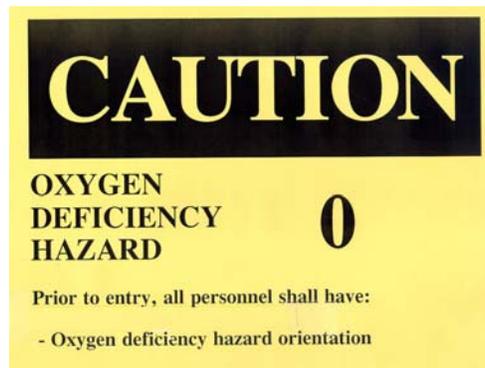
If you transport the person yourself, time may be wasted in having the ambulance track you down. In addition, you may be stuck with an injured person who passes out or stops breathing, etc., on the way to the Clinic or you could be nervous and have an accident on the way to the Clinic.

If you are injured but do not require emergency attention, then report as soon as possible to the BNL Occupational Medicine Clinic (OMC), which is located in Building 490. Your supervisor or Liaison Physicist should accompany you. If your supervisor is not available, you should call upon another member of supervision or management in your Department, Division or experimental area to go with you. In most circumstances, it is expected that you report to the Clinic immediately after the injury. If this is not possible, you are required to notify the Clinic immediately and report to the Clinic with your supervisor, or alternate member of management, before the end of the work shift in which the injury occurred, or at the start of your next work-shift. If employees fail to notify and report to the Clinic as required, any resulting missed work may be considered unauthorized leave and will be ineligible for sick leave.

ELECTRICAL POWER FAILURE - Be Prepared

In the event of an electrical power failure, the accelerator tunnels and experimental areas could become pitch black if emergency back-up power fails to turn on. It is strongly recommended that you bring a flashlight with you if you enter any of these areas.

OXYGEN DEFICIENCY HAZARDS



This Collider User Training includes an equivalency for BNL's ODH Class 0 training, for entry into ODH-0 areas at RHIC only.

What is oxygen deficiency?

Normal atmospheric content is 20.9% oxygen, 78% nitrogen, and 1% argon. Oxygen deficiency is defined as less than 19.5 % oxygen. This happens when air in an enclosed space is displaced by another gas.

What causes oxygen deficiency?

Cryogenic systems at RHIC use large amounts of helium and nitrogen. Both liquids expand about 700-800 times when released into air. This could happen quickly with a major release as a result of catastrophic failure. In a major release, one might see a rapidly expanding white cloud and hear a "whooshing " sound. The leak could also be slow, invisible and silent. Both helium and nitrogen are colorless and odorless. Other causes of oxygen deficiency are use of compressed gasses, combustion, welding, use of fire suppressants. All of these in a confined space or area of low ventilation are significant concerns.

EFFECTS OF OXYGEN DEFICIENCY

The following table summarizes the health effects of oxygen deficiency.

EFFECT THRESHOLDS FOR EXPOSURE TO REDUCED OXYGEN	
(Normal Individuals at Rest at Sea Level)	
Volume Oxygen %	Oxygen Effect
17	Night vision reduced Increased breathing volume Accelerated heartbeat
16	Dizziness Increased time doubled for novel tasks
15	Impaired attention Impaired judgment Impaired coordination Intermittent breathing Rapid fatigue Loss of muscle control
12	Very faulty judgment Very poor muscular coordination Loss of consciousness Permanent brain damage
10	Inability to move Nausea Vomiting
6	Spasmodic breathing Convulsive movements Death in 5 - 8 minutes

Effects may occur rapidly. Effects can become permanent if exposure is not terminated quickly. The major effects hindering escape are disorientation and unconsciousness.

CLASSIFICATION LEVELS OF ODH

There are five ODH classes: 0 through 4, with 0 being the least hazardous. Each class requires controls and posting commensurate with the hazard. Classification is based on the likelihood of fatality and the probability of occurrence. There are currently no areas at C-AD with a classification greater than Class 1. RHIC Building 1005R (the refrigerator building) is a Class 1 area. Additional control measures and training are required for entry into a Class 1 ODH area.

This training allows you to enter Class 0 ODH areas at RHIC. The following are examples of Class 0 areas at RHIC:

- Collider Tunnel (not the Intersection Regions at STAR and PHENIX)
- Service and Support Buildings 1002B, 1004B, 1006B, 1008B, 1010A, 1012A (buildings with valve boxes)
- Building 1005E (west end, Helium Reliquifier section)
- Compressor Building 1005H

WHEN IS EVACUATION OF AN ODH AREA REQUIRED?

Any one or combination of the following requires an immediate evacuation of an ODH area:

- The in-place oxygen monitors activate an alarm. At the RHIC complex, Blue strobe lights accompany an audible alarm.
- A vapor cloud is observed inside the ODH area or a loud "whooshing" sound is heard (even if no alarm is seen or heard).

The evacuation procedure is as follows:

- Leave the area, moving away from any vapor cloud, loud "wooshing" sound or other potential problem.
- Stay Low! Do not use vertical escape exits, use only horizontal exits.
- If someone is in danger, hurt or feeling ill, call 2222 or 911. Otherwise, call the Control Room.

It is important to remember that you should not re-enter, even with an escape pack. Let the Fire/Rescue Group handle it. ODH deaths usually come in pairs; more than 50% of ODH deaths are of people re-entering an area trying to save another person. One or two breaths could cause loss of consciousness under certain conditions, and lung damage is possible if the gas cloud temperature is -50 to -70 °C.

LABORATORY COMPUTERS

Any User who has access to the BNL Network and its computing resources must complete a BNL Course titled "Cyber Security". Essentially all Users will be required to complete this training.

SAFETY ATTITUDE

In the recent past in New Jersey, an Exxon worker did not turn off an ignition source, which was the truck he drove to a gas storage site, he did not wear his protective clothing to perform the job, and he did not follow a procedure that minimized gas leakage when he opened valves. These individual failures added up to a tragedy. A film describing this incident is available for viewing (~1 hour long) from the BNL Safety and Health Services Division. See the C-AD Training Coordinator if you want to view this film. Likewise, simple failures have added up to major disruptions at BNL, such as not installing groundwater wells south of the HFBR or not installing an interlock on the C-line diffuser at AGS. The risk of losing 500 jobs due to a forced shutdown is very real at BNL since our work is radiological in nature. We do not have to ignite a few million gallons of gasoline in order to have upheaval and misfortune.

Many "errors" in series must usually occur to cause an accident. For a single accident there may be many causes and sub-causes, and certain combinations of these give rise to accidents. From a simple viewpoint, the causes can be grouped into the following two categories:

a) Behavioral - This category includes factors pertaining to the worker, such as improper attitude like the Exxon worker, or lack of knowledge, lack of skills and inadequate physical and mental condition. In the case of the Exxon worker, his attitude was based on years of experience in which nothing ever went wrong for him whenever he took a short cut.

b) Environmental - This category includes improper protection from hazardous work elements and degradation of equipment through use and unsafe procedures and inadequate maintenance.

Major accidents are rarely, if ever, the result of a single cause or act. You can view an accident as toppling dominoes. The accident will occur if the sequence of events lets all the dominoes topple to the last. If one or more of the dominoes is removed, then the last domino toppling, which is the accident, probably won't occur.

After an accident, most people tend to look for "things" to blame, because it's easier than looking for "root causes," such as those listed below. Consider the underlying accident causes described below. Have you been guilty of any of these attitudes or behaviors? If so, you may not have been injured, but next time you may not be so lucky.

- **Taking Shortcuts:** Every day we make decisions we hope will make the job faster and more efficient. But do these time savers ever risk your own safety, or that of coworkers?
- **Being Over Confident:** Confidence is a good thing. Overconfidence is *too much* of a good thing. "It'll never happen to me" is an attitude that can lead to improper use of procedures, tools, or methods in your work.
- **Starting a Task with Incomplete Instructions:** To do the job safely and correctly the first time you need complete information. Have you ever been sent to do a job, having been given only a part of the job's instructions? Don't be shy about asking for explanations about work procedures and safety precautions. It isn't dumb to ask questions; it's dumb not to.

- **Poor Housekeeping:** When managers, supervisors or safety professionals walk through your work site, housekeeping is almost always an accurate indicator of your attitude about safety. Poor housekeeping creates hazards of all types.
- **Ignoring Safety Procedures:** Purposely failing to observe safety procedures can endanger you and your coworkers and cost you your job.
- **Mental Distractions from Work:** Having a bad day at home and worrying about it at work is a hazardous combination, and visa versa. Dropping your 'mental' guard can pull your focus away from performing any task safely including changing the gas bottle on your barbecue. You can also be distracted when you're busy at work and a friend comes by to talk while you are trying to do a hazardous job. Don't become a statistic because you took your eyes off the job at hand "just for a minute."
- **Failure to Pre-Plan the Work:** Job Hazard Analysis and Enhanced Work Permits are an effective way to figure out the smartest ways to work safely and effectively. Being hasty in starting a task or not thinking through the process can put you in harms way. Instead, Plan Your Work and then Work Your Plan.

Alcohol/substance Abuse:

Employees or Guests of the Laboratory who abuse alcohol and/or controlled substances pose unacceptable risks to the safe and efficient operation of the Laboratory. In addition to jeopardizing employee safety and/or impacting on performance, conduct and reliability, substance abuse is illegal.

LIAISON PHYSICISTS

Your Liaison Physicist (LP) is your primary contact for information concerning Environmental, Safety and Health issues concerning the experiment. An up-to-date list of Liaison Physicists is maintained at the web site: <http://server.ags.bnl.gov/bnlags/liaisons.html>. The following are Liaison Physicists:

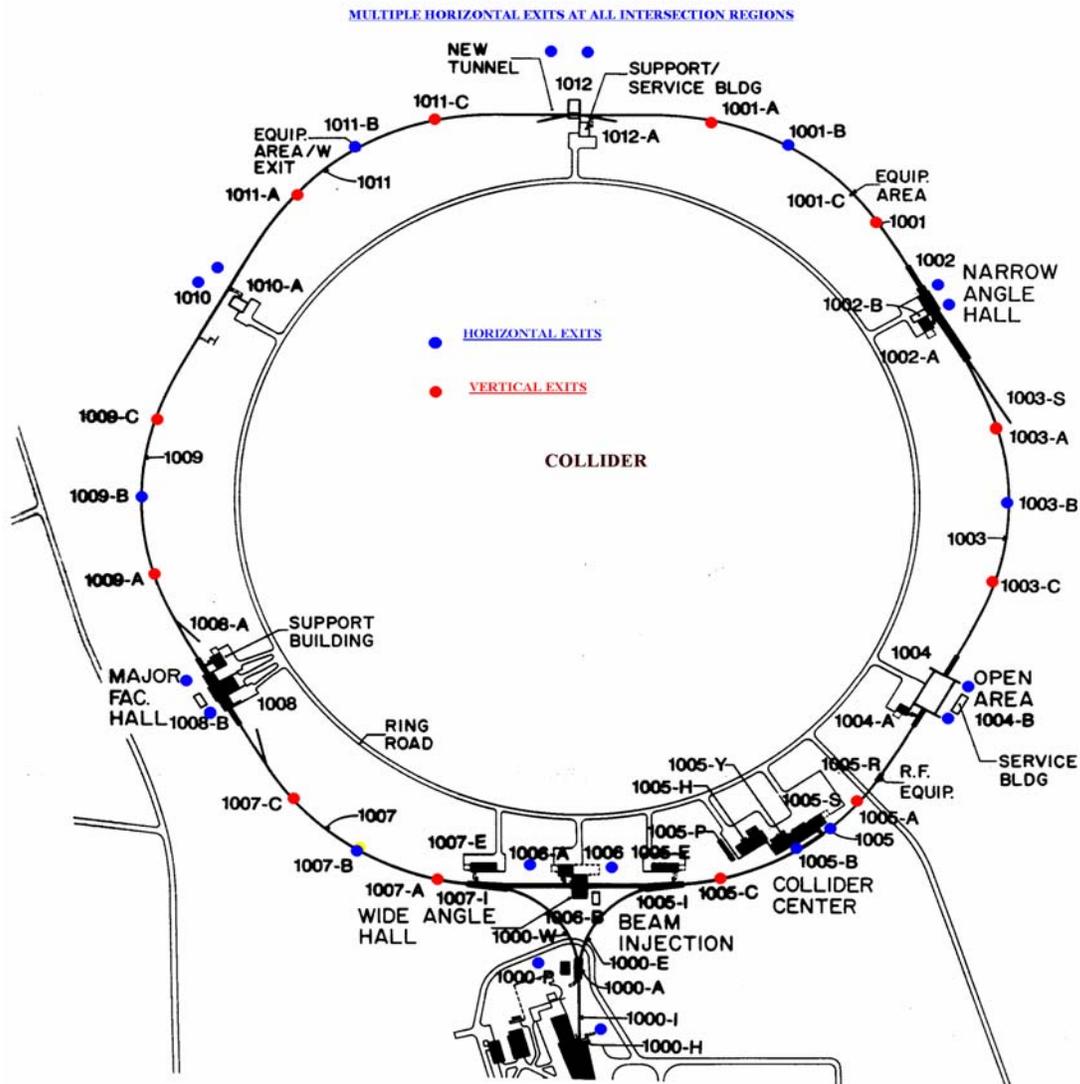
<u>Experiment</u>	<u>Liaison Physicist</u>	<u>Telephone</u>
STAR	Wuzheng Meng	2120
PHENIX	Yousef Makdisi	4932
PHOBOS *	Don Barton	7925
BRAHMS *	Dana Beavis	7124
PP2PP	I-Hung Chiang	7903

* The PHOBOS and BRAHMS experiments are inactive at this time. These experimental areas and LPs may be changing. If working in these areas, please be sure you have done the appropriate work planning through the appropriate C-AD/BNL personnel.

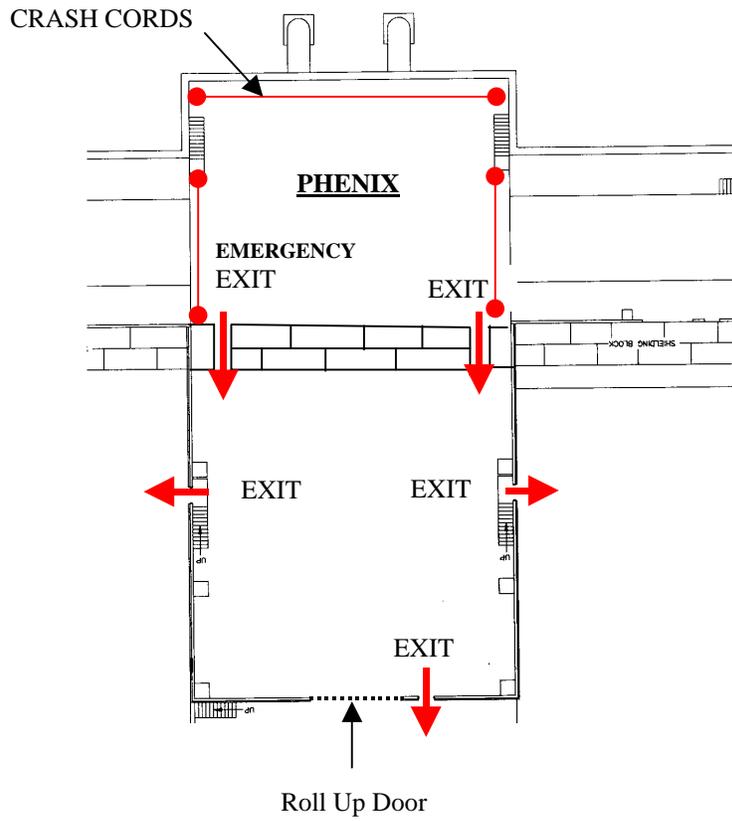
EMERGENCY EGRESS DIAGRAMS

Upon entering any building or experimental area/hall at the C-A complex one should note the locations of emergency equipment as well as the exit points.

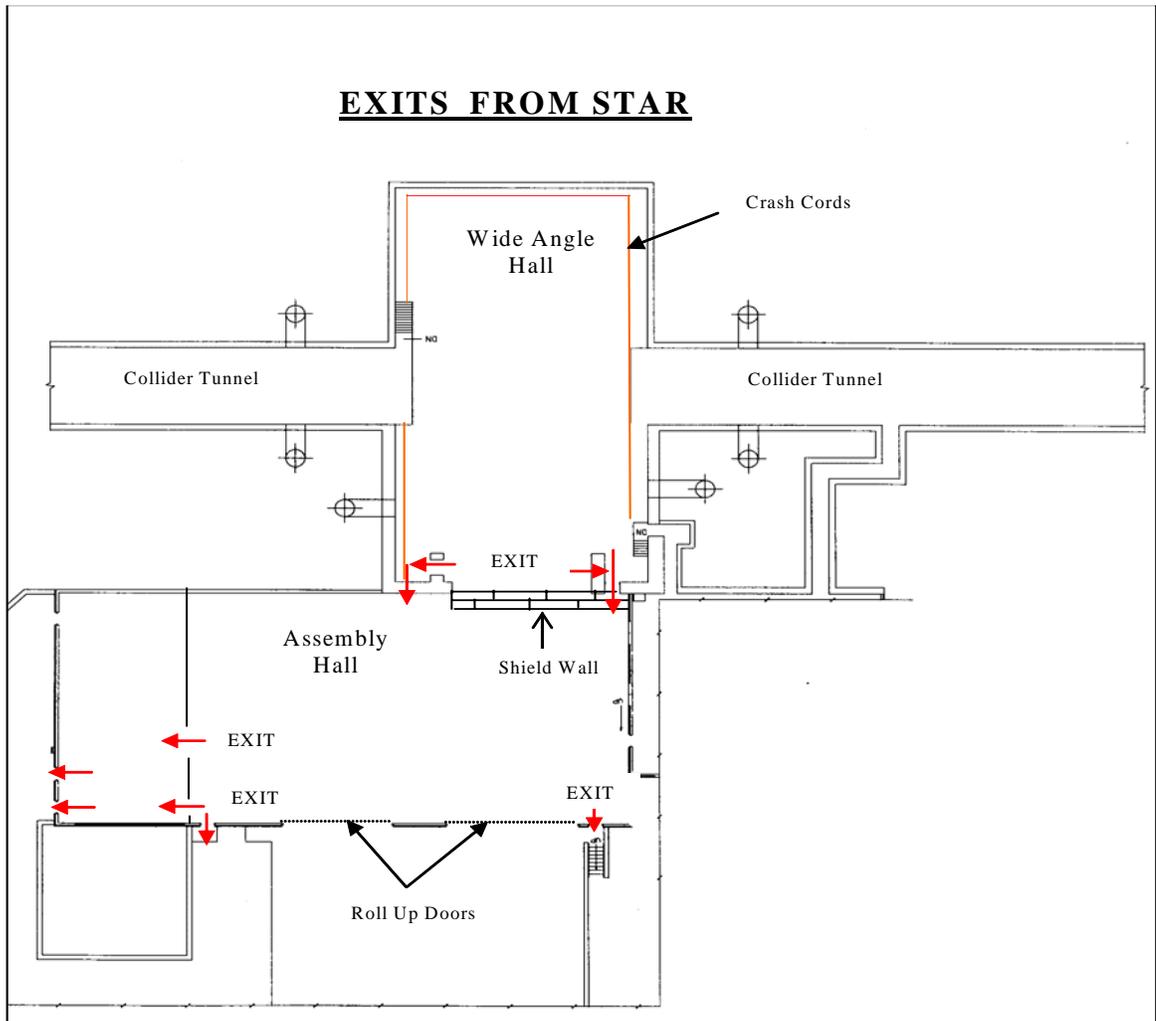
EXITS FROM COLLIDER TUNNEL



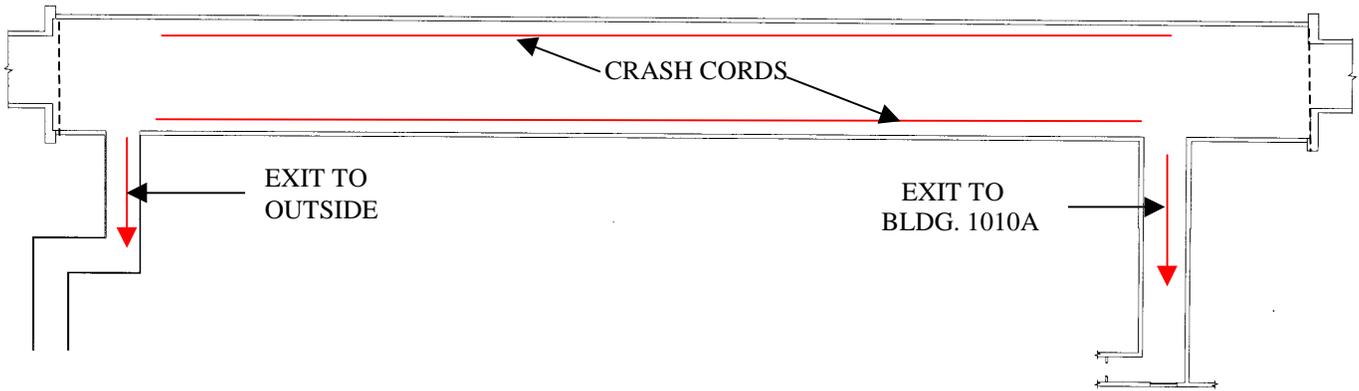
EXITS FROM PHENIX



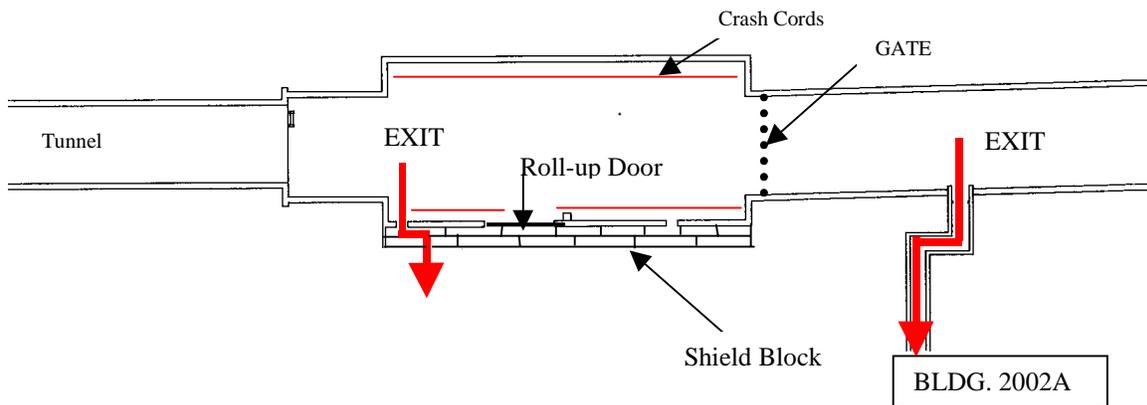
EXITS FROM STAR



EXITS FROM PHOBOS



EXITS FROM BRAHMS



LIST OF ACRONYMS

AGS	-	Alternating Gradient Synchrotron
ALARA	-	As Low As Reasonably Achievable
BNL	-	Brookhaven National Laboratory
BSA	-	Brookhaven Science Associates
C-AD	-	Collider Accelerator Department
DEC	-	Department Emergency Coordinator
DOE	-	United States Department of Energy
ESHQ Div	-	C-AD Environment, Safety, Health & Quality Division
ESH	-	Environment, Safety & Health (e.g.: ESH Coordinator)
ESRC	-	Experiment Safety Review Committee
FEB	-	Fast Extracted Beam
HP	-	Health Physics
IR	-	Intersecting Region
LEC	-	Local Emergency Coordinator
LOTO	-	Lock Out / Tag Out
LE	-	Liaison Engineer
LP	-	Liaison Physicist
MCR	-	Main Control Room
OC	-	Operations Coordinator
ODH	-	Oxygen Deficiency Hazard
OSHA	-	United States Occupational Safety and Health Administration
PAAA	-	Price-Anderson Amendments Act
PPE	-	Personal Protective Equipment
RCT	-	Radiological Control Technician
RWP	-	Radiation Work Permit
SBMS	-	Standards Based Management System
SEB	-	Slow Extracted Beam
SOP	-	Standard Operating Procedure
SRD	-	Self-Reading Dosimeter
TLD	-	Thermo-Luminescent Dosimeter