

C-A
DEPARTMENT-SPECIFIC
LO/TO CERTIFICATION

May 1, 2008

VACUUM GROUP

WHY ARE WE HERE?

Aside from the obvious, that being to pay our mortgage or rent, I am sure we all want to go home at the end of the day without being injured on the job. And with the electricity we deal with here at the lab, the various systems we work on, there is much to be made aware. So stay awake for this one. It could save your life.

FOLLOWING THIS CLASS

You will be certified in department-specific lockout/tagout for LOTO activities as long as you maintain current training status in the following BNL courses:

- HP-OSH-151B (Lockout/Tagout Authorized Worker)
- TQ-ELECSAF1 (Electrical Safety 1)
- AD-ELECSAFETY (Electrical Safe Work Practices)

WHAT IS LOTO?

"Lockout/Tagout (LOTO)" refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.

WHAT IS LOTO?

- Installing a lockout device on all sources of hazardous energy such that the energy isolating devices are in a safe or off position and forcible removal of the lock is required to operate the disconnecting means.
- The physical isolation of an energized system from the source of energy, verification of isolation, the application of a barrier for each person or group working on the system (padlock), and identification for accountability at each barrier/red tag.

WHO CAN LOTO?

- Only employees authorized by the Department/Division are to perform LOTO, in accordance with this program.
- All BNL and non-BNL employees upon observing a piece of equipment that is LOTO'd must not attempt to start, energize, or use that machine or equipment. Violation of this program falls under the guidelines of the [Disciplinary Actions](#) Subject Area.

CAUTION & HOLD TAGS

- Here in the vacuum group we use both HOLD and CAUTION TAGS when turning off equipment.
- **HOLD TAGS are used for personal protection (LOTO).**
 - Basically, if you are going to repair a cable, you will use a HOLD tag. This is for YOUR protection.
- **CAUTION TAGS are used for equipment protection.**
 - CAUTION TAGS are used to protect the equipment from being damaged, such as an ion pump being energized when the pressure is too high, or a mechanical pump being turned on during an oil change.

Equipment Required for LOTO Includes:

- A distinctive red tag (BNL Stock #S-81045)
- A Master Lock with a red band (BNL Stock #I-65064)



DATE _____ TAG NO. 74266
APPARATUS _____ TIME _____

**HOLD
DANGER**

WRITE REASON IN SPACE BELOW

DO NOT USE, MOVE OR OPERATE
WHILE THIS TAG IS ATTACHED

TAG ATTACHED BY
AND MAY BE REMOVED ONLY BY

PRINT NAME _____ DEPT. _____ EXTENSION _____

RETURN TAG TO ISSUING
OFFICE WHEN NO LONGER REQUIRED

TAG NO. 74266 DATE _____
HAS BEEN ATTACHED TO _____

BECAUSE _____

SIGNED _____

RETURN STUB TO ISSUING OFFICE

BNL F 2791A

SECURING A HOLD TAG

- Use a non-reusable nylon cable tie, suitable for the environment, with strength of not less than 50 pounds.
- HOLD tags may be secured using tape, or black-and-yellow striped safety tape, only if it is not possible to use the non-reusable nylon cable tie.

TAGS & LOCKS

- Tags are required in addition to locks with the following exceptions:
 - When a Responsible Employee attaches his lock and tag, subsequent Authorized Employees may attach locks only.
 - When a single Authorized Employee is **within clear sight of a single disconnecting means** (Simple LOTO) and completes the task within one shift and the lock has employee identifying information (life number).

Accountable Key Systems

KIRK LOCKS

If an isolating device has a built-in locking mechanism, such as an Accountable Key System (e.g., Kirk-key lock), then it can be used as a locking device and it is not necessary to affix an additional padlock.

- For a Simple LOTO, a personal LOTO tag properly dated and signed must be attached to the built-in lock to indicate that work is being done on the circuit or equipment if the work extends beyond a single shift.
- If there is more than one person involved, the Kirk-key (or a similar device) shall be placed in a lockbox with a tag by the Responsible Employee as for a Group LOTO and then each crew or person shall affix their own lock to the lockbox.

KIRK LOCKS

Are used for Vacuum Equipment in AGS houses A10, E18, and H10.



CAUTION – DO NOT OPERATE

- These tags are used to protect equipment, not lives.
- Equipment, upon which this tag is placed, may not be operated until the tag is removed by the person who signed the tag.



CAUTION

(Without The Words Do Not Operate)

This tag authorizes operation of equipment and or systems in a range (volts, amperes, degrees, microns, etc.) or other warnings or instructions that are defined in the Comments field on the tag.



CAUTION TAG

- The CAUTION tag shall have the following legible information on the tag:
 - (1) date
 - (2) clear reason or comment for the CAUTION tag
 - (3) printed name, signature, and life number of person applying tag
- Inform affected personnel that a DO NOT OPERATE or CAUTION tag is to be applied.

BACK OF CAUTION TAG

Same for both
CAUTION
and
DO NOT OPERATE

CAUTION

COMMENTS

PRINT NAME

SIGNATURE BNL # DATE

C-A OPM 2.13

DO NOT OPERATE TAG

- A yellow tag placed on a device that prohibits operation by anyone except those listed as authorized operators of the device.
- Only used at C-A facilities.
- These tags may remain in place for extended periods and may be moved to different locations for reuse by authorized operators.

TAG NO. _____ DATE _____

APPARATUS _____

**DO NOT
OPERATE**

THIS DEVICE SHALL NOT BE OPERATED BY ANY ONE
OTHER THAN THOSE DESIGNATED BY:

C-A OPM 2.13

PRINT NAME:

SIGNATURE:

(SUPERVISORS OR DESIGNEE)

UNAUTHORIZED OPERATORS ARE
SUBJECT TO DISCIPLINARY ACTION

(OVER)

DO NOT OPERATE TAG

- The DO NOT OPERATE tag shall have the following legible information on the tag:
 - (1) tag number
 - (2) easily understood machine/apparatus/system name and number
 - (3) date
 - (4) printed name and signature, of person applying tag
 - (5) list of authorized operators who can operate the apparatus.

BACK OF DO NOT OPERATE TAG

**AUTHORIZED
OPERATORS**

<u>NAME</u>	<u>BNL PHONE</u>	<u>HOME PHONE</u>	<u>AUTHORIZED</u>
1. _____			
2. _____			
3. _____			
4. _____			
5. _____			
6. _____			

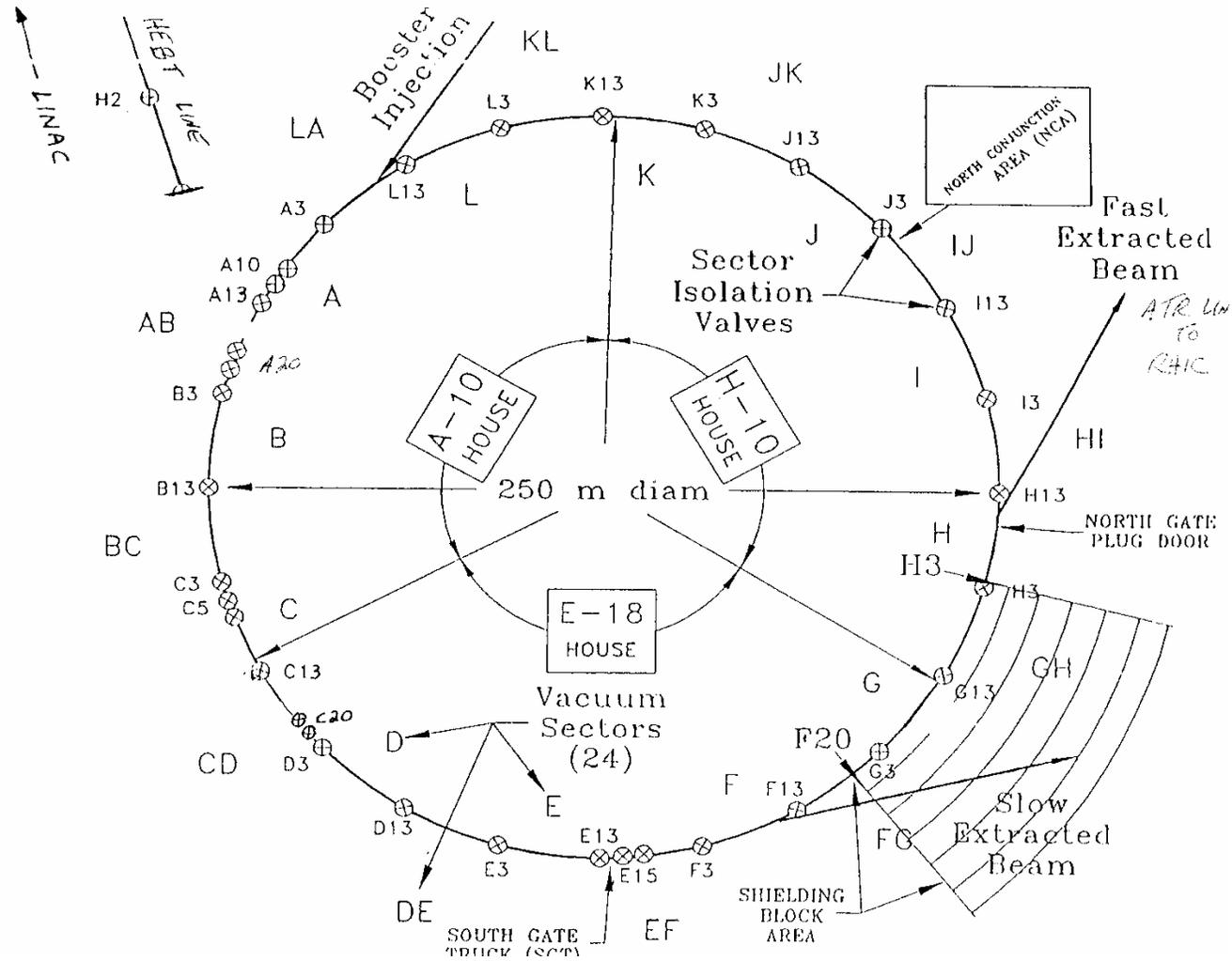
C-A OPM 2.13

REMEMBER!

- The use of a DO NOT OPERATE or CAUTION tag shall never be implemented in place of LOTO for personnel safety.
- Any LOTO always takes priority whenever a LOTO and a DO NOT OPERATE, and/or CAUTION tag, are on the same device at the same time.
- The DO NOT OPERATE or CAUTION tags are for machine / apparatus / system protection, or to provide information ONLY, and shall never be used for personnel protection.

So now that you know about **HOLD** and **CAUTION** tags, let's take a tour of where you will be placing them.

AGS



GETTING THERE



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AGS EQUIPMENT HOUSES

- **A-10 HOUSE (K14-C-13) KL - C**
- **E-18 HOUSE (C14-G13) CD - G**
- **H-10 HOUSE (G14-K13) GH - K**

**ALL ARE PRETTY MUCH
THE SAME**

H-10 HOUSE



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A-10 HOUSE



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Pump, Gauge and Turbo Controllers



A10 EQUIPMENT HOUSE

Vacuum Rack AC Disconnects



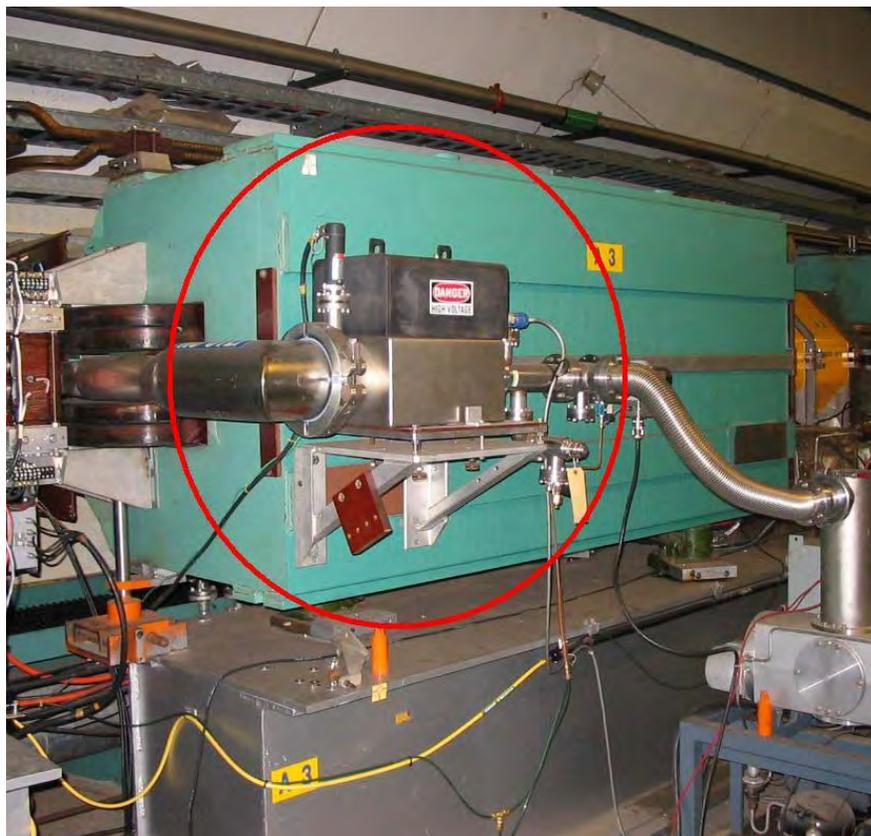
WARNING

Ion pump controllers present an electrocution hazard (7500 Vdc max, 400 mA max). Failure to comply with the ion pump controller manufacturer's instructions may result in injury.

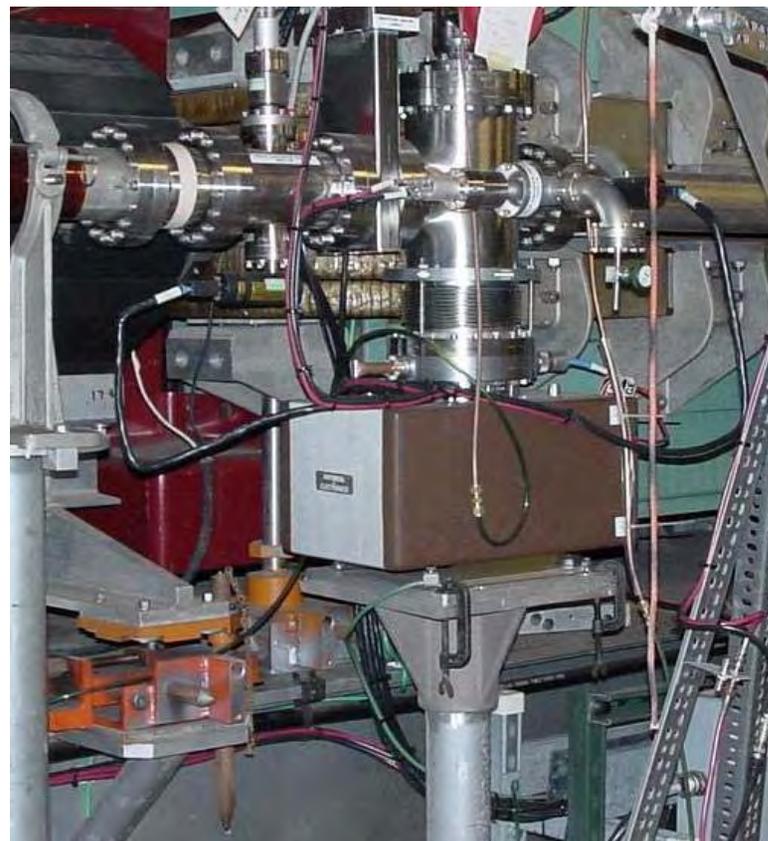


EXAMPLES OF ION PUMPS

AGS



AtR LINE



C-A VACUUM SYSTEMS

Working On Ion Pump Cable

When pump or cable maintenance is required, and there is the potential for exposed voltages, the ion pump cable must be LOTO in accordance with C-AD OPM 2.36 Lock & Tag Program for Control of Hazardous Energy.

C-A VACUUM SYSTEMS

Working On Ion Pump Cable

- Before disconnecting any cable, inspect the cable, connector, and strain relief for damage or degradation.
- If the cable/connector is damaged, **STOP**.
 - Do not continue to disconnect the cable.
 - Report the problem to your supervisor or cognizant engineer (Steve, Loralie, or Doug).

C-A VACUUM SYSTEMS

Working On Ion Pump Cable

- There is a specific procedure for ion pump cable repair, to be performed only by trained individuals.
 - C-AD OPM 15.5.72 Procedure For C-AD Vacuum Ion Pump Maintenance Or Cable Repair
- Only authorized, trained individuals within the group can verify deenergization of the hazardous energy.
- These individuals are listed on the Electrical Energized Work Permit for voltage verification.
 - Currently, Loralie, Doug, Dave and Victor are authorized to work on energized electrical equipment.

When Venting a Sector

The bleed-up of a sector for work on equipment other than ion pumps will not expose a worker to high voltage from the ion pump. To protect the pumps from being damaged by operation at high pressures (above $1e-5$ Torr), a Do Not Operate tag is used. A Do Not Operate tag allows only authorized individuals to operate the equipment.

RHIC / ATR / NSRL

When Venting a Sector

- Turn off high voltage to ion pump through the front panel, leaving the controller in LOCAL control mode. Each controller operates two pumps. Be sure to select the correct pump by checking the cable label.
- Unplug the Fischer high voltage connector from the rear of the controller.
- Complete the Do Not Operate tag information in accordance with C-AD OPM 2.13.
- Apply tag to ion pump cable and proceed with sector bleed-up.

RHIC / ATR / NSRL When Venting a Sector

- Following pump down, remove Do Not Operate tag from cable.
- Re-connect cable to controller.
- Turn on high voltage.
- Restore controller to Remote mode.
- Destroy tag.

AGS & BOOSTER

When Working On Ion Pump Cable

- Write out a HOLD tag & log into book.
- Turn off high voltage to ion pumps through the front panel, leaving the controllers in LOCAL control mode.
- Wearing the proper PPE throw the disconnect switch off.
- Hang your HOLD tag.
 - AGS - Remove Kirk key & attach HOLD stub to key.
 - BOOSTER - As there is no Kirk key, you must attach a lock.
- Use OPM 15.5.72 procedure.

PPE CHART

(partial table copied from SBMS)

Table 1. Hazard Risk Category Classifications			
Equipment	Voltage	Ampere [Notes 3 and 4]	BNL PPE Rating
In all cases, if there is a label on the equipment that lists required PPE, you must use at least that PPE.	Less than 600 V		Example is Light and Power panels fed from 30-KVA transformers only require safety glasses.
Circuit Breaker Panels or Disconnect Switches operating at less than or equal to 240 V and rated less than or equal to 225	Less than or equal 240 V	Less than or equal 225 A	NFPA 70E Cat. 0 PLUS leather palm gloves
Circuit Breaker Panels or Disconnect Switches (excluding 277 V wall light switches) operating more than 240 V and rated less than or equal to 225 A	More than 240 V	Less than or equal 225 A	NFPA 70E Cat. 2 (8 Cal/cm ²)
Circuit Breaker Panels or Disconnect Switches operating at less than or equal to 240 V and equipment rated greater than 225 A	Less than or equal 240 V	Greater than 225 A	NFPA 70E Cat. 2 (8 Cal/cm ²)

Protective Clothing Characteristics

(Table copied from SBMS)

NFPA Cat.	PPE Required
	PPE as listed on the cover of the panel. An analysis of the available arc flash energy has been performed and PPE required is specific to this device, but in all circumstances you will require safety glasses with side shields.
0 +	BNL is increasing the NFPA 70E Cat. 0 required PPE (i.e., non-melting, flammable natural materials (untreated 100% cotton, wool, rayon ² , or silk, or blends of these materials with a fabric weight of at least 4.5 oz/yd ²) long-sleeve shirt and long pants) PLUS leather gloves (minimum leather palm with cotton back: BNL # K62980), and safety glasses with side shields. (Cal/cm ² N/A)
2	Cotton underwear and FR long-sleeve shirts and FR long pants, hardhat with arc rated face shield: BNL # K64942 (protective storage bag for face shield and hat: K64793), safety glasses, all leather gloves: BNL # K62902, leather work shoes, and hearing protection. (Cal/cm ² 8) (Cotton underwear not required with 8 Cal/cm ² FR long-sleeve shirts and FR long pants)
4	Cotton underwear plus FR shirt and FR pants plus multilayer flash suit, hardhat, safety glasses, Flash Suit hood, hearing protection, leather gloves, and leather work shoes. (Cal/cm ² 40)

Category 0+ PPE

- Circuit Breaker Panels or Disconnect Switches operating at less than or equal to 240 V and rated less than or equal to 225A are considered NFPA Category 0+.
 - BNL is increasing the NFPA 70E Cat. 0 required PPE (i.e., non-melting, flammable natural materials (untreated 100% cotton, wool, rayon, or silk, or blends of these materials with a fabric weight of at least 4.5 oz/yd²) long-sleeve shirt and long pants) PLUS leather gloves (minimum leather palm with cotton back: BNL # K62980), and safety glasses with side shields. (Cal/cm² N/A).
- Safety glasses for electrical work must be all plastic. Metal framed glasses are no longer allowed.

AGS & BOOSTER

When Working On Ion Pump Cable

If a cable is being disconnected because of a component change (for example, a chamber swap in AGS) you should boot the connector at the pump end using a plug lockout device.

AGS & BOOSTER

When Venting a Sector

- Write out a CAUTION DO NOT OPERATE tag.
- Turn off high voltage to ion pumps through the front panel, leaving the controllers in LOCAL control mode.
- Wearing the proper PPE throw the disconnect switch off.
- Hang your CAUTION DO NOT OPERATE tag.

BOOSTER

- The Booster power supplies are located in the LINAC building 930 on the second floor, known as 930UEB.
- This summer (2008) the ion pump power supplies will be the same as AGS and RHIC.
- The main disconnect differs from AGS in that there is no Kirk key on the disconnect.

AtR (AGS to RHIC) LINE

- AtR consists of U, V, W, X, and Y Lines.
- U & V line ion pump controllers are located in the “A” trailer, behind building 912 on the north side
- Controllers for W, X, and Y are in building 1000-P (behind 919A).
- Controllers fed by circuit breakers, not fused disconnect switches.

RHIC

- Ion pump controllers are located in each of these 6 service buildings: 1002B, 1004B, 1006B, 1008B, 1010A, & 1012A.
- All controllers are fed from circuit breakers
- Controllers typically control one pump on the Blue beamline and one pump on the adjacent Yellow beamline.
- Typically, individual cables are locked out using a lockout device.

NSRL (NASA, or R-Line)

- The first 2 ion pumps are controlled from 930UEB.
- The remaining 8 ion pumps are fed from power supplies located in the upstairs mezzanine of building 957 (behind LINAC).
- Controllers in 957 are fed by circuit breakers.

LINAC

no more needs to be said



Closing Comments

- **IF AT ANY TIME** you are unsure of the required PPE, procedure, work planning, etc., **STOP** what you're doing and talk to Steve.
- Always make sure you are using the latest version of the procedure. Requirements can change.

And most important of all

REMEMBER THIS :

**HEY ...
BE CAREFUL OUT THERE!**

