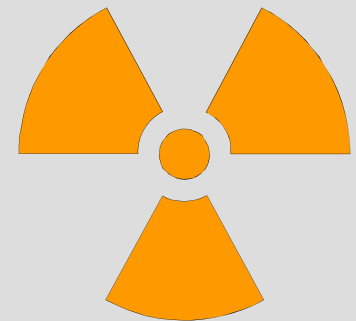


Irradiator Technology H-315

Session 13 Emergency Procedures

Required by Regulations
10CFR36.53





Emergency Procedures

- Source stuck in the unshielded position
- Personnel overexposure
- Radiation alarm from the product exit portal monitor or pool monitor
- Detection of leaking sources, pool contamination or alarm caused by contamination of pool water.



Emergency Procedures

- A low/high water level alarm, an abnormal water loss or leakage from the source storage pool
- A prolonged loss of electrical power
- A fire alarm or explosion in the radiation room
- An alarm indicating unauthorized entry into the radiation room, area around or another alarmed area



Emergency Procedures

Natural phenomena, including an earthquake, tornado, flooding or other phenomena as appropriate for the geographic location of the facility

- Product totes or carriers jam
- Accident without exposure (Not in 10CFR36.53)
- Demonstrators (Not in 10CFR36.53)

Radiation Level

If any unexplained audible alarm sounds, immediately lower the source to the bottom of pool. Call the radiation safety officer (RSO at 4492). The RSO will then monitor the surrounding areas with a survey meter to determine the cause of the alarm.

- A) If the cause can be immediately ascertained and controlled, first control the cause then reset the alarm system. Update the incident book.
- B) If the cause cannot be immediately ascertained and controlled, the RSO determines the actions to be taken based on a review of the monitoring systems, survey meter readings and machine status.

Emergency actions taken are based on limiting radiation doses to atomic radiation workers (ARW) to 5 rem and other employees to 0.1 rem during the course of the emergency.

Emergency actions include but are not limited to: evacuation of personnel, erection of barriers and temporary shielding, contact NORDION INTERNATIONAL (613) 592-2790 if necessary.

If the occurrence results or is likely to result in the receipt by any person of a dose of ionizing radiation in excess of any dose specified in respect of such person in the National Regulations, report such occurrence to the Nuclear Regulatory Commission. (Tel: xxx-xxx-xxxx)



Demonstrators

Should demonstrators block entrance to the CIC or rush into the CIC, contact Monique Cadieux immediately at 4325. She will then call the police at 911 or 662-4240 (Laval Police Station).

Make sure that all access to the irradiator storage area are closed and locked. Call the operator at 4493 to let him know of what is happening, Also call the barrier guard at 4209 to direct the police to the proper area .

This is not a 10CFR36.53 Requirement

Radiation Overexposure

A) Victim unconscious

- 1) If the victim is unconscious from an overexposure or a suspected overexposure, immediately call an ambulance at 911 and tell the driver to take the victim to the designated Hôpital . Call the hospital at Tel: xxx-xxx-xxxx, explain the problem and request that Dr. X or Dr. Y be notified and requested to come to the hospital. (Before the victim is taken away, a survey should be performed to ensure that the victim's clothing is not contaminated)
- 2) Following the action in 1), immediately call one of the following:

Personnel	Home	Work
Philip Vastopoulos	(514) ***-****	4492
Yves Doyle	(613) ***-****	4490

The person contacted will notify the Nuclear Regulatory Commission (Tel: xxx-xxx-xxxx) and explain the circumstances of the accident. NORDION INTERNATIONAL, Kanata, Ontario will also be notified (613-592-2790).

- 3) Escort the victim to the hospital, either in the ambulance or in your car.

Radiation Overexposure (continued)

B) Victim conscious

- 1) If the victim is conscious after an overexposure or a suspected overexposure, immediately call one of the following:

Personnel	Home	Work
Philip Vastopoulos	(514) ***-****	4492
Yves Doyle	(613) ***-****	4490

If none of the above can be reached on the first try, call Health Service (9h-17h) at 4296. The nurse will take the victim to the designated Hospital. Call the hospital at Tel: xxx-xxx-xxxx, explain the problem and request that Dr. X or Dr. Y be notified and requested to come to the hospital. (Before the victim is taken away, a survey should be performed to ensure that the victim's clothing is not contaminated).

If there is no answer at 4296 on the first try, call the Hôpital as above and take the victim there.

Radiation Overexposure (continued)

- 2) If one of the above-mentioned persons is reached, take the actions directed. Actions may include the following:
 - i) Take the victim to the designated Hospital in your own car.
 - ii) Call for an ambulance at 911.
 - iii) Call Health Service (9h-17h) at 296.
 - iv) Call the Hospital [Tel:xxx-xxx-xxxx](tel:xxx-xxx-xxxx) to tell them to expect the victim and notify Dr. X or Dr. Y.
- 3) Call the barrier guard if necessary to direct the ambulance to the proper area

The person contacted will notify the Nuclear Regulatory Commission (Tel: xxx-xxx-xxxx) and explain the circumstances of the accident. NORDION INTERNATIONAL, Kanata, Ontario will also be notified (613-592-2790).

Fire

A) Fire outside of irradiator (warehouse area)

- 1) Stop the irradiator, activate the closest fire alarm actuator, and leave the area.
- 2) Wait for the firemen to come and ensure that they do not enter the irradiator. Under no circumstances, should the firemen enter the irradiator.

Fire (continued)

B) Fire inside of irradiator

- 1) Push STOP button on the control console and activate the closest fire alarm actuator. Make sure that the source has reached the bottom of pool before leaving the area. Also confirm that the ventilation fan has been automatically turned off. If not, push STOP button of the fan control box.
- 2) Immediately contact one of the following:

Personnel	Home	Work
Philip Vastopoulos	(514) ***-****	4492
Jeannot Proulx	(514) ***-****	4493
Yves Doyle	(613) ***-****	4490

The person contacted will then come to assist the firemen if it is necessary to enter the interim and pool area. It is imperative that the firemen be preceded, while entering the irradiator, by one of the above persons who will be carrying radiation detection equipment.

Fire (continued)

- 3) Firemen and one of the above person will assess situation carefully before entering the irradiator and use of the internal sprinkler system and/or portable fire extinguisher should be considered. (Care should be taken not to spray the survey meter).
- 4) Also, plywood or boxes could be used to obstruct the product ports.
- 5) Notify the Nuclear Regulatory Commission (Tel: xxx-xxx-xxxx) and NORDION (613) 592 2790.

Contamination

In the event of any indication of contamination by any of the monitors or from routine leak tests, close down the facility, restrict entrance and quarantine all products in the suspected area. Contact one of the following:

Personnel	Home	Work
Philip Vastopoulos	(514) ***-****	4492
Yves Doyle	(613) ***-****	4490

NORDION INTERNATIONAL, Kanata, Ontario shall be notified (613 - 592-2790). The person contacted should immediately advise the Nuclear Regulatory Commission that an incident is suspected and that safety measures are being implemented.

Safety measures include but are not limited to the following:

1. No immediate attempt shall be made to clean up the contamination.
2. All windows shall be closed; fans, water filtration plant and air conditioners shall be shut off; and everyone shall leave the facility.
3. All doors shall be closed and locked.

Contamination (continued)

4. All personnel who may have been contaminated shall be thoroughly tested for contamination and immediate steps taken to remove any radioactive contamination.
5. Entrance to the facility (or contaminated area) shall be prohibited except to authorized personnel requiring access in the performance of their special duties.
6. Under no circumstances shall any unauthorized or untrained persons attempt to examine or clean up any spilled of radioactive material.
7. Fans or ventilating apparatus shall not be used in an attempt to disperse the radioactive material or its decay products. Such a manoeuvre will only disseminate the radioactive contamination through-out the area.
8. If contamination is found outside of the irradiator, demarcate the area with magenta/yellow rope and radiation warning signs.
If necessary, NORDION INTERNATIONAL will provide emergency equipment and will dispatch a group of radiation specialists to institute corrective

Stuck Source Rack

For any malfunction in the cell, personnel safety is maintained if the source can be lowered into the pool by normal means or if the personnel do not enter the cell.

In order to establish that the source rack cannot be returned to its storage position the following checks must be conducted by the Radiation Safety Officer. No attempt to enter the cell should be made

1. Check source up and source light for proper operation at the control console.
2. Check all safety interlock responses to determine on what fault the machine shut down, if any.
3. Dump the air in the source pass by pressing the red emergency button on the control console (this procedure varies with different units.)
4. Press the test button on the control console (if the monitor alarms then the source is exposed)

Stuck Source Rack (continued)

5. Go onto the roof and check the source down switch on the source hoist for proper operation.
6. Check radiation levels at known hot spots to see if levels are different from the last survey.
7. Check source cable for slack; if any, pull the slack cable by retracting the cylinder by hand and make sure the cable is in the sleeves and pulleys where it belongs.

WARNING:

IF THE SOURCE RACK REMAINS STUCK IN THE EXPOSED POSITION FOR A PROLONGED PERIOD OF TIME, WITHOUT PRODUCT MOVING, THERE IS DANGER OF FIRE DUE TO PRODUCT OVERHEATING. THIS DEPENDS ON THE QUANTITY OF COBALT PRESENT AND THE PHYSICAL CHARACTERISTICS OF THE PRODUCT AND PACKAGING MATERIALS.

Stuck Source Rack (continued)

8. Measure length of piston outside of cylinder body and multiply by six to obtain position of source rack in the irradiation chamber.
9. Before any further actions are taken, the Radiation Safety Officer will notify NORDION INTERNATIONAL in Kanata (613-592-2790).
10. Notify the Nuclear Regulatory Commission (Tel:xxx-xxx-xxxx).

Experiences:

Bad Source Hoist Cable or Guide Cable

Bad Totes or Carriers

Electrical tape on guide cable!!

Brass dust at cable nulleys

Accident Without Exposure

- A) If the victim is not in serious condition, contact Health Service (9h to 17h) at 296. The Institute nurse will come immediately and if necessary will take the victim to the hospital.
- B) If the victim is in serious condition and needs immediate treatment, call an ambulance at 911. Also call Health Service (9h to 17h) at 4296 for assistance. The barrier guard should also be contacted, if necessary, at 4209, to direct the ambulance to the proper area.

This is not a 10CFR36.53 Requirement

Low Water

If the low water alarm turns on, immediately lower the source to the bottom of the pool. Call the Radiation Safety Officer (RSO) at 4492, who will supervise the following procedures:

- 1) On PLC, verify all the inputs from the float switch (very high, high, low, very low).
- 2) Verify if make-up valve at the pump is open. If not, open it.
- 3) Water can also be supplied through the deionizer and chiller pipes.
- 4) At the last resort, the sprinkler system could be used taking the inlet water from the city instead of from the pool.

If it appears that the problem is due to a crack in the pool, call NORDION at (613) 592-2790. Also advise the Nuclear Regulatory Commission at (Tel:xxx-xxx-xxxx).

Natural Phenomena

- 1) In case of any natural phenomena, such as earthquake or tornado, shut down the irradiator immediately by pressing the emergency stop button and contact one of the following individuals as soon as possible after the event:

Personnel	Home	Work
Philip Vastopoulos	(514) ***-****	4492
Jeannot Proulx	(514) ***-****	4493
Yves Doyle	(613) ***-****	4490

- 2) The individual contacted will perform a radiation survey of the biological shield along with a visual inspection of the building and pool structure.
- 3) Radiation survey results and pool water make up quantity will be compared with previous records.
- 4) If any deficiency is discovered, all operation will be suspended immediately and one of the above persons will notify the Nuclear Regulatory Commission (Tel:xxx-xxx-xxxx and NORDION INTERNATIONAL (Tel: 613) 592-2790.



Product Carrier Jam

A) Carrier jam in warehouse

- 1) Push the closest emergency stop button.
- 2) Wait for the air pressure from the cylinders to reduce.
- 3) When satisfied that the jam has been cleared, reset the emergency stop and watch closely to make sure that carrier/cylinder movement is normal.

Product Carrier Jam (continued)

B) Carrier jam in irradiation chamber

- 1) If the irradiator did not stop on a source pass fault or an overdose fault, stop the machine.
- 2) Press the emergency stop button on the console to remove air from cylinders.
- 3) Enter irradiator through normal procedure.
- 4) When satisfied that jam has cleared, reset the emergency stop button.
- 5) Before resuming operation, make sure that carriers in source pass are at the right position (i.e. no position was skipped in maintenance manual).
- 6) Update the irradiator log book .
- 7) **Two qualified people are required to clear a jam.**

Loss Of Power

In case of a prolonged loss of electrical power, the facility RSO will ensure that the following is performed:

- 1) “NORTRACK” must be turned off.
- 2) Since the air in the product door cylinders leak and make entry through the product inlet or outlet door possible, plywood or product boxes should be used to prohibit entry into the irradiator.
- 3) Warning signs should also be posted at the product doors to warn personnel.
- 4) Before re-start of the irradiator the interim area must be cleared (actual inspection).

Unauthorized Entry

In case of any unauthorised entry into the cell:

- 1) Call the RSO, irradiator should already be stopped, if not immediately press the stop button.
- 2) The RSO or Operator should investigate and make sure no one is inside, if so (possibility of overexposure? follow emergency procedure for overexposure!)
- 3) Reset locally (when photosensors are triggered they are resetted manually from inside the cell) once the cause is known.