

Facsimile Header Sheet

U.S. ARMY
Communications-Electronics Command
Safety Office



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TO: *Charlie Amato,*

*SOP for Pool Irrad.,
as requested.*

HB

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SOP Number 10-10

STANDARD OPERATING PROCEDURE
FOR THE USE OF THE
Co-60 UNDERWATER IRRADIATOR

1. Purpose: To provide a procedure for use of the Co-60 underwater irradiator in Building 9401.
2. Scope: This procedure applies to authorized personnel of the CECOM Safety Office (CSO), Radiological Engineering Branch and Night Vision Electronic Sensor Directorate, Buildings 9401 and 9010A.
3. Reference(s):
 - a. NRC License Number 29-01022-10.
 - b. CSO Lab SOP Number 40-01, Use of Canberra 35 Plus MCA.
 - c. CSO Lab SOP Number 40-04, Use of Canberra Model 2404 Low Background Alpha/Beta counter.
4. Discussion: The Co-60 underwater irradiator contains a total of 110 rods configured in two rings, one ring mounted on top of the other. Within each rod is a sealed Co-60 source that emits gamma radiation which is used to irradiate items for research and development. The source(s) are stored/used in their fixed configuration at the bottom of the 50,000 gallon pool. The total activity of the 110 rods in September 1994 was approximately 4,790 curies. The sealed Cobalt 60 sources (AECL Model C-133) are encapsulated sealed sources of Curtis-Wright Drawing Number D700129F.
5. Approved Operator: Before an individual is permitted to operate the irradiator he must be trained and pass the operators test. Training shall be conducted by the Radiation Protection Officer (RPO), his designee or the Radiation Area Supervisor. Training shall consist of the following topics:
 - a. Fundamentals of radiation protection applied to irradiators, external radiation, radioactive contamination, units of radiation dose, NRC dose limits, the proper use of survey meters and dosimeters, and safety features of the underwater irradiator.
 - b. The requirements of 10 CFR Parts 19, 20, 21, 30 and 36.
 - c. This SOP, reading and discussion.

d. Operation of the irradiator, hands-on and study.

Upon completion of training, the operator must pass a written test (see attached example). Results of the test will be maintained on file.

6. Procedures:

a. Pre-Operation Set-Up.

*****NOTE*****

AT NO TIME IS AN INDIVIDUAL ALLOWED TO USE THE
Co-60 UNDERWATER IRRADIATOR WITHOUT APPROVAL OF
THE RADIATION AREA SUPERVISOR!

*****NOTE*****

(1) Report to the Radiation Area Supervisor for a briefing. Topics normally covered in the briefing will be proposed use of the irradiator, operation of the "fishing line" and pole used to lower sources into the pool and exposure times for intended use.

(2) For normal operation of the underwater pool irradiator, no dosimetry is required. Dosimetry is required during emergency situations. The dosimetry custodian will provide dosimeters to all emergency personnel as required. Dosimetry service is provided by the U.S. Army Ionizing Radiation Dosimetry Center (USAIRDC) at Lexington-Blue Grass Army Depot. A copy of the USAIRDC certificate of NVLAP accreditation is retained on file by the dosimetry custodian.

(3) An appropriate survey meter is required for entrance into the pool area. Perform the following checks of the survey meter:

- (a) Visual Inspection.
- (b) Check the DA Label 80 to ensure survey meter is in calibration.
- (c) Batteries checked.
- (d) Passed a functional operation test with a radioactive source.

b. Operation of Cobalt-60 Underwater Irradiator.

(1) Ensure pool room radiation levels are safe to work in. This can be done by reading the Eberline RMS II monitor located in the administrative area and/or using the hand held survey meter taken into the pool room. Readings are typically less than 0.2 mR/hr throughout the pool room.

(2) Tie the item to be exposed to the end of the "fishing line" on the pole. If the item is to be kept dry, insert the item into a sealed container.

(3) Align the pole over the pool, vertically center the item over the Co-60 source.

(4) Loosen the control wheel on the pole, this will release the hold on the "fishing line." Lower the item to be exposed into the pool. Exert braking action on the reel by hand.

(5) Stop the reel when the green marks on the pole and the "fishing line" are aligned. The item is now being exposed. Tighten the control wheel to lock the item in place.

(6) After the planned exposure time, crank the "fishing line" up and out of the water. Swing the pole to the edge of the pool and remove the exposed item.

c. Post Operation Procedures.

(1) Ensure the pole and "fishing line" are secured.

(2) Exit room, and return the survey meter.

7. Pool Water Purity: The water purification system runs continuously to maintain a low corrosion environment for the Co-60 sources. Conductivity readings below 10 microsiemens (micromhos) are required. The Radiation Area Supervisor maintains a logbook to record these readings.

8. Leak Testing Procedure: At present, an on-line radiation monitor is used to monitor the resin filter on the pool water recirculating system on a continuous basis. In addition, on a semi-annual basis, CECOM Safety Office will analyze the pool water in one of the following manners:

a. Collect a representative sample (450 milliliters) of pool water.

b. Transfer the sample to a Marinelli beaker.

c. Analyze the sample on the MCA located at the CECOM Safety Office Radiological Engineering Laboratory (Refer to SOP Number 40-01). Report results as pCi of Co-60/milliliter of pool water. Clean tap water will be used as a background.

OR

d. Collect a representative sample (450 milliliters) of pool water.

e. Boil off a majority of the volume under stable conditions in a pyrex beaker. Transfer the remaining sample to a planchet and boil off the remaining liquid.

f. Allow the planchet to cool.

g. Analyze the planchet on a low background alpha-beta proportional counter (Refer to SOP Number 40-04). Report results as pCi of Co-60/milliliter of pool water. Clean tap water will be used as a background.

9. Reporting of Leak Test Results:

a. After analysis is completed IAW paragraph 8 above, the data will be reviewed by the CSO RPO or his designee.

b. If any radioactivity above the background sample is detected, the CSO will determine if the radioactivity is due to a leaking source. Any source found to be leaking will be removed from service. A report of a leaking source shall be made to the NRC within 5 days of the date that leak test results are known.

10. Change-out of the Resin Filter Cartridge:

a. The Radiation Area Supervisor will notify the CSO RPO that the resin filter cartridge has been replaced.

b. Upon notification of the change-out, the CSO RPO or his designee will analyze a sample of the resin from the filter on the Canberra 35 Plus MCA (see reference 3b) or equivalent. Clean resin will be used as a background sample.

c. If any radioactivity above the background sample is detected, the CSO will determine if the radioactivity is due to a leaking source. Any source found to be leaking will be removed from service. A report of a leaking source shall be made to the NRC within 5 days of the date the results are known. In addition, the resin filter will be maintained as radioactive waste and disposed of IAW AR 385-11.

11. Emergency Procedures:

a. Report any radiation levels greater than twice background to the Radiation Area Supervisor.

b. If the water level in the pool should suddenly start to fall faster than the normal refill spigot can replace the water, notify the fire department. The Fort Monmouth fire department will attach a fire-hose to the 2" fill pipe. Water from the fire hydrant will keep the pool water at the normal level until the problem is corrected.

c. Isolation of leaking sources are to be handled in accordance with the SOP (titled Isolation of Leaking Source(s) in the Pool Irradiator, see attached) included in the original license request dated 7 April 1988.

d. EMERGENCY PHONE NUMBERS:

- Radiation Area Supervisor - X45443, X45683
- Fire Department - 911
- Police - 911
- Ambulance - 911
- CECOM Safety Office - X43112
- NRC Emergency Notification - (301) 816-5100

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STANDARD OPERATING PROCEDURE
for the
ISOLATION OF LEAKING SOURCE(S)
in the
POOL IRRADIATOR

1. Lower the eleven isolation containers, with their pumping hose in place, into the bottom of the pool irradiator.
2. Place up to ten of the irradiator sources into each of the isolation container(s) using the emergency source manipulators. Close and seal the isolation container(s).
3. Using the pump provided, evacuate the water from the container(s). Return the collected water to the pool.
4. Pump fresh water into the isolation chamber(s) and let stand for 24 hours.
5. Pump out the water from the isolation chamber(s), collect the chamber water at the pump outlet, and analyze for the presence of Cobalt-60.
6. Once a given group of sources has been identified as leaking, remove all non-leaking sources from the isolation chamber(s) and return them to the source holder.
7. Take the container holding the leaking source, place one source each in an isolation chamber, and repeat steps 2 through 6 to isolate the leaking source.
8. Leaking sources will remain in the isolation containers, at the bottom of the pool, until proper radioactive waste disposal can be arranged.

OPERATORS TEST FOR
UNDERWATER IRRADIATOR (POOL)

1. Do gamma rays induce radioactivity? Y or N
2. The dose rate in the two source rings at the bottom of the pool is approximately 7 rads tissue per second. If you were placed there, how long would it take to receive a lethal dose?
3. Before using a survey meter, list 3 checks you should perform.
 - a.
 - b.
 - c.
4. Are TLD whole body dosimeters required when operating the pool source?
Y or N
5. If one of the Co-60 rods leaks/breaks, how will the operator know about it?
6. Briefly describe the significance of the "green marks" on the "fishing line" and pole.
7. Should you accidentally fall in the pool, would you become contaminated?
8. While operating the irradiator, you've noticed that the radiation levels in the room have increased by more than a factor of 2, what action should you take?
9. If the water level in the pool should drop faster than the normal refill spigot can replace the water, what action should you take?
10. Who should you report to before using the pool?