

ADVANCED MEDICAL SYSTEMS OPERATING PROCEDURE

SOURCE TRANSFER OUT OF HOT CELL AND SOURCE CALIBRATION

ISP-27 Rev. 1/95

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- 1.0 PURPOSE: To ensure that sources are safely transferred between the various containers and storage areas in the Isotope Shop Area.
- 2.0 PRECAUTIONS AND LIMITATIONS:
 - 2.1 This procedure is to be used whenever sources are transferred between the Hot Cell, transfer monster, exchange container(s) or calibration head.
 - 2.2 This task should be performed under a RWP.
 - 2.3 This work requires individuals to work in the Isotope Shop Area. All individuals should be made aware of the radiation and contamination levels in various parts of this area so as to maintain personnel exposure ALARA.
 - 2.4 Personnel should be aware of the extremely high potential dose from an unshielded source and should be conscious of collimated beams emitted from shielded containers during the transfer process.
 - 2.5 This procedure should be followed carefully and deliberately to minimize potential over exposures.
 - 2.6 Individuals should be thoroughly familiar with the equipment used in this procedure. Practice runs using 'dummy' sources is mandatory before transfer of live sources is attempted.

Prepared by: Robert Meschter

Approved by: *R Meschter*

Date: 1-24-95

3.0 INSTRUCTIONS:

3.1 Contamination Control

- 3.1.1 All equipment that the source should come into contact with should be cleaned prior to use.

3.2 Source Transfer Between Cell and Transfer Monster (TM)

3.2.1 Source storage in Hot Cell wall.

- a. Insert from lab side one-3 source holder, top up, holes vertical, with disc in hole to be used, pinned to chromed extension, (2 pinhole side toward lab) pinned to hook pin rod.
- b. Insert so that hook pin is just vertical inside the Hot Cell wall. Slanted area to be vertical and slanted left to right.
- c. Using wooden hook tool, push rod assembly into the Hot Cell so that source may be placed in the holder cavity that contains the disc.
- d. Insert source, threaded side up.
- e. Pull assembly back into Hot Cell wall with the wooden hook tool.
- f. Post written note in Lab and Cell Control Area as to source serial number and cavity location.

3.2.2 Hang Transfer Monster on Hot Cell wall.

- a. Monster must be hanging square on the lift truck forks.
- b. Chains must be of equal lengths.
- c. Hooks must be in the same direction.
- d. The Cell chute will be in alignment with the bottom TM rod.

NOTE: TM has two (2) rods in it. They are both lead filled for shielding purposes. It is important that once a source is trapped in the TM, these rods are not removed. High radiation beams could result.

3.2.3 Insert top TM rod into TM so that center cavity is in vertical position. Note the red alignment marks on the TM and rod.

3.2.4 Align the rod pin hole with the innermost hold on the TM chute. This will place the center cavity in alignment with both TM push rods (top and bottom).

3.2.5 Screw extension onto lower TM push rod. When three (3) pinholes in push rod are showing, pin the top hole.

3.2.6 In this position, the push rod is clear of the TM lower rod.

NOTE: Pin in middle hole will lock TM lower rod but allow TM top rod to move. Pin in lower hole will lock both top and bottom TM rods.

3.2.7 Insert lower TM rod (note red alignment marks with hook barb pointing to the right) and hook onto rods in the Hot Cell wall.

3.2.8 Pull out on bottom rod until the chrome extension is visible.

3.2.9 Align the clear hole in extension (not the hole with the peg in it) with one (1) of the three (3) holes on the TM chute.

NOTE: Whichever TM chute hole is in alignment, means that the corresponding holder cavity is directly above the TM push rod.

3.2.10 Push upward on push rod to move the source into the upper TM rod. To avoid trapping the disc, drop the push rod 1/4 to 3/8 inch.

- 3.2.11 Pull upper TM rod out (towards operator) one (1) hole (#2 position) and pin it. This traps the source in the TM.
- 3.2.12 Verify that the disc has not been trapped by pushing the rod up. If the middle hole will not align, the disc is on top of the push rod and not under the source.
- 3.2.13 Reinsert TM lower rod into the TM by utilizing hook section (hook rotated 90° so hook will not engage).
 - a. Push in so that the outer pin holes line up.
 - b. The source holder and extensions are now back in Hot Cell wall.
- 3.2.14 Attach eyebolt to the end of the TM upper rod. Pin the lower TM rod through this eyebolt (lower TM rod should extend three (3) inches beyond the upper TM rod).

NOTE: It may be necessary to pin the upper TM rod in the #3 position to allow the bolt to pass into the lower TM rod. The source is located on the same side of the TM as the radiation symbol (decal).

- 3.2.15 Remove the lower push rod extension.
- 3.2.16 Lift TM off the wall using the lift truck.
- 3.2.17 Lock hand crank into position so that the TM rods are parallel to the floor.
- 3.2.18 Transfer TM to the hoist.
- 3.3 Source Transfer between TM and Source Exchange Container
 - 3.3.1 Verify that the TM rods are pinned into place.
 - 3.3.2 Remove lower TM push rod.
 - 3.3.3 Rotate TM to be 90° to Source Exchange Container (SEC).
 - 3.3.4 Using proper adapter, mate TM to SEC.

- 3.3.5 Lay clean paper or plastic on floor.
- 3.3.6 Individual performing exchange should wear disposable head cover in addition to other protective clothing.
- 3.3.7 Align the lower TM rod with the push rod (pin hole with innermost alignment hole). Remove pin so that the pin will not drop onto person.
- 3.3.8 Insert two (2) SEC push rods (dark iron first then stainless/chrome second).
- 3.3.9 Put handle in second hole from bottom.
- 3.3.10 Push SEC push rod into lower TM rod.
- 3.3.11 Rotate SEC push rod 90° so that the bar end of the handle is locked on the I-beam base of SEC and the rod will not drop down.
- 3.3.12 Push the upper TM rod into alignment and drop the source into SEC.
- NOTE: Use a survey meter to verify that the source has been transferred.
- 3.3.13 Close SEC drawer.
- 3.3.14 Pull upper and lower TM rods partially out of TM and pin.
- 3.3.15 Lift TM off SEC and place on a pallet or designated storage supports. Be certain that the hook does not protrude and become damaged by contact with the floor or other objects.

3.4 Source Transfer between Exchange Container and Calibration Head

- 3.4.1 Put calibration head adapter into SEC (step side up).
- 3.4.2 Using overhead hoist, put head into place on top of SEC. Verify that shutter control switch is off.
- 3.4.3 Insert head plug cord into left side of orange painted receptacle. This will allow the shutter rotor to be electrically opened with the switch.

- 3.4.4 Lay clean paper or plastic on floor.
- 3.4.5 Individual performing exchange should wear disposable head cover in addition to other protective clothing.
- 3.4.6 Open SEC drawer.
- 3.4.7 Energize calibration head to open shutter.
- 3.4.8 Using single push rod, push source into head and engage threads for three and a half (3 1/2) turns.

3.5 Calibration of Source

- 3.5.1 Using overhead crane, lift the calibration head off the SEC and move it to the calibration stand in the Source Storage Garden Area.
- 3.5.2 Attach the three piece bottom adapter to the head and place the head on the calibration stand.

NOTE: Source calibration is performed by electrically opening the head shutter and exposing a probe for a long period of time. Shutter opening and closing is accomplished by utilizing a Gralab timer located near the Isotope Shop well counter. The shutter operating circuit consists of an orange painted receptacle in the calibration stand area, wired to a yellow plug cord in the timer area. The yellow plug must be inserted in the timer outlet receptacle with the switch in the open position. Operation of the timer on/off switch then controls the shutter circuit.

- 3.5.3 Verify that the timer is shut off.
- 3.5.4 Plug the calibration head into the orange receptacle.

CAUTION: If the shutter begins to open, unplug the head immediately.

- 3.5.5 Place the Victoreen 570 meter (or equivalent) on the shop well counter table, plug it in, turn it on and allow meter to stabilize for ten (10) minutes.
- 3.5.6 With no probe in the meter, charge and zero the meter. Insert the probe and twist 1/4 turn. Charge the meter again (this discharges probe). Remove probe from meter.
- 3.5.7 Place the probe in the holder beneath the calibration stand. Again twist 1/4 turn to seat the probe in the holder.
- 3.5.8 All personnel in the Isotope Shop should return to the timer area and remain there until calibration is complete.
- 3.5.9 With the timer control switch off, set the timer for the desired exposure time. Refer to Attachment 1, Counting Time Chart, for recommended times.

NOTE: The timer indicates 15 seconds per revolution of the sweep hand.

- 3.5.10 Turn the timer on.
- a. A red light near the basement door should flash intermittently while the timer is on.
 - b. The calibration head shutter should open.
 - c. The gamma alarm light should change from green to red.

CAUTION: Do not go near the Calibration Area while these indicators are on.

- 3.5.11 Once the timer has turned off and the shutter has closed (verified by gamma alarm green light), retrieve the probe. Charge the meter (to rezero) then insert probe into meter. Record the reading and exposure time.
- 3.5.12 Record at least three (3) short and three (3) long readings. Readings should be consistent with each other.

3.5.13 On a Source Calibration Form, Form ISP-36A, record the following data:

- a. Date, temperature ($^{\circ}\text{C}$), atmospheric pressure, meter S/N, probe S/N, long and short time period, long and short readings, and source S/N.
- b. Submit the form for review.
- c. Pass the form out of the Isotope Shop for calculation of the source output.

3.6 Source Transfer from Calibration Head to Shipping Container

3.6.1 Prepare a source exchange container to receive the source.

- a. Remove top, bottom and drawer covers.
- b. Take smears to verify container is clean.
- c. Screw lifting bolt into top brass plug.
- d. Place container on clean skid in airlock.

3.6.2 Bring container into Isotope Shop using a forklift.

3.6.3 Place clean paper or plastic on steel stand and place container on the stand.

3.6.4 Remove the top plug and insert adapter in container.

3.6.5 Unplug calibration head.

3.6.6 Using the overhead crane, lift the head off the calibration stand and remove the three piece adapter.

3.6.7 Position the calibration head on top of the container. Plug head plug cord into left side of orange painted receptacle.

3.6.8 Lay clean paper or plastic on the floor.

3.6.9 Open SEC drawer.

- 3.6.10 Energize the calibration head to open the shutter.
- 3.6.11 Using single push rod, engage source pin holes and unthread source from head.
- 3.6.12 Drop source into container, verifying transfer with a meter.
- 3.6.13 Close container drawer.
- 3.6.14 Mark container with label and source S/N.
- 3.6.15 Remove calibration head and adapter from container.
- 3.6.16 Replace the top brass plug and secure with lifting bolt. Also secure drawer plug with stop bracket.
- 3.6.17 Smear inside of head rotor assembly to verify that the source is clean.
- 3.6.18 Transfer exchange container to the airlock.
- 3.6.19 Smear exterior of container to verify that it is clean before transfer to other areas. Replace covers.

COUNTING TIME CHART

ATTACHMENT 1

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All short and long counting times are in seconds.

<u>RHM</u>	<u>SHORT</u>	<u>LONG</u>
1000	55	300
1200	50	270
1575	45	240
1800	35	195
2000	30	165
2400	25	150
3000	25	120
3044	25	115
3600	20	100
4000	20	90
4500	18	85
5000	17	75
6000	15	60
7000	12	50
7800	12	50
9000	10	45

SOURCE CALIBRATION DATA FORM

ISP-27A

Source Serial Number: _____

Meter Serial Number: _____ Probe Serial Number: _____

Short Time: _____ seconds Long Time: _____ seconds

Short Readings: _____ R _____ R _____ R

Long Readings: _____ R _____ R _____ R

Temperature: _____ °C

Pressure: _____

Collimator Factor: _____

Comments: _____

Performed by: _____ Date: _____

Reviewed by RSO: _____ Date: _____

ADVANCED MEDICAL SYSTEMS OPERATING PROCEDURE

INSTRUCTIONS TO ANCILLARY PERSONNEL

ISP-28 Rev. 1/95

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- 1.0 PURPOSE: To instruct part time or occasional workers on the presence, storage and use of radioactive materials and the associated safety precautions and procedures.
- 2.0 PRECAUTIONS AND LIMITATIONS:
- 2.1 This procedure applies to all part time or occasional workers who will be working in the Restricted Areas of the facility or in the vicinity of radioactive materials. It applies to both AMS and non-AMS personnel.
 - 2.2 The RSO or designee shall be responsible for providing training to these workers.
 - 2.3 Ancillary personnel will receive training prior to performing job assignments.
 - 2.4 Refresher training will be provided on an annual basis to permanent AMS employees, unless the employee requests or the RSO insists upon a more frequent basis.
 - 2.5 Ancillary personnel may be asked general questions relating to the training to determine their overall comprehension.
 - 2.6 Personnel with a previous radiation exposure history should complete Form ISP-28A, Certificate of Prior Dose.
 - 2.7 A copy of the signed record of training will be maintained at the Isotope Facility, and for AMS employees, also in their personnel file.

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Approved by: *R Meschter*

Date: 1-24-95

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3.0 INSTRUCTIONS:

3.1 Outline of Worker Training.

3.1.1 Background discussion.

- a. Radiation.
- b. Radioactive contamination.
- c. Airborne contamination.
- d. Biological effects (acute and chronic).
- e. Prenatal exposure (Reg. Guide 8.13).

3.1.2 Personal monitoring.

- a. Film badges.
- b. Pocket dosimeters.
- c. Whole body frisking.
- d. ALARA concept - time, distance, shielding.
- e. Exposure limits - previous work history.
- f. Expected exposure levels.
- g. Right to receive exposure reports.

3.1.3 Facility tour.

- a. Locations of Restricted Areas.
- b. Areas of storage.
- c. Areas of transfer.
- d. Interpretation of signs and placards.
- e. Areas of unauthorized entry.

3.1.4 Protective devices.

- a. Protective clothing.
- b. Respirators.
- c. Fixed gamma ray detectors.
- d. Shielding materials.
- e. Equipment and tool monitoring.
- f. Trained radiation workers.

3.1.5 Response to warnings and alarms.

- a. Location of emergency exits.
- b. Personal safety first.
- c. Heed instructions of trained radiation worker.

3.1.6 The right to inquire or respond to any condition which they believe to constitute a violation of NRC Regulations.

CERTIFICATE OF PRIOR DOSE

ISP-28A

This certification is to be completed prior to the first entry into a Restricted Area during a work assignment under such circumstances that the individual could receive a dose in excess of 125mrem.

I certify that I have had no prior occupational dose during the current calendar year.

Printed Name: _____

Signature: _____ Date: _____

OR

I certify that my occupational dose for the current calendar year is _____ mrem.

Printed Name: _____

Signature: _____ Date: _____

Comments: _____

Reviewed by RSO: _____ Date: _____

STATEMENT OF TRAINING

ISP-28B

Name: _____ Soc. Sec. No.: _____

Employer: _____

*I have been trained to Advanced Medical Systems Operating Procedure
"Instructions to Ancillary Personnel", ISP-28, and Regulatory Guide
8.13, "Instruction Concerning Prenatal Radiation Exposure".*

Comments: _____

Signature of Trainee: _____ Date: _____

Signature of Trainer: _____ Date: _____

Reviewed by RSO: _____ Date: _____