



# Technical Safety




## RADIATION PROCEDURES MANUAL

### Procedure Cover Sheet

Procedure Title: Operational Procedure for Shepherd & Associates  
<sup>137</sup>Cs Sources

Procedure Number: TSO-09-15-REV 0

Effective Date: August 10, 2009

Approved By:  Date: 10 August, 2009  
Technical Safety Office Director



Procedure #: TSO-09-15-REV 0  
Procedure Title: Operational Procedure for Shepherd & Associates <sup>137</sup>Cs Sources  
Approval Date: August 10, 2009  
Effective Date: August 10, 2009

---

## A. INTRODUCTION

The Shepherd & Associates <sup>137</sup>Cs Sources located in the basement of the physical science building are NIST traceable and are therefore a very useful tool with many applications. These irradiators allow users to control exposures in mandatory calibrations of portable radiation survey instruments and to conduct experiments at ISU.

## B. PURPOSE

The purpose of this procedure is to familiarize the user with the operation of the two Shepherd & Associates <sup>137</sup>Cs sources.

**Note:** The ISU Cs-137 irradiation vault is equipped with an area monitor and flashing lights. The area monitor measures the field intensity along the back wall of the facility, the area outside of the facility in the motor control room and the general area outside the facility in the adjacent laboratory. Use of the 1.0-Ci “low range” irradiator has little impact on the area monitor and no impact on the alert alarm system developed for this room. If using the high range (20-Ci) source one should expect that the yellow alert light flashes when the interlock system is energized and therefore it flashes yellow anytime the irradiator is capable of producing a High Radiation Area without any additional warning. The red light begins flashing when a radiation area greater than or equal to 5 mrem/hr is detected in the irradiation facility.

## C. REQUIRED MATERIAL(S)

Shepherd & Associates 1.0-Ci Calibrator (Model 28-6A) or Shepherd & Associates 20-Ci Irradiator (Model 81-8B)  
Dose calculation spreadsheet applicable to either source  
Tape measure  
Survey meter  
Interlock keys  
Stop watch or some other timing device

## D. PROCEDURE

### Procedure for Shepherd & Associates 1.0-Ci Calibrator (Model 28-6A)

1. Obtain the key to the padlock on the 1.0-Ci Calibrator.
2. Obtain a survey meter. Verify that it is within calibration and also that it is responding appropriately.
3. Determine the required distance for the desired exposure rate.
4. If delivering a specific exposure to a target, determine the required time for the desired exposure.
5. Measure the required distance from the front surface of the calibrator.
6. Place the item to be irradiated at the required distance.
7. Make sure the item is centered in the beam of the calibrator.
8. Unlock the padlock on the calibrator, and remove the padlock.
9. Pull the black knob on top the calibrator up to open the shutter and start irradiation. **Note: The authorized user is responsible for preventing unauthorized access to the exposed source during any time it is being used.**
10. If delivering a specific total exposure to a target, start timing when the shutter is pulled up.
11. After the desired measurement is made, device is calibrated, or when the time required obtaining the desired exposure is reached, push down on the black knob to shut the shutter.
12. Survey the room and immediate vicinity of the source to verify that the source is in the closed position when the irradiation is completed.
13. When the irradiations are complete, replace the padlock on the calibrator and lock the padlock.
14. Remove the item that was irradiated.
15. When finished, shut the door to the room and return the keys and survey meter to the Technical Safety Office (TSO).

### Procedure for Shepherd & Associates 20-Ci Irradiator (Model 81-8B)

**Note: This source is capable of producing a High Radiation Area greater than 100- mrem/hr in the vicinity of the exposed radiation beam. The ISU policy for operation of this source is to exclude individuals from the irradiation vault during operation of this source. No individuals are allowed in the irradiation vault during operation of this source unless pre-authorized in writing by the University Radiation Safety Officer.**

1. Obtain keys to the irradiator.  
**Note:** Keys will be signed out to approved users by the Technical Safety (TSO) Staff.
2. Obtain a survey meter. Verify that it is within calibration and also that it

- is responding appropriately.
3. Determine the required distance for the desired exposure rate.
  4. Determine the required time for the desired exposure.
  5. Measure the required distance from the front of the calibrator.
  6. Place the item to be irradiated at the required distance.
  7. Make sure the item is centered in the beam of the irradiator.
  8. Close the door to the room where the irradiator is located. **Note: No one is allowed in this room during normal operation. This irradiator will generate a High Radiation Area while the source is in the “expose position. This door is interlocked and must be shut for the irradiation to proceed.**
  9. Turn on air to shutter lifting mechanism.
    - a. Located under the fume hood near the Shepherd room door
    - b. Furthest yellow lever toward the backHorizontal = Off  
Vertical = On (Should hear an air flow sound)
  10. Set time to irradiate on the interlock-controller.
  11. Turn on the power to interlock-controller.
  12. Make sure switch to “Ortec” power supply is “on.” (powers the red warning light).
  13. Insert the key and turn it to start irradiation.
  14. Once the time has expired the system will shut itself down. Should you need to stop the irradiation before the pre-determined irradiation time has expired you may momentarily depress the green off-button directly below the control key.
  15. Wait until “Red” indicator light goes off and then remove the key.
  16. Turn off the power to the interlock-controller and remove the key keeping it on your person during the remainder of the irradiation operation while the machine is not intentionally producing a radiation field.
  17. Make certain to perform a radiation area survey while entering the room.
  18. When finished, shut the door to the room, turn off the air to the lifting mechanism and return the keys and survey meter to the Technical Safety Office (TSO).

### **SPECIFIC PRECAUTIONS**

- A. Make sure to practice ALARA; when possible avoid standing in the path of the low level irradiator while irradiation is being performed.
- B. No one is to be present in the irradiator room while the high level irradiator is operating.
- C. Do not operate either of the Cs-137 irradiation sources unless you have been authorized by the ISU Radiation Safety Officer and your name appears on a written list of

authorized users.



Procedure #: TSO-09-15-REV 0  
Procedure Title: Operational Procedure for  
Shepherd & Associates <sup>137</sup>Cs  
Sources  
Approval Date: August 10, 2009  
Effective Date: August 10, 2009

---

## REVISION TRACKER

Revision 0	August 10, 2009	Original Procedure
------------	-----------------	--------------------