

Amend #3 to 34-653-2

Operating and Emergency Procedures for  
Electronic Research Division, Clevite Corporation

A. Responsibility for over-all radiation protection programs:

1. The responsibility for the over-all radiation protection program shall rest with the Security and Safety officer of Clevite Research Center, J. E. Dawson.
2. The following person has been assigned the duties of Radiation Protection Officer: D. R. Hale.
3. The Radiation Protection Officer shall ensure compliance with AEC regulations and these procedures.

B. Qualified Personnel

1. Only personnel qualified by the division and specifically named on the attached copy of the AEC License are permitted to manipulate and use the sealed sources for which the division is licensed.
2. As of the date of these procedures D. R. Hale and W. A. Gilroy are designated as division radiographers. These names may be deleted or added to as the situation may require by qualifying new individuals and applying to the AEC for license amendments.

C. Sealed Sources and Devices

1. The division is licensed to use only the byproduct material sealed sources in devices designated on its license. A copy of the current license is attached to these procedures.
2. Instructions for the safe use of these devices are outlined in Attachment A of these procedures.

5. Should the survey meter become inoperable for any reason, immediately cease work and do not proceed with any further radiography until the meter has been repaired or a replacement obtained.
6. Batteries for survey meters shall be checked, using test equipment available in the division, at intervals not to exceed one week.

E. Restricted Areas for Radiography:

1. Post all "Restricted Areas," as specified in Attachment B of these procedures with warning signs, provided by the division, bearing the words: "CAUTION - RADIATION AREA," and showing the standard three-bladed radiation sign, purple on a yellow background.
2. Rope and radiation signs, as provided by the Company, shall be used to designate the perimeter of the restricted area.
3. The guard force shall be notified when an overnight exposure is to be made. They shall be informed of the location of such exposures, source used, time started and finish time.
4. Personnel who do not need to enter the restricted area, whether for operational inspection or emergency purposes, and personnel who are not adequately monitored and aware of the radiation field, must not be allowed to enter the restricted area.

F. Personnel Monitoring:

1. Pocket chambers and radiation film badges shall be issued to each radiographer.
2. Pocket chambers and film badges shall be worn at all times by radiographic personnel during radiographic operations.

3. Every device is to be clearly labeled with the radiation caution symbol and the words "CAUTION RADIOACTIVE MATERIAL." They shall also carry labels or tags plainly stating the kinds of radioactive material contained in the device together with the quantities thereof and the date of measurement of those quantities. Radiographers are responsible for keeping equipment in their possession properly labeled.

D. Physical Radiation Surveys:

1. A calibrated and operable survey meter shall be maintained at the job site where radiography is being performed. The small tag attached to the survey meter provides the date of the latest calibration. This tag should be inspected frequently to ensure that the instrument has been calibrated within 90 days. If the instrument has not been so calibrated, it is not to be used, but forwarded to the radiation protection officer for immediate calibration.
2. A survey must be made during an exposure to ensure that no individual, other than authorized personnel, shall be in an area in which such individual could receive, if continuously present in the area, a dose in excess of 2 mr in any one hour or 100 mr in any seven consecutive days.
3. All radiation surveys shall be conducted in accordance with Attachment C of these procedures.
4. Survey meters when transported in company vehicles should be put in the driver's compartment and not in back where they may be subject to abuse. Adequately support the instrument to prevent damage during transit.

3. Pocket chambers and film badges shall be stored in racks at a location designated by the Radiation Protection Officer.
4. Film badges and pocket chambers shall be returned to this location at the end of each work assignment.
5. Operating instructions for pocket chambers and minometers are outlined in Attachment D of these procedures.
6. Film badge schedule provides a change of film on a semi-monthly basis. During this semi-monthly period only one person may use any one film badge.
7. Radiographers shall be given specified dates to return film badges to the Nurses Office to be changed and sent out for processing, in accordance with steps outlined in Attachment E of these procedures.
8. The pocket chambers are to be charged before each use and the initial setting of the needle recorded by the Radiographer.
9. Pocket chambers should be read as often as necessary to determine if an abnormal dose of radiation has been received. If a pocket chamber is found to read off-scale, an emergency situation shall be considered to exist and the corresponding film badge shall be immediately returned to the supplier for processing.
10. The pocket chamber reading for each man shall be entered in the appropriate space on the radiation record, at the end of each use.
11. Each radiographer is responsible for recording his dose on the radiation record.
12. Radiographic personnel shall be removed from exposure to radiation, as required to keep their individual dosages from exceeding 100 mr per week.

G. Security of Sealed Sources in Radiographic Devices:

1. Never leave a radiographic exposure device unattended when outside a locked storage area.
2. Storage areas shall remain locked at all times while containing a radiographic device.
3. Storage areas shall be properly identified using the radiation signs provided which bear the words "CAUTION RADIOACTIVE MATERIAL."

ATTACHMENT "A"

Operating Procedure for Radiographic Devices

I. General Instructions

- (a) Each radiographic device shall be checked with a radiation survey meter before it is put into operation or moved. This is to insure the radiographer that the source is in the device and in its shielded position.
- (b) No radiographic device shall be moved unless the shutter is in the closed position and locked.

II. Specific Instructions for Making an Exposure

- (a) Position device at exposure site. Make certain device is firmly positioned and that shutter is facing item to be radiographed. Position film.
- (b) Stand near device so that aperture is pointed away from body. Lift shutter and key into open position.
- (c) Immediately leave exposure site and close autoclave chamber door. This door is to be padlocked during over-night exposures.
- (d) Survey the perimeter of the restricted area to assure that radiation levels do not exceed 2 mr/hr. (See Attachment "C" A.I.(b).)
- (e) After exposure is complete enter autoclave chamber, close shutter and lock device.
- (f) Remove film.

III. Specific Instructions for Securing Exposure Device when no Additional Exposures are Required.

- (a) Return device to safe storage vault.
- (b) Make a physical radiation survey of device to insure source is in safe position. Make record of this survey on the radiation record.
- (c) Lock storage vault.

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ATTACHMENT "B"

Instructions for Posting and Restricting Radiographic Areas

1. High Radiation Areas

"High Radiation Areas" are those areas which contain radiation levels such that a person continuously present in the area could receive an exposure in excess of 100 mrem in only one hour. The limits of this area must be posted with signs bearing the radiation caution symbol and the words "CAUTION HIGH RADIATION AREA." High radiation areas will not be established during use of radioactive source (500 millicurie) now authorized. The exposure site is limited to the autoclave chamber and the radioactive source is 500 millicurie. When an exposure is being made the autoclave chamber doors should be closed and locked and a sign bearing the radiation caution symbol and the words "CAUTION HIGH RADIATION AREA" posted on the doors.

2. Radiation Areas

Radiation areas are those areas which contain radiation levels such that a person continuously present in the area could receive an exposure in excess of 5 mrem in any one hour. Radiation areas must be posted with sign bearing the radiation caution symbol and the words "CAUTION RADIATION AREA." Our policy is to post these signs at the perimeter of the restricted area as designated under Paragraph 3 of this attachment, therefore, no action concerning the perimeter of the radiation area need be taken.

3. Restricted Area

A restricted area is that area into which the radiographer must control access for purposes of radiation safety. This restriction must be extended to those areas containing radiation levels such that a person continuously present in the area could receive an exposure in excess of 2 mrem in any one hour. As explained above, our exposures are limited



to the autoclave chamber and the 500 millicurie source. Therefore, signs bearing the radiation symbol and the words "CAUTION RADIATION AREA" must be posted at the three points designated on the attached sketch.

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ATTACHMENT "C"

- A. Physical radiation surveys shall be performed by radiographers at the following locations and in the manner listed below.
  - 1. Physical radiation survey during exposure period.
    - (a) All exposures shall be made in the autoclave chambers using the 500 millicurie source. The 2 mr/hr isodose line for this use is established and indicated on the sketch which is a part of these instructions.
    - (b) Surveys are not required each time the source is exposed under these conditions.
  - 2. Physical radiation survey of device after completion of individual exposures.
    - (a) After shutter of device is closed check device for excessive radiation levels.
    - (b) After determining the source is in safe condition in device from survey meter readings, lock device.
  - 3. Physical radiation survey prior to storage of device after last exposure.
    - (a) After determining that source is in safe condition in device from survey meter readings and that device is locked, return to storage area.
    - (b) Use survey meter to measure radiation levels at surface of device. Readings should be approximately 25 mr/hr near the surface of the device. A zero reading is an indication that the source is not contained in the device. This should be handled as an emergency situation.

ATTACHMENT "D"

Operating Instructions for Use of Pocket Chambers and Minometers

1. Dosimeters:

- a. Radiographers shall wear a pocket chamber during the time the radioactive source is being used.
- b. Pocket chambers, (Victoreen Instrument Co. Model 362), are furnished. These pocket chambers measure the amount of gamma and x-ray radiation received from zero to 200 mr.
- c. Pocket chambers are delicate instruments, and should be treated as such. Jarring or dropping the instrument may cause a high reading. Excessive humidity may cause a high reading. If damage to your pocket chamber is suspected, notify your supervisor immediately.
- d. If a pocket chamber should go off scale (over 200 mr), stop work and notify the Radiation Protection Officer or Safety Officer immediately.
- e. Section 31.203(b) of 10 CFR, Part 31, requires that if a pocket chamber becomes fully discharged, the film badge shall be processed immediately to determine if any overexposure has taken place. Such a film badge must be taken to the Nurse's Office and from there it will be sent to the film badge supplier for immediate processing. Having followed this procedure, immediately recharge the pocket chamber and leave it in an area which is free of any type of radiation for a period of approximately one hour. After this time lapse, recheck the pocket chamber. If it is again discharged, totally or partially, in all probability you have not been exposed to an overdose of radiation. This would indicate that the pocket chamber is probably faulty. Having determined this, inform your supervisor.

Only your supervisor may decide whether or not you may return to radiation work after he has carefully evaluated the situation.

- f. All pocket chambers shall be charged before start of each use of the radioactive source by the radiographer. The radiographer shall read the pocket chamber at the end of each use and shall record these readings.

2. Operating Instructions for Minometer

- a. Plug power cord in 110V 60 cps ac. and turn on switch on minometer. Allow 30 seconds for warm up.
- b. Remove dust cover on charging chamber.
- c. Depress spring-loaded plunger just above off-on switch and turn large knob to adjust scale to zero.
- d. Insert pocket chamber and depress plunger. Scale should read zero. The Pocket chamber is now ready for use.

ATTACHMENT "E"

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Procedures for Issuance and Processing of Film Badges

1. Film badges shall be worn by all radiography personnel during each exposure.
2. Each film badge is the responsibility of the user and is to be placed in the designated place when not in use.
3. Each film badge has a code number assigned by the nurse for each radiographer. No other person may wear that film badge.
4. Each 15th and last day of the month or the last working day preceeding the 15th and last day of the month, the film badges are taken to the nurse by the man assigned each badge. The nurse removes the old film and replaces it with new film.
5. The nurse makes entries in her diary recording issuance of new film and sends old film to processer. When results are reported by processer, they are entered into individual medical records. Any unusual exposures (above averages normally experienced) shall be immediately reported to the Safety Officer who in turn shall consult with the company physician.

ATTACHMENT "F"

Amend. # 3  
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Emergency Procedure for Radiographic Personnel

1. In the event of a plant emergency, in an area adjacent to a radiographic device, such as fire or an accident involving plant personnel, immediately do the following:
  - a. Return source to shielded position in device. Lock device.
  - b. Perform physical radiation survey of device to assure that the source is in the shielded position.
  - c. Remove device from danger area and if possible return to storage vault.
  - d. Notify your supervisor.
  - e. If a radiographic device cannot be removed from a danger area, do the following:
    - (1) Set up a restricted area as specified in Attachment B of these procedures around the device using survey instrument to determine area.
    - (2) Notify the Radiation Protection Officer and Safety Officer.
    - (3) Radiation Protection Officer or Safety Officer shall determine further course of action.
  
2. In the event of an accident to the source or device, such as a falling object hitting device, immediately do the following.
  - a. Return source to device, if possible, and lock device.
  - b. Notify the Radiation Protection Officer.
  - c. Do not use device again until the Radiation Protection Officer has made an inspection of device and personnel monitoring equipment and grants approval for its use.
  - d. In the event the source cannot be returned to the device, immediately do the following:

- (1) Set up and post a restricted area as specified in Attachment B of these procedures, using a survey instrument to determine the perimeter of the area.
- (2) Do not allow anyone to enter this area.
- (3) Notify the Radiation Protection Officer.
- (4) Continue to restrict entry into area.
- (5) The Radiation Protection Officer will notify the following people:

J. E. Dawson, Safety Officer, Ext: 236

Or in his absence

E. J. Gilmore, Manager of Central Services, Ext: 223

3. In the event of accident involving the exposure of non-monitored personnel to radiation, immediately do the following:
  - a. After setting up restricted areas as specified in Attachment B of these procedures, use survey instrument to determine the perimeter of the area, retain and take names and numbers of non-monitored personnel involved.
  - b. Notify Radiation Protection Officer.
  - c. Radiation Protection Officer shall check restricted area and post guards to prevent admittance to area.
  - d. Radiation Protection Officer shall obtain all pertinent facts involving accident and report to Safety Officer.
  - e. Safety Officer shall determine the course of action and shall notify AEC in accordance with Sections 20.403 and 20.405 of Part 20 as necessary.

4. In the event of loss of source:
- a. Notify the Radiation Protection Officer of the incident.
  - b. The Radiation Protection Officer shall notify other company officials of the incident
  - c. The following shall be performed by the Radiation Protection Officer.
    - (1) Obtain all information on the last known location of the source.
    - (2) Check area with survey meters and rope off safe area.
    - (3) Locate the source using the survey meter and triangulation methods and replace in device or containers as soon as possible.
    - (4) Check non-monitored personnel and handle as in Paragraph 3 above.
    - (5) Notify AEC in accordance with Section 20.402 and 20.405 of Part 20 as necessary.



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MOVEMENT OF RADIOGRAPHIC DEVICES

1. Devices shall be checked, using a survey meter, by a radiographer prior to removal from any storage area.
2. A radiographer shall be in constant attendance during movement.
3. No device shall be moved unless it is locked.
4. In plant transportation can be accomplished by the use of hand carts or company vehicles. Portable exposure devices are not to be hand carried long distances since relatively high radiation levels often exist at the surfaces of these devices. Any transporting vehicle must be clearly marked with the radiation caution symbol and the words "CAUTION RADIOACTIVE MATERIAL."
5. Radioactive material must not be transported outside of our plant property.

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ADDITIONAL INFORMATION

A. The conditions under which our 500 millicurie radioactive source will be used are clearly established. They are as follows:

1. The storage vault is located in a ground floor "pit" accessible by stairs adjacent to the autoclave chamber where exposures will be made.
2. The storage vault and autoclave chamber are so located in the building that personnel traffic is minimal and easily controlled.
3. Exposures are made in the autoclave chamber only. This chamber is 8' X 9' and of concrete block construction with steel liner. The chamber doors are also steel plate and have hardware for padlocking.
4. Only D. R. Hale and W. A. Gilroy are authorized to handle the radioactive sources.

D. R. Hale is the head of the Crystal Growth Section. He has a Ph.D. in Physical Chemistry (1928) from Cornell University. Dr. Hale joined the Clevite organization in 1946 and has been involved in the study of crystals and development of crystal growing techniques. He has used radiography for determining growth of crystals in autoclaves for a number of years.

W. A. Gilroy is employed in the Crystal Growth Section reporting to Dr. Hale. Mr. Gilroy has completed more than three years of university schooling toward a B.S. Degree. He joined Clevite in Sept. 1959 and has assisted Dr. Hale in all aspects of crystal growth including radiography.

5. Each radiographer will receive a copy of the Operating and Emergency Procedures and a copy of the license and copies of pertinent regulations as prescribed in 31.201, Part 31.

The Safety Officer will conduct a seminar with the radiographers to assure understanding of, and ability to comply with, the Commission's regulation and license requirements and our Operating and Emergency Procedures. As pertinent changes to the Commission's regulation and license requirements are received, the Safety Officer will assure that the radiographers are advised and any necessary changes made in the Operating and Emergency Procedures. The Safety Officer will review pertinent regulations and procedures with the radiographers at least once each year when the byproduct license is renewed.

B. Organizational Structure:

John E. Dawson, Safety Officer, will have overall responsibility for compliance with AEC regulations and our operating procedures.

Ruth Eisermann, Industrial Nurse, Miss Eisermann is employed full time and reports to Mr. Dawson. She handles procurement, assignment and processing of film badges along with her regular duties as nurse. She maintains a daily diary of all activities of her office and also individual personnel records. The latter include records of film badge assignments and reports from the film badge processor.

D. R. Hale, Head, Crystal Growth Section. Dr. Hale will be the Radiation Protection Officer and a radiographer. His office and work area is near the exposure site and he is in direct supervision of the work in this area.

W. A. Gilroy, Technician. Mr. Gilroy reports to D. R. Hale and has been assigned the duties of radiographer.