



THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN 48640

EMERGENCY PROCEDURE FOR COBALT-60 RADIOGRAPHIC SOURCES

I. A. Magnitude of Emergency Problem

If the unshielded source were laying on the ground a person standing one foot away from it would receive the permissible exposure limit for a calendar quarter to his feet and legs in about 16 minutes (18.75 rem), and to his whole body (trunk, gonads and other vital organs) in about 25 minutes (3 rem). At a distance of one foot from source to the body (vital organs), one hour exposure may produce a blood change, but it would require about three hours exposure to produce radiation sickness and six hours exposure to produce a 50% risk of fatality (LD_{50} for humans is about 400-450 rem).

In an emergency it is very unlikely that anyone will stand still long enough to receive exposure in excess of the quarterly limits mentioned above and certainly not long enough to risk illness or fatality. Since the probability of injurious exposure to the unshielded source at close range is rather low and the consequences are minor, it is obvious that a person should not risk life or even injury to recover the source in an emergency.

The physical construction of the source is rugged enough that even a major fire or explosion would probably not rupture it in such a way that extensive contamination would result. In any event, the cost of decontamination is preferable to any injury.

The source should never be handled directly with the fingers. The radiation intensity at the surface of the source is about 2000 rem/min. Assuming that half the surface of the source is in contact with the hand, the radiation exposure to the hand would be

about 1000 rem/min. The permissible exposure for extremities of 18.75 rem per calendar quarter would be reached in about 1 second.

If it is necessary to retrieve the source in an emergency, any tool or stick that will keep your hand even an inch or two away from the source should be used. A pencil, pen, pliers, or even a small card or paper used as a shovel will serve the purpose.

It is important that supervision and the Industrial Hygiene Section be notified as soon as possible after any incident in order to avoid unnecessary exposure or contamination in the post-emergency period.

For the reasons cited in the first two paragraphs, Fire Department and Plant Protection personnel have been instructed to combat the emergency first and disregard the presence of a radiographic source in the area, if necessary to bring the emergency under control or to rescue persons. They have been advised to avoid unnecessary exposure to the source or unnecessary damage to it, however.

B. Notification

	<u>Plant</u>	<u>Home</u>
1. Supervision		
H. R. Field	6 0101	
W. A. Snodgrass	6 2312	
2. Industrial Hygiene		
L. G. Silverstein	6 4676	
J. B. Charm	6 0641	
H. R. Hoyle	6 2377	
E. J. Schneider	6 0893	
3. Plant Protection		
Dispatcher	6 4400	

II. Plant Emergencies

A. Alert Signal Sounds

1. Reel in source, lock container, check with survey meter.
2. Proceed to check point and determine what emergency exists.
3. Notify persons in I.B., above.
4. If time and lack of risk permits, return source to vehicle, remove signs and ropes, drive out of emergency area.
5. If Step 4 is not advisable, notify Plant Protection of the exact location of the source, that it is shielded, and whether the ropes and signs are still up.

B. Evacuation Signal Sounds

1. Proceed immediately to check point and determine what emergency exists.
2. Only if there is no risk to you, secure source and remove it to safety.
3. Notify persons in I.B., above.
4. Advise Plant Protection of exact location of the source, whether it is shielded or unshielded, and whether ropes and signs are still in place.
5. Stand by with survey meter to find the source when emergency permits re-entry to the area, or to assist the Health Physicist when he arrives.

III. Accidents Involving the Cobalt Source

A. Jammed Mechanism

1. Do not leave unshielded source unattended. Keep people away from roped-off area.
2. Notify supervision, Industrial Hygiene and Plant Protection. If you are alone and must leave to telephone, try to shield the source with a lead sheet. Locate it in the cable by using the Victoreen 592B meter.
3. After notifying people, return to source and stay with it, at a safe distance, until help arrives. Assign Plant Protection to guard the area, advising them where it is safe for them to stay.
4. Stand by to assist and to report the incident in detail to the Health Physicist.

B. Lost Source

1. Use survey meter to locate general area of the source.
2. Rope off area and prevent entry to it of all persons except supervision or Health Physicist.
3. Notify persons in I.B., above.
4. Locate the source using the survey meter and replace it in its container, only if this can be done with less than 1000 mrem exposure to you.
5. If Step 4 is not advisable, stand by to assist Health Physicist and to report the incident in detail to him.

C. Rupture of Source or Contaminated Area

1. If either is even suspected, return source to its container.
2. If source cannot be replaced in its shielding, rope off radiation area and restrict entry to supervision and Health Physicist.
3. Notify persons in I.B., above.
4. Stand by to assist Health Physicist and to report incident in detail to him.
5. Do not attempt to clean up contamination without respiratory protection.

D. Vehicle Accident During Transport

1. Attend to injured persons first.
2. Make visual inspection of source container to ascertain its condition. Use survey meter to confirm that source is shielded.
3. If visual inspection or survey meter indicate an unshielded source, proceed as in III.B., Lost Source, Steps 1, 2 and 3.
4. To prevent traffic tie-up, accept more than 1000 mrem exposure, if necessary, to find source and replace it in its container. As illustrated in I.A., it is very unlikely that the Dow emergency limit of 5 rem exposure will be exceeded.
5. If source is intact and shielded, proceed as in a nonradiation vehicle accident.
6. Report accident promptly to persons in I.B., above.

IV. Exposure of Radiographers or Others

A. Radiographers

1. If you suspect an overexposure, or if dosimeter discharges beyond the scale for any reason, the second person should secure the source in its container and both should proceed to the Medical Department, 607 Building.
2. Notify persons in I.B., above. If source is left in the plant, ask the Dispatcher to send a Scout to stay with the source until it is reclaimed.
3. Describe incident to the doctor in as much detail as possible.
4. Remember that fatal or even acutely hazardous exposures are not at all likely, even with the large source.
5. Deliver film badge and dosimeters to the Health Physicist.

B. Others

1. If exposure to other persons is even suspected, secure the source and accompany the affected persons to the Medical Department.
2. Reassure persons that the overexposure is, at most, a technical one, and not great enough to cause injury, but that Dow, Michigan and AEC regulations require the action.
3. Notify persons in I.B., above.
4. Relate incident to the doctor.
5. Relate incident to Health Physicist.

V. Notification of Michigan Department of Health and AEC

If any person could have received an exposure greater than permitted by State and AEC regulations, the incident must be reported to both agencies.

The decision on the need to report, and the report itself, will be made only by members of the Radiation Safety Committee or the Health Physicist.

VI. Post-Emergency Procedures

A. The Source

1. After the source is reclaimed, a complete survey of radiation levels from the source in its container will be made by the Health Physicist.
- 2. A wipe test of the source, its container and handling equipment will be made by the Health Physicist. The source will not be used until the radiation survey and wipe tests are completed and the report made to radiographic supervision.
3. Immediate action will be taken to repair the source or its container, if it is found necessary.
 - a. The source will be sealed and returned to the supplier, or else sealed and stored for disposal to an outside firm.
 - b. If the container needs repair, the source will be removed and placed in the cave at 1602 Building for storage.

After a wipe test, the container may be released to the Shops for repairs.

B. The Area

1. A thorough survey of the area involved will be made by the Health Physicist with the assistance of the radiographers.
2. Any decontamination necessary will be done under the direct supervision of the Health Physicist, by the Radiographers. Appropriate clothing, procedures and monitoring will be designated by the Health Physicist.
3. Radioactive wastes will be stored for later disposal under the supervision of the Health Physicist.
4. The area will be thoroughly surveyed after clean-up.

C. The People

1. All personnel, and their equipment, will be kept at the scene until they can be monitored for contamination by the Health Physicist.
2. Those who require decontamination will be taken to Medical for showers and further monitoring.
3. All contaminated clothing and equipment will be segregated at the scene.
4. All film badges and dosimeters will be turned in to the Health Physicist. Radiographers or Plant Protection Scouts who used survey meters will also report in detail to the Health Physicist.
5. Anyone who is injured, however slightly, will report to the Medical Department.

L. G. Silverstein
Revised March 2, 1972