

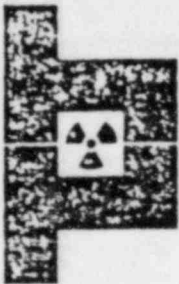
HEALTH PHYSICS ASSOCIATES LTD. CONSULTANTS IN RADIATION SAFETY

3304 COMMERCIAL AVENUE / NORTHBROOK, IL 60062 / PHONE 312/564-3330

OVEREXPOSURE INCIDENT REPORT

Calumet Testing Services Inc.
1945 North Griffith Boulevard
Griffith, Indiana 46319

B508010506 B50717
REG3 LIC30
13-16347-01 PDR



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OVEREXPOSURE INCIDENT REPORT

June 24, 1985

Client:

Calumet Testing Services Inc.
1945 North Griffith Boulevard
Griffith, Indiana 46319
Attn: Robert Vidimos, President

Individual Involved:

Birth Date -
Social Security No. -

Date and Location of Incident:

Date - June 14, 1985 at 10 PM
Location - Northern Indiana Public Service Co.
Burns Harbor, Indiana

Radiation Source Information:

Radioactive Material	-	Iridium 192
Source Strength	-	61 Curies on June 14, 1985
Source Dimensions	-	0.1 inch x 0.1 inch focal spot size 0.25 inch x 0.5 inch stainless steel capsule
Cable Material	-	1/8 inch of copper
Manufacturer	-	Gamma Industries 2255 Ted Dunham Avenue Baton Route, Louisiana 70802
Camera No.	-	2367

NAMES AND OTHER IDENTIFYING INFORMATION HAVE BEEN REMOVED TO PROTECT
INDIVIDUAL PRIVACY. (10CFR9, APPEND.0211, ANNEX A, EXEMPTION NO. 6).

OVEREXPOSURE INCIDENT REPORT

Page 2

Notifications:

1. Employer notified on June 14, 1985, 10:30 P.M.
2. Health Physics Associates, Ltd. called June 15, 1985, 8:00 A.M.
3. Nuclear Regulatory Commission Notified on June 15, 1985, 10:40 A.M.
4. State of Indiana called June 17, 1985 by Health Physics Associates, Ltd.

Description of Incident:

noticed that when he performed the cable disconnect of a 61 Curie Ir-192 source, the source did not winch completely into the housing and was exposed at the housing entry. immediately withdrew his hands and body from the source and cranked the source in the shield. During the cable disconnect procedure, inner left wrist surface was closest to the source and may have actually brushed the source.

Dosimetry of Incident:

film badge was worn at chest level and indicated an exposure to high energy photons resulting in a dose-equivalent of 1.66 Rem. The film badge was evaluated on June 15, 1985, by R. S. Landauer Jr. & Co. of Glenwood, Illinois. A blood sample taken from on June 15, 1985 at 10 A.M. indicated normal blood count values. No skin reddening or hair loss of hands, wrist, face or body has occurred since the date of the incident. Blood samples from were taken on June 18, 1985 for chromosomal aberration analysis by Dr. Neil Wald at the University of Pittsburgh. Results will be forthcoming. Previous exposure history for the two weeks preceeding this incident during which time the same film badge was worn, was 0.11R, based on pocket ion chamber readings. Thus, the dosimetry of this incident to the film badge location is 1.66R less 0.11R or 1.55 Rem.

Evaluation of the Incident:

According to , his left hand was near the source for an exposure time of 1 to 3 seconds. His right hand was on top of the source housing for the same length of time that his left hand was near the source. His right hand was approximately 6 inches from the source. His head, chest and waist were approximately 1 foot, 2 feet and 3 feet, respectively, from the source during the cable disconnect procedure. The total time to reach and return from the source location was 40 seconds.

Photographs of hands three days after the incident and his position during the incident as recalled by were taken for documentation purposes. A set of photographs is attached to this report.

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OVEREXPOSURE INCIDENT REPORT

Page 3

Dose Calculations:

Specific Gamma Ray Constant for Ir-192 is $4.8 \text{ R cm}^2 \text{ hr}^{-1} \text{ mCi}^{-1}$ *

1. The left hand dose range may be as low as 244 Rem based on a 3 second exposure or may be as high as 5768 Rem based on the film badge dose of 1.55 Rem and the inverse square law. The left hand dose range is large because of the largely variable affects of time, distance and shielding.
2. Based on the observed biologic effects of the left hand to this exposure incident and the incident reconstruction, the total dose-equivalent to the left hand is believed to be less than 300 Rem. Radiation injury to the skin is summarized in Table I.

TABLE I - RADIATION INJURY TO THE SKIN

Dose (Rads to Skin)	Effect
200 - 300	Epilation
> 300	Radiation dermatitis and erythema
1000 - 2000	Transermal injury
> 2000 (single exposure)	Radionecrosis
> 5000 (over extended period)	Chronic dermatitis

(After NCRP Report No. 29)

Cause of Incident:

Failure to accurately perform a radiation survey of the source housing after completion of the radiation exposure and not establishing that the source was in a shielded position, caused this incident.

Preventive Action Taken:

Instruct all personnel to thoroughly survey the source container to establish that the source is in a shielded mode before cable disconnection is attempted.

* Radiological Health Handbook (p.131) 1970.

OVEREXPOSURE INCIDENT REPORT

Page 4

Remedial Action To Be Taken:

1. Weekly observation of hands
2. Blood counts taken at monthly intervals (Three times)
3. The left hand should be followed-up by a qualified dermatologist for possible radiation dermatitis.
4. Undergo complete physical by personal physician.
5. In the event of any deliterious signs to the left hand or significant changes in blood count noticed by or his physician, it is suggested that he visit Dr. Frank Hendrickson at Rush-Presbyterian-St. Lukes Medical Center in Chicago, Illinois, Phone No. (312) 942-7000.

HEALTH PHYSICS ASSOCIATES, LTD.

Report Submitted by

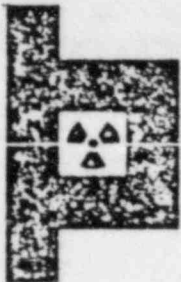
Gerald Wicks
Gerald Wicks, Radiation Physicist

Report Reviewed by

William B. Rivkin
William B. Rivkin, Vice President

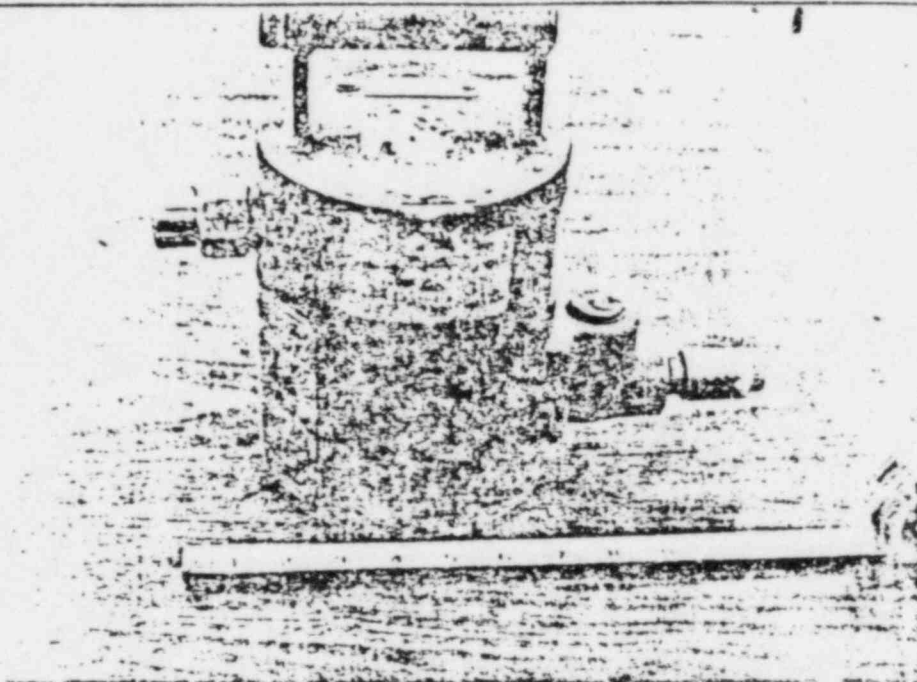
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enclosure

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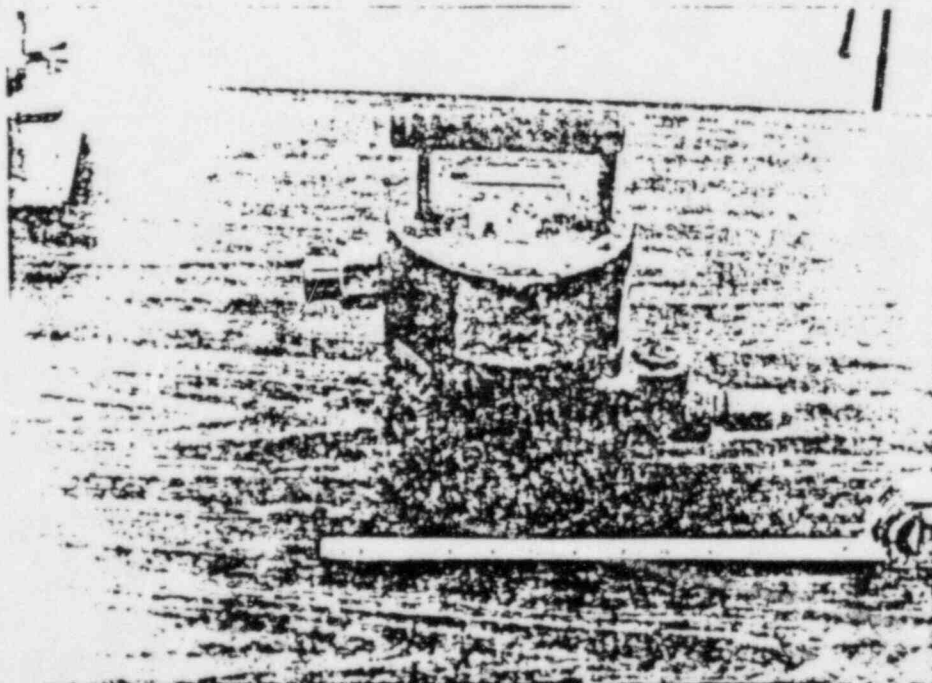


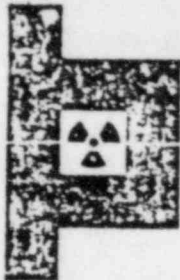
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June 17, 1985
Camera No. 2367
Ir-192 61 Ci
Gamma Industries
Baton Rouge, LA

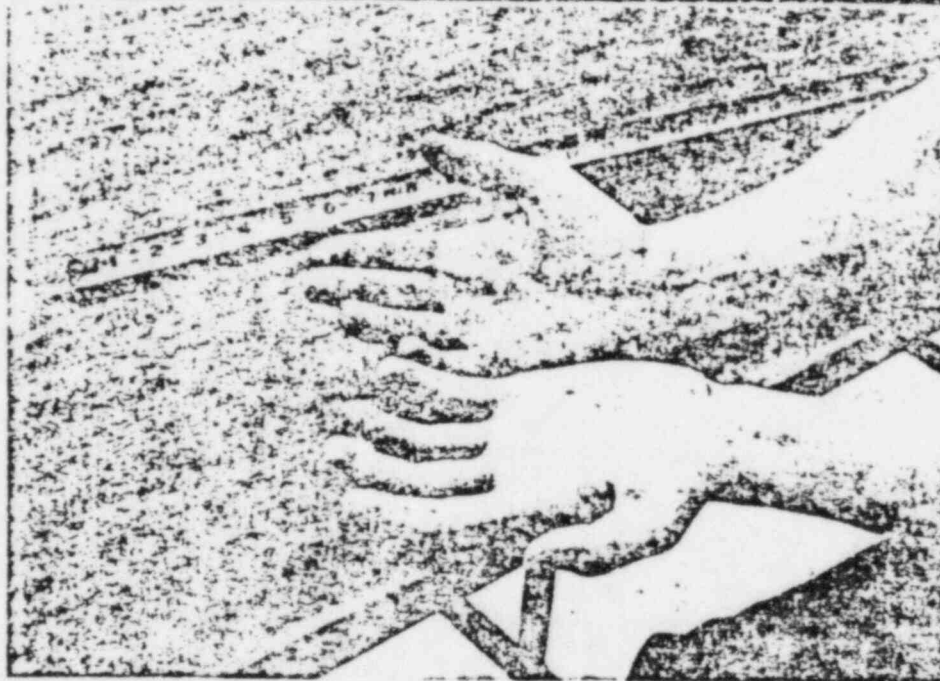




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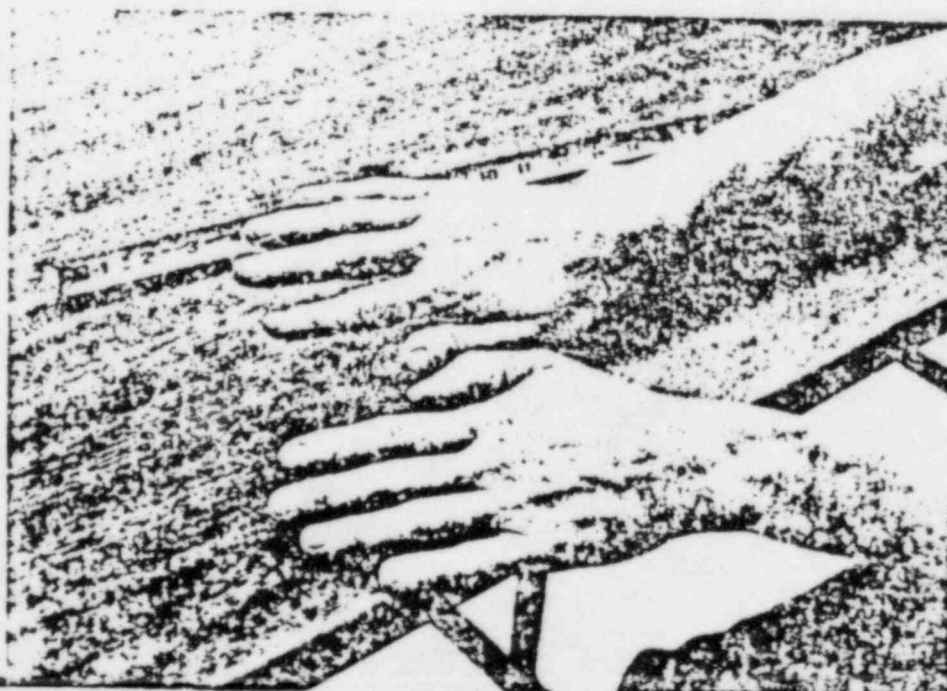
Anterior View

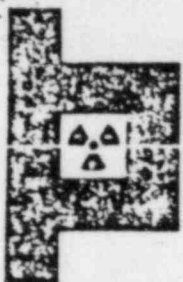


June 17, 1985

Hands

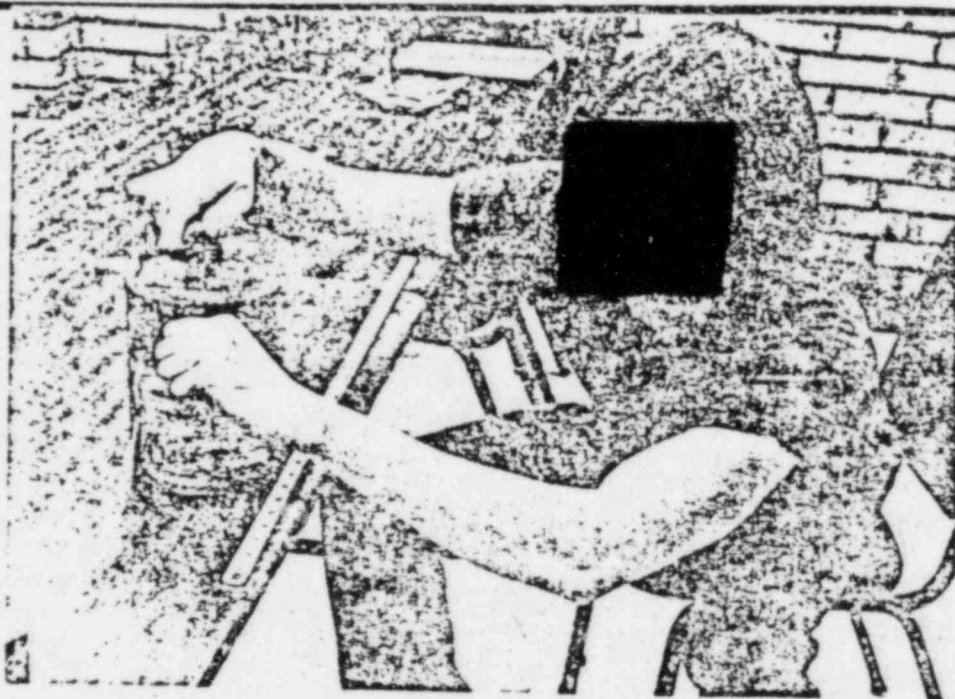
Posterior View



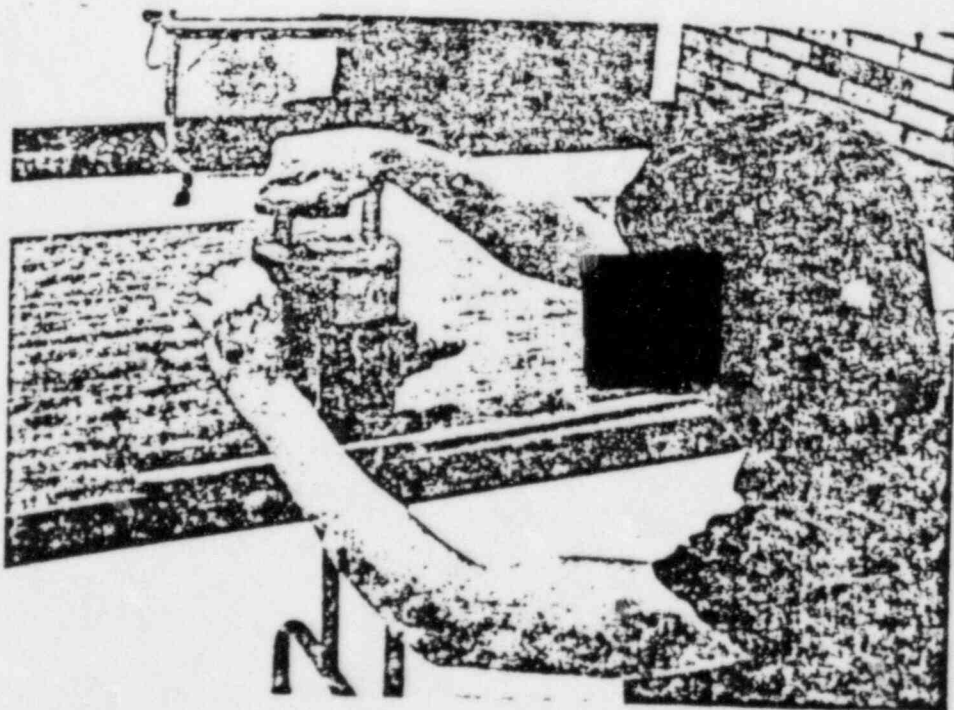


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June 17, 1985
Hands Position of



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NRC Dose Assessment

Gamma Constant for Iridium 192 = 5.2 R/hr/Ci @1 foot from NUREG/BR-0024

Source Strength = 61 curies

R = Distance to Source = 0.25 inches

Shielding Material - 1/8 inch of copper

$$D = D_0 \left(\frac{R_0}{R} \right)^2$$

$$D = (5.2R)(h^{-1})(Ci^{-1}) \times 61 \text{ curies} \left(\frac{12 \text{ in.}}{0.25 \text{ in.}} \right)^2 \times \frac{\text{hr.}}{3600 \text{ sec.}}$$

$$D = 203 \text{ R} \times \text{sec}^{-1} @ 0.25 \text{ in.} - \text{unshielded}$$

linear (cm^{-1}) for copper = 0.196 cm^{-1} for 0.5 MeV photon

Shield Thickness = 0.125 in. x 2.54 cm/in = 0.318 cm

$$D = D_0 e^{-ux}$$

$$D = 203 \frac{\text{R}}{\text{sec}} e^{-(0.196 \text{ cm}^{-1} \times 0.318 \text{ cm})}$$

D = 190.7 R/sec @ 0.25 in. shielded with 0.125 in. copper

$$D(2 \text{ sec}) = 381.4\text{R}$$

$$D(3 \text{ sec}) = 572.1\text{R}$$

$$D(5 \text{ sec}) = 953.5\text{R}$$