A SUMMARY OF INDUSTRIAL ACCIDENTS IN USAEC FACILITIES 1961-1962

December 1963

UNITED STATES ATOMIC ENERGY COMMISSION
Division of Technical Information
LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, “person acting on behalf of the Commission” includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

Printed in USA. Price $0.75. Available from the Office of Technical Services, Department of Commerce, Washington 25, D. C.
DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.
DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.
A SUMMARY OF INDUSTRIAL ACCIDENTS IN USAEC FACILITIES

UNITED STATES ATOMIC ENERGY COMMISSION
Industrial Safety and Fire Protection Branch
Division of Operational Safety
PREFACE

“A Summary of Industrial Accidents in USAEC Facilities,” TID-5360(Suppl. 4), presents information on accidents and incidents occurring during 1961-62 in plants owned and operated by the Atomic Energy Commission. The original TID-5360 covered the years 1945-55; the first supplement 1956; the second supplement 1957-58; the third supplement 1959-60.

Short narrative descriptions of accidents and incidents involving radioactive materials, together with a table of radiation exposures for AEC contractor personnel, are included because of their special interest to the atomic energy industry. Also included are descriptions of industrial fatal accidents.

The accidents and incidents listed for 1961 are those which were then required to be reported immediately to Commission Headquarters, and include the following:

(a) fatalities;
(b) Government property damage of $5,000 or more;
(c) an external radiation exposure greater than 15 rems received over a short period of time; and
(d) other injury or industrial illness, no matter how slight, of five or more persons in one accident, and other defined accidents. (AEC Manual Chapters 0502-04 and 0523-052 then in effect fully defined immediately reportable accidents.)

In April 1962, revised reporting requirements were established in AEC Manual Chapter 0502, “Reporting and Investigating Accidents and Radiation Exposures.” This chapter categorizes types of accidents and radiation exposures. The information in this supplement pertaining to 1962 experience includes those accidents and incidents designated as “Type A” and “Type B,” along with a few others of a lesser degree of importance, which may be of interest.

“Type A” and “Type B” are defined below:

“Type A”:

1. Loss or Damage to Government Property, $100,000—up.
2. Injury or Death
   a. Fatal or imminently fatal injury.
   b. Five or more injuries in one accident.
3. Radiation Exposures
   a. 25 rem or more to the whole body.
   b. 150 rem or more to the skin
   c. 375 rem or more to the feet, ankles, hands and/or forearms.
   d. Any release of radioactive material offsite which exceeds RPG’s.
   e. 25 rem or more external whole body during the calendar year.
   f. Any unplanned release of radioactive material which exceeds in 24 hours, 5000 x Appendix B Table II–10 CFR 20.
4. Public Interest
   a. Any accident or radiation exposure which gives rise to an inquiry by members of the public; or an inquiry from the press; or which the field office manager believes to have public information significance.
   b. Any offsite accident involving vehicles carrying AEC shipments of radioactive materials. (These are not included in this TID but are summarized in TID-16764.)
5. Miscellaneous
   a. Any accident in which an atomic or nuclear weapon (under the jurisdiction of AEC) is involved and where damage is inflicted to persons or private property.
   b. Any injury or industrial illness following cumulative or massive exposure to internal or external ionizing radiation which might reasonably be expected to have caused the illness or injury and when so diagnosed by a physician competent in nuclear medicine.

"Type B":
1. Loss or Damage to Government Property: $5,000 to $99,999
2. Radiation Exposures
   a. When in one calendar quarter exposure exceeds: 3 rem or more whole body; 10 rem skin; 25 rem to feet, hands, ankles and/or forearms.
   b. Any dose which exceeds (N-18) 5 rem.
   c. Internal body deposition which exceeds RPG’s.
# CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>iii</td>
</tr>
<tr>
<td>Serious Accidents 1961-1962</td>
<td>1</td>
</tr>
<tr>
<td>Radiation Exposure of AEC Contractor Personnel</td>
<td>7</td>
</tr>
<tr>
<td>Accidents and Incidents Involving Radioactive Material in AEC Activities 1961-1962</td>
<td>8</td>
</tr>
<tr>
<td>Accidents Involving Fatalities in AEC Activities 1961-1962</td>
<td>27</td>
</tr>
</tbody>
</table>
Table 1—SERIOUS ACCIDENTS
USAEC Facilities, 1961—1962

Serious accidents which occurred in atomic energy facilities during 1961-1962 are summarized in Table 1

Please refer to the "Preface" of this summary for definitions of "serious accidents".

<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Operations office &amp; contractor</th>
<th>Injuries &amp; overexposures</th>
<th>Loss</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>61-1</td>
<td>1-3-61</td>
<td>ID-Combustion Engineering, Inc</td>
<td>3 killed, 9 overexposures</td>
<td>$430,000</td>
<td>Explosion within reactor vessel of SL-1 reactor plant. Two members of crew were killed instantly by explosion. Third died within about two hours as result of injury to head. Maximum overexposure to nine emergency crew members during emergency was 27 rem. (See page 8)</td>
</tr>
<tr>
<td>61-2</td>
<td>1-9-61</td>
<td>AL-ACF Industries, Inc</td>
<td>0</td>
<td>$27,060</td>
<td>Fire in plating shop</td>
</tr>
<tr>
<td>61-3</td>
<td>1-11-61</td>
<td>AL-Reynolds Electrical &amp; Engineering Co</td>
<td>0</td>
<td>$8,000</td>
<td>Test vehicle being towed from test bunker to disassembly building with prime mover accidentally uncoupled and vehicle car crashed into face of test bunker, damaging car and bunker</td>
</tr>
<tr>
<td>61-4</td>
<td>1-24-61</td>
<td>AL-Los Alamos Scientific Laboratory</td>
<td>1 killed</td>
<td>0</td>
<td>Employee fell from bunker 10-12 to concrete pad. (See page 27)</td>
</tr>
<tr>
<td>61-5</td>
<td>2-2-61</td>
<td>AL-ACF Industries, Inc</td>
<td>1 killed</td>
<td>$2,500</td>
<td>Head-on motor vehicle collision. (See page 28)</td>
</tr>
<tr>
<td>61-6</td>
<td>2-14-61</td>
<td>AL-Los Alamos Scientific Laboratory</td>
<td>1 killed</td>
<td>0</td>
<td>Employee overcome by solvent vapors while working in enclosure. (See page 28)</td>
</tr>
<tr>
<td>61-7</td>
<td>1-25-61</td>
<td>ID-Phillips Petroleum Co</td>
<td>0</td>
<td>$6,000</td>
<td>Criticality accident occurred at chemical processing plant, when U235 solution accidentally surged from geometrically safe container to unsafe vessel leading to momentary occurrence of chain reaction. There were no overexposures. (See page 9)</td>
</tr>
<tr>
<td>61-8</td>
<td>3-19-61</td>
<td>OR-Central Illinois Tower Maintenance Co</td>
<td>2 killed</td>
<td>0</td>
<td>Two employees fell 145' when top section collapsed during erection of tower. (See page 29)</td>
</tr>
<tr>
<td>61-9</td>
<td>3-18-61</td>
<td>PSR-Eichieay Corp</td>
<td>1 killed, 3 injured</td>
<td>0</td>
<td>Scaffold arrangement rigged for painting overhead structure and ceiling of shop collapsed, causing the death of one and injuries to three. (See page 29)</td>
</tr>
<tr>
<td>61-10</td>
<td>5-11-61</td>
<td>AL-Monsanto Chemical Co (Mound Laboratory)</td>
<td>1 overexposure</td>
<td>$4,016</td>
<td>Pressure buildup in closed caustic scrubber system forced airborne radioactive material into room. Employee received 2.05 times maximum permissible body burden. Area contaminated. (See page 10)</td>
</tr>
<tr>
<td>61-11</td>
<td>1-10-61</td>
<td>SR-1, L du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>$7,750</td>
<td>Overhead machine used to discharge reactor components struck aluminum t-beam used to support portable bridge</td>
</tr>
<tr>
<td>61-12</td>
<td>3-19-61</td>
<td>OR-Goodyear Atomic Corp</td>
<td>0</td>
<td>$37,130</td>
<td>Air circuit breaker failed resulting in shutdown of seven cells</td>
</tr>
<tr>
<td>61-13</td>
<td>7-11-61</td>
<td>SAN-University of California (Lawrence Radiation)</td>
<td>0</td>
<td>$13,500</td>
<td>Fire occurred involving approximately 180 pounds of chemical explosive</td>
</tr>
<tr>
<td>61-14</td>
<td>7-18-61</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>$5,000</td>
<td>Two Hanford railroad locomotives collided head on</td>
</tr>
<tr>
<td>61-15</td>
<td>8-1-61</td>
<td>HA-Hanford Operations Office</td>
<td>0</td>
<td>$8,000</td>
<td>Range fires burned approximately 4,300 acres, probably caused by sparks from defective muffler on railroad diesel locomotive</td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Operations office &amp; contractor</td>
<td>Injuries† &amp; overexposures</td>
<td>Loss</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>----------------------------------------</td>
<td>---------------------------</td>
<td>--------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>61-16</td>
<td>8-14-61</td>
<td>HA-General Electric Co</td>
<td>1 killed</td>
<td></td>
<td>Employee fatally injured when tractor rolled backwards out of control while he was assisting in unloading it from a trailer. (See page 20)</td>
</tr>
<tr>
<td>61-17</td>
<td>8-14-61</td>
<td>SNR-General Electric Co</td>
<td>0</td>
<td>$5,700</td>
<td>Fire burned approximately 3,000 square feet of newly laid roof, causing damage to building and ventilating equipment located on roof</td>
</tr>
<tr>
<td>61-18</td>
<td>8-29-61</td>
<td>AL-Sandia Corp</td>
<td>0</td>
<td>$14,700</td>
<td>Flash flood at deactivated base Removal of 8-12 inches of salt majority of cost</td>
</tr>
<tr>
<td>61-19</td>
<td>9-2-61</td>
<td>ID-Phillips Petroleum Co</td>
<td>0</td>
<td>$20,000</td>
<td>Compressor malfunctioned, damaging insulation and wiring on stator and rotor</td>
</tr>
<tr>
<td>61-20</td>
<td>9-7-61</td>
<td>AL-Los Alamos Scientific Laboratory</td>
<td>1 killed</td>
<td></td>
<td>Employee killed in motor vehicle accident in which car skidded and turned over. (See page 20)</td>
</tr>
<tr>
<td>61-21</td>
<td>8-14-61</td>
<td>HA-Hanford Operations Office</td>
<td>0</td>
<td>$69,865</td>
<td>Series of brush fires caused by violent electrical storm</td>
</tr>
<tr>
<td>61-22</td>
<td>9-13-61</td>
<td>AL-Bendix Corp</td>
<td>0</td>
<td>$448,206</td>
<td>Flood following Hurricane Carla Series of flame failures occurred in SRP reactor cooling water efficient system</td>
</tr>
<tr>
<td>61-23</td>
<td>10-2/24-61</td>
<td>SR-I du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>$400,000</td>
<td>Employee killed in motor vehicle accident in which car skidded and turned over. (See page 20)</td>
</tr>
<tr>
<td>61-24</td>
<td>10-25-61</td>
<td>AL-Dow Chemical Co</td>
<td>0</td>
<td>$7,000</td>
<td>Explosion (considered to be of low order) occurred in boiler</td>
</tr>
<tr>
<td>61-25</td>
<td>10-26-61</td>
<td>AL-Sandia Corp</td>
<td>1 killed</td>
<td>$131,210</td>
<td>Fire in dry room. (See page 20)</td>
</tr>
<tr>
<td>61-26</td>
<td>10-29-61</td>
<td>AL-Monsanto Chemical Co (Mound Laboratory)</td>
<td>1 overexposure</td>
<td>$390</td>
<td>Employee received 1 4 body burden of polonium when glass apparatus containing polonium was dropped Small amount of room contamination readily cleaned up. (See page 13)</td>
</tr>
<tr>
<td>61-27</td>
<td>10-29-61</td>
<td>AL- Albuquerque Operations Office</td>
<td>0</td>
<td>$57,000</td>
<td>Airplane struck 500-foot radio tower, collapsing tower Wing torn from plane</td>
</tr>
<tr>
<td>61-28</td>
<td>11-7-61</td>
<td>AL-ACF Industries, Inc</td>
<td>0</td>
<td>$34,450</td>
<td>Gas explosion in portable metal shed housing reactor Four employees received minor injuries Shed badly damaged, piping and equipment exterior to reactor also damaged</td>
</tr>
<tr>
<td>61-29</td>
<td>10-27-61</td>
<td>OR-Oak Ridge National Laboratory</td>
<td>1 overexposure</td>
<td></td>
<td>Employee received beta burns to hands and fingers on at least two occasions while performing operations on fuel specimens Dose estimates were 1 200 rad to fingers of left hand and 900 rad to fingers of right hand. (See page 14)</td>
</tr>
<tr>
<td>61-30</td>
<td>10-15-61</td>
<td>ID-Phillips Petroleum Company</td>
<td>0</td>
<td>$10,000</td>
<td>Contractor’s bus collided with private car, 20 bus passengers received minor injuries Private car driver killed</td>
</tr>
<tr>
<td>61-31</td>
<td>9-18-61</td>
<td>ID-Idaho Operations Office</td>
<td>0</td>
<td>$7,525</td>
<td>Flood damage</td>
</tr>
<tr>
<td>61-32</td>
<td>12-19-61</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td></td>
<td>Superficial plutonium contamination puncture wound on finger when wire pierced glove while wiring inside of a hood. (See page 16)</td>
</tr>
<tr>
<td>61-34</td>
<td>8-16-61</td>
<td>HA-J A Jones Construction Co</td>
<td>0</td>
<td>$5,100</td>
<td>Contamination spread occurred while dismantling old laboratory equipment in a process building Five employees received some skin contamination. (See page 12)</td>
</tr>
<tr>
<td>No</td>
<td>Date</td>
<td>Operations office &amp; contractor</td>
<td>Injuries &amp; overexposures</td>
<td>Loss</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
<td>---------------------------------</td>
<td>--------------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>61-36</td>
<td>12-12-61</td>
<td>ID-Phillips Petroleum Co</td>
<td>0</td>
<td>$16,360</td>
<td>Reactor manually scrammed following fissile break caused by restriction of primary coolant flow resulting from remnants of transparent acrylic resin sight box. (See page 15)</td>
</tr>
<tr>
<td>61-37</td>
<td>12-4-61</td>
<td>BH-Brookhaven National Laboratory</td>
<td>0</td>
<td>$19,850</td>
<td>Major portion of loss was damaged equipment</td>
</tr>
<tr>
<td>61-38</td>
<td>4-20-61</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>$13,000</td>
<td>Uranyl nitrate (1,355 lbs of depleted uranium) lost to ground when tank trailer was overfilled due to misunderstanding between regular operators and their lunch relief</td>
</tr>
<tr>
<td>61-39</td>
<td>4-13-61</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>$12,000</td>
<td>Approximately 30,000 gals of nitric acid (100%) lost to chemical sewer as result of valves being left open</td>
</tr>
<tr>
<td>61-40</td>
<td>11-21-61</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>$9,000</td>
<td>Approximately 1,089 pounds of depleted uranium lost to chemical sewer in plant</td>
</tr>
<tr>
<td>62-1</td>
<td>1-22-62</td>
<td>SR-E L, du Pont de Nemours &amp; Co</td>
<td>1 killed</td>
<td>0</td>
<td>Carpenter crushed beneath concrete form. (See page 31)</td>
</tr>
<tr>
<td>62-2</td>
<td>2-15-62</td>
<td>SR-E L, du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>0</td>
<td>Purging of stack gas sampling line released contaminated particulate material requiring washing of 163 vehicles for decontamination. (See page 16)</td>
</tr>
<tr>
<td>62-3</td>
<td>2-14-62</td>
<td>NV-Reynolds Electrical &amp; Engineering Co</td>
<td>0</td>
<td>$7,000</td>
<td>Tractor-trailer load with drill rig overturned</td>
</tr>
<tr>
<td>62-5</td>
<td>2-21-62</td>
<td>OR-National Lead Co of Ohio</td>
<td>1 injured</td>
<td>$420</td>
<td>Hydrogen explosion occurred in uranium casting pot while cover was being removed. One employee received severe laceration of head and eye injury, one a minor shoulder injury</td>
</tr>
<tr>
<td>62-6</td>
<td>3-18-62</td>
<td>OR-Union Carbide Nuclear Co</td>
<td>1 killed</td>
<td>$15,500</td>
<td>Chemical explosion occurred during routine operations in metal reduction furnace. Two operators 35 feet from furnace were burned over 50% of body, one died 12 days later. (See page 31)</td>
</tr>
<tr>
<td>62-7</td>
<td>3-29-62</td>
<td>CH-Argonne National Laboratory</td>
<td>1 killed</td>
<td>0</td>
<td>Pipefitter fell 25 feet. (See page 32)</td>
</tr>
<tr>
<td>62-9</td>
<td>3-21-62</td>
<td>OR-Union Carbide Nuclear Co</td>
<td>0</td>
<td>$24,700</td>
<td>Fire occurred in ventilation system, probable cause electrical spark</td>
</tr>
<tr>
<td>62-10</td>
<td>3-23-62</td>
<td>OR-W L Hailey &amp; Co, Inc</td>
<td>1 killed</td>
<td>0</td>
<td>Pipefitter crushed by slide of shale from side of trench. (See page 32)</td>
</tr>
<tr>
<td>62-11</td>
<td>4-7-62</td>
<td>HA-General Electric Co</td>
<td>3 overexposures</td>
<td>0</td>
<td>Criticality accident with plutonium solution. Exposures were 110, 43, and 19 rem. (See page 17)</td>
</tr>
<tr>
<td>62-12</td>
<td>4-7-62</td>
<td>NV-Reynolds Electrical &amp; Engineering Co</td>
<td>0</td>
<td>$20,000</td>
<td>Drift rig fell over when anchor pulled out to which guy wires were fastened</td>
</tr>
<tr>
<td>62-13</td>
<td>5-4-62</td>
<td>AL-Bendix Corp</td>
<td>0</td>
<td>$20,430</td>
<td>Electric oven overheated damaging channels in the oven</td>
</tr>
<tr>
<td>62-14</td>
<td>5-23-62</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>$10,000</td>
<td>Air ventilation equipment failure</td>
</tr>
<tr>
<td>No.*</td>
<td>Date</td>
<td>Operations office &amp; contractor</td>
<td>Injuries &amp; overexposures</td>
<td>Loss</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>--------------------------------</td>
<td>--------------------------</td>
<td>-------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>62-15</td>
<td>5-29-62</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>0</td>
<td>Employee received cut on right index finger while cleaning debris under pumps in loadout area. 70,000 d/m detected in excised tissue. Less than 10% maximum permissible body burden estimated to remain at wound site. (See page 19)</td>
</tr>
<tr>
<td>62-16</td>
<td>4-29-62</td>
<td>GJ-Lucius Pitkin Co</td>
<td>0</td>
<td>$9,728</td>
<td>Boiler explosion occurred when electrician attempted to light oil fire.</td>
</tr>
<tr>
<td>62-17</td>
<td>6-2-62</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>0</td>
<td>Pipefitter received puncture wound in left index finger while performing maintenance work in hood. Initial radiation measurement of 250,000 d/m detected at wound site. Tissue excised. Estimate of 10-20% maximum permissible body burden remained at wound site. (See page 20)</td>
</tr>
<tr>
<td>62-18</td>
<td>6-20-62</td>
<td>OR-Union Carbide Nuclear Co.</td>
<td>1 killed</td>
<td>0</td>
<td>While breaking bridge formation of coal in reclaim hopper, coal gave way, covering two employees. One suffocated. (See page 32)</td>
</tr>
<tr>
<td>62-19</td>
<td>4-18-62</td>
<td>SR-E. I. du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>0</td>
<td>Gas release from stack</td>
</tr>
<tr>
<td>62-20</td>
<td>4-25-62</td>
<td>NV-Reynolds Electrical &amp; Engineering Co.</td>
<td>0</td>
<td>$19,000</td>
<td>Drill rig collapsed.</td>
</tr>
<tr>
<td>62-21</td>
<td>Apr/June-1962 PNR-Westinghouse Electric Corp.</td>
<td>1 overexposure</td>
<td>0</td>
<td>Employee received exposure of 8.1 rem during calibration of X-ray spectrometer. (See page 19)</td>
<td></td>
</tr>
<tr>
<td>62-22</td>
<td>Mar/July-1962 ID-General Electric Co.</td>
<td>1 overexposure</td>
<td>0</td>
<td>Employee received exposure of 3.2 rem one quarter and 3.9 rem another. (See page 17)</td>
<td></td>
</tr>
<tr>
<td>62-23</td>
<td>7-24-62</td>
<td>OR-Puerto Rico Nuclear Center</td>
<td>7 overexposures</td>
<td>0</td>
<td>Crane operator thought he had been given all clear signal and moved rack of irradiated fuel elements into position against aluminum window which separates exposure room from reactor pool. Exposures received were 100 rem, 58 rem, 24 rem, 18 rem, 18 rem, 8 rem, and 4 rem. All were hospitalized for observation. (See page 21)</td>
</tr>
<tr>
<td>62-24</td>
<td>7-26-63</td>
<td>AL-Monsanto Chemical Co. (Mound Laboratory)</td>
<td>5 contaminated</td>
<td>$4,243</td>
<td>Opening of calorimeter can accidentally discharged alpha contamination into room atmosphere, causing surface and personnel contamination. Cost was due to decontamination. (See page 21)</td>
</tr>
<tr>
<td>62-25</td>
<td>7-29-62</td>
<td>HA-General Electric Co</td>
<td>0</td>
<td>$22,884</td>
<td>Fire in climatizer room apparently caused by overheated electrical control ballast on one of the climatizers.</td>
</tr>
<tr>
<td>62-26</td>
<td>7-12-62</td>
<td>AL-Albuquerque Operations Office</td>
<td>0</td>
<td>$13,000</td>
<td>Fire in AEC-owned building.</td>
</tr>
<tr>
<td>62-27</td>
<td>8-14-62</td>
<td>PNR-Pittsburgh Naval Reactors Office</td>
<td>1 injured</td>
<td>$15,000</td>
<td>Train was rammed from rear by another freight train. Courier hurt but returned to work within 2 weeks. Damage was to Government railway car and contents.</td>
</tr>
<tr>
<td>No *</td>
<td>Date</td>
<td>Operations office &amp; contractor</td>
<td>Injuries &amp; overexposures</td>
<td>Loss</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>62-28</td>
<td>8-15-62</td>
<td>OR-Union Carbide Nuclear Co</td>
<td>1 killed</td>
<td>0</td>
<td>Result of burns received when flash fire occurred during inspection of manhole port in side of oil circuit breaker tank in switchyard (See page 33)</td>
</tr>
<tr>
<td>62-29</td>
<td>10-7-62</td>
<td>NV-Reynolds Electrical &amp; Engineering Co</td>
<td>1 killed</td>
<td>$1,179</td>
<td>Power wagon overturned (See page 33)</td>
</tr>
<tr>
<td>62-30</td>
<td>Apr/June-1962</td>
<td>AL-Dow Chemical Co</td>
<td>3 overexposures</td>
<td>0</td>
<td>Chemical operators received 3 1 rem, 3 3 rem and 3 4 rem respectively, while processing plutonium metal (See page 19)</td>
</tr>
<tr>
<td>62-31</td>
<td>June/Aug-1962</td>
<td>ID-General Electric Co</td>
<td>1 overexposure</td>
<td>0</td>
<td>During cleanup of SL-1 incident, employee received 3 1 rem whole body exposure (see page 20)</td>
</tr>
<tr>
<td>62-32</td>
<td>8-24-62</td>
<td>ID-Phillips Petroleum Co</td>
<td>0</td>
<td>$1,000</td>
<td>Trailer and load (radioactive material shipping cask) were contaminated 5 rem/hour, due to sodium 131 leaking from the cask. Cost due to cleanup (See TID-16764(Suppl 1))</td>
</tr>
<tr>
<td>62-33</td>
<td>10-7-62</td>
<td>NY-Martin Co</td>
<td>0</td>
<td>0</td>
<td>Nuclear electric power plant, McMurdo Sound, Antarctica, damaged by fire No AEC loss</td>
</tr>
<tr>
<td>62-34</td>
<td>10-19-62</td>
<td>OR-Union Carbide Nuclear Co</td>
<td>0</td>
<td>0</td>
<td>Private driver hit truck carrying cylinders of radioactive materials No damage to truck (See TID-16764(Suppl 1))</td>
</tr>
<tr>
<td>62-35</td>
<td>10-21-62</td>
<td>SR-E I du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>$13 200</td>
<td>Approximately 700 pounds of D2O lost when rotameter sight glass ruptured (See page 24)</td>
</tr>
<tr>
<td>62-36</td>
<td>Sept/Oct-1962</td>
<td>SAN-Lawrence Radiation Laboratory</td>
<td>1 overexposure</td>
<td>0</td>
<td>Employee purported to have received 3 5 rem neutron exposure (See page 26)</td>
</tr>
<tr>
<td>62-37</td>
<td>11-13-62</td>
<td>ID-Phillips Petroleum Co</td>
<td>0</td>
<td>0</td>
<td>Slight increase in radioactivity levels caused temporary evacuation (See page 25)</td>
</tr>
<tr>
<td>62-38</td>
<td>12-3-62</td>
<td>AL-Albuquerque Operations Office</td>
<td>0</td>
<td>0</td>
<td>Train involving courier coach and two ATMX cars containing weapons components (no high explosives) derailed. Shipment undamaged. Estimated $15,500 repairs to coach and casks acknowledged as railroad liability (See TID-16764(Suppl 1))</td>
</tr>
<tr>
<td>62-40</td>
<td>9-14-62</td>
<td>OR-Oak Ridge Operations Office</td>
<td>0</td>
<td>0</td>
<td>Fire in radioactive shipment by train. Shipment undamaged. (See TID-16764(Suppl 1))</td>
</tr>
<tr>
<td>62-41</td>
<td>12-13-62</td>
<td>OR-Union Carbide Nuclear Co</td>
<td>0</td>
<td>$2 9 million</td>
<td>Explosion and fire in cell</td>
</tr>
<tr>
<td>62-42</td>
<td>12-14-62</td>
<td>OR-Union Carbide Nuclear Co</td>
<td>0</td>
<td>0</td>
<td>Truck moving UF6 in cylinders involved in accident with private car. No material released. (See TID 16764(Suppl 1))</td>
</tr>
<tr>
<td>62-43</td>
<td>Sept-Dec-1962</td>
<td>AL-Los Alamos Scientific Laboratory</td>
<td>1 overexposure</td>
<td>0</td>
<td>While handling residue in a recovery operation, an employee received a quarterly exposure of 4 86 rem (See page 22)</td>
</tr>
<tr>
<td>62-44</td>
<td>11-19-62</td>
<td>SR-E I du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>$18,060</td>
<td>Gas release from a stack (See page 25)</td>
</tr>
<tr>
<td>62-45</td>
<td>11-26-62</td>
<td>SR-E I du Pont de Nemours &amp; Co</td>
<td>0</td>
<td>$15,310</td>
<td>Gas release from a stack (See page 26)</td>
</tr>
<tr>
<td>62-46</td>
<td>8-4-62</td>
<td>NV-Reynolds Electrical &amp; Engineering Co</td>
<td>0</td>
<td>$9,535</td>
<td>While attempting to remove stuck pipe, drilling mast was damaged</td>
</tr>
<tr>
<td>No.*</td>
<td>Date</td>
<td>Operations office &amp; contractor</td>
<td>Injuries† &amp; overexposures</td>
<td>Loss</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-------------------------------</td>
<td>---------------------------</td>
<td>--------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>62-47</td>
<td>2-28-62</td>
<td>SNR-United Nuclear Corp.</td>
<td>0</td>
<td>$16,210</td>
<td>Slag from overhead cutting and welding fell on security curtains suspended across room from ceiling to floor, igniting curtains.</td>
</tr>
</tbody>
</table>

* Division of Operational Safety, USAEC Headquarters, File Number
† Lost-time injury as defined in ASA Z16 1.
‡ Also being reported by the military
RADIATION EXPOSURE OF AEC CONTRACTOR PERSONNEL

In the course of their work, some employees at atomic energy installations may receive exposure to radiation; however, AEC operations are conducted to comply with federally approved Radiation Protection Guides and to limit radiation exposure to personnel to the lowest practical level. A survey of AEC and AEC contractor employees showed that, of the more than 95,000 employees monitored in 1961 and 128,000 employees in 1962, 99.9 per cent received less than 5 rems within the year and that 94.5 per cent received only one rem or less. Table 2 gives details for the two years.

Table 2—EXPOSURE OF AEC AND AEC CONTRACTOR PERSONNEL TO PENETRATING RADIATION, SUMMARIZED FOR 1961 AND 1962

<table>
<thead>
<tr>
<th>Range of annual total exposure in Rems*</th>
<th>1962</th>
<th>1961</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of employees</td>
<td>No. of employees</td>
</tr>
<tr>
<td>0–1</td>
<td>122,437</td>
<td>90,651</td>
</tr>
<tr>
<td>1–2</td>
<td>3,436</td>
<td>2,963</td>
</tr>
<tr>
<td>2–3</td>
<td>1,640</td>
<td>1,641</td>
</tr>
<tr>
<td>3–4</td>
<td>398</td>
<td>430</td>
</tr>
<tr>
<td>4–5</td>
<td>233</td>
<td>140</td>
</tr>
<tr>
<td>5–6</td>
<td>89</td>
<td>29</td>
</tr>
<tr>
<td>6–7</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>7–8</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>8–9</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>9–10</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>10–11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11–12</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>12–plus</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>128,265</td>
<td>95,876</td>
</tr>
</tbody>
</table>

* The rem is a measure of the dose of any ionizing radiation to body tissues in terms of its estimated biological effect relative to a dose of one roentgen of high voltage X-rays.
ACCIDENTS AND INCIDENTS INVOLVING RADIOACTIVE MATERIAL IN AEC ACTIVITIES 1961-1962

The following descriptions add details to accidents and incidents involving radiation, including those listed in Table 1 and a few others of lesser concern.

SL-1 Excursion


Nature of Accident

A nuclear excursion occurred within the reactor vessel, resulting in the death of three persons, extensive damage of the reactor core and room, and in high radiation levels (approximately 500—1000 r/hr) within the reactor room.

Description of Operation

At the time of the accident, a three-man crew was on the top of the reactor reassembling the control rod drive mechanisms and housing. The SL-1 is a direct-cycle, boiling-water reactor of 3,000 kw. gross heat capacity with enriched uranium fuel, clad in aluminum, and moderated and cooled by light water in natural circulation. The reactor was operated as a prototype of a facility that could be operated at remote sites for three years without refueling.

Details of Accident

At the time of the explosion, which resulted from a nuclear excursion, the reactor was loaded with 40 fuel elements and 5 control rod blades of cadmium. The first indication of trouble at the SL-1 came when automatic heat-detection alarms were received at the fire stations at the National Reactor Testing Station. Members of the AEC fire department and security forces responded.

The assistant fire chief entered the reactor support building and immediately detected radiation levels up to 25 r/hr. He retreated from the reactor building, and thoroughly searched the administrative and support facilities buildings looking for the three men believed to be on duty.

Fifteen minutes later three men (two firemen and a health physicist) approached the reactor building, observed radiation levels adjacent to the reactor floor of the order of 500 r/hr, and withdrew.

Approximately 50 minutes later, it was decided to enter the building, after having verified that the three military men on duty at SL-1 had not left the site. The plant health physics supervisor and operations supervisor entered the operating floor for less than two minutes. They saw two men, one of whom was moving. They withdrew, and returned with additional help. The individual that was alive was put on a stretcher and removed. Subsequent entries
were made over the next several days to remove the two bodies and to recover certain equip-
ment and records. The accident was caused by manual withdrawal, by one or more of the
maintenance crew, of the central control rod blade from the core considerably beyond the
limit specified in the maintenance procedure.

Nature of Injuries or Loss

Of the several hundred people engaged in recovery operations, 22 persons received radia-
tion exposures in the range of three to 27 rem gamma radiation total body exposure. The maxi-
mum whole body beta radiation was 120 rem. Precautionary medical checkups did not disclose
any clinical symptoms.

Two members of the crew were killed instantly, and the third man died within two hours
following the incident as a result of an injury to the head.

Loss of $4,350,000 resulted from the accident.

Some gaseous fission products, including radioactive iodine, escaped to the atmosphere
outside the building and were carried downwind in a narrow plume. Particulate fission material
was largely confined to the reactor building, with slight radioactivity in the immediate vicinity
of the building.

Criticality Accident


Nature of Accident

A nuclear excursion of approximately \(6 \times 10^{18}\) fissions occurred in a first-cycle product
evaporator at a chemical processing plant.

Description of Operation

Recovery of enriched uranium from aluminum-uranium alloy fuel assemblies and unalloyed
fuel pins.

Details of Accident

The criticality accident resulted when a solution of enriched uranyl nitrate accidentally
surged from a geometrically safe section of the evaporator into the upper critically unsafe,
vapor disengagement section. The accident occurred behind thick concrete walls in a hot cell
which is part of the first cycle for processing highly radioactive spent-fuel elements.

Nature of Injuries or Loss

Personnel response to the radiation alarms and the evacuation signal was prompt and
orderly.

Analyses of badges from 65 individuals indicated a maximum exposure of 55 mrem gamma
and 0 beta. The maximum thermal neutron exposure detected in the badges analyzed was less
than 10 mrem. Analyses of nuclear accident dosimeters indicated that there was negligible
fast neutron flux associated with personnel exposures.

The radioactivity released to the atmosphere as a result of the accident was about twice
normal background when it left the area.

Loss of $6,000 resulted from cleanup of the incident.
Employee Exposed To Low-Energy Radiation

Argonne, Ill., Feb. 22, 1961

Nature of Incident

X-ray exposure to the back of an employee's head.

Description of Operation

Drafting work.

Details of Incident

A camera assembly used in conjunction with a 40 Kev X-ray machine is normally tied in with a guillotine-type shield in such a way that when the camera is removed, the shutter is automatically dropped. A drawing board is located in the area. The day of the incident an employee was working at the drawing board. The camera had been disassembled and removed earlier and, unknown to the employee, the shutter remained up.

Nature of Injuries or Loss

The employee was at the drawing board approximately ten minutes and received a concentrated low-energy exposure to the back of the head of 94 rem from the beam from the X-ray machine. The employee showed no ill effects from the exposure.

Airborne Radioactive Material

Miamisburg, Ohio, May 11, 1961—Ref: —61-10

Nature of Accident

A pressure buildup in a closed caustic scrubber system forced airborne radioactive material into a room.

Description of Operation

A research chemist was performing a drying operation on plutonium precipitate in a drybox.

Details of Accident

A chemist heard a noise that sounded like hissing steam but observed nothing unusual in the dryboxes. The noise seemed to be coming from underneath the dryboxes. It was later determined that this incident was due to a pressure buildup in a closed caustic scrubber system (which neutralized HF gas during fluorination of plutonium oxalate), forcing the airborne radioactive material into the room from a weakened caustic scrubber joint. Some of the circumstances favorable to the spread of plutonium 238 when the leak developed were the loss of vacuum in the scrubber system which allowed a pressure buildup, weakening of the upper section of the scrubber due to mechanical vibration or pressure fluctuation, and the fact that the wooden box enclosure was not liquid or gas tight.
Based on bioassay data, the research chemist received 2.05 times the maximum permissible burden for plutonium 238. He has been restricted from working with radioactive materials for an indefinite period.

The cost of replacing contaminated equipment and room decontamination was $4016.

Radioactive Gas Release

Aiken, S. C., May–June 1961

Nature of Incident

Gas release from a 200-foot-high stack.

Description of Operation

Plant's separation facilities.

Details of Incident

The release came from the vent system which served storage tanks and other process vessels. The release from the system indicated that an unusual amount of radioiodine had been introduced into the plant.

Nature of Injuries or Loss

The release, which began about May 29 and continued into the early part of June, did not result in exposure to personnel near the plant environs in excess of currently established permissible limits.

Plutonium Contamination

Richland, Wash., June 12, 1961

Nature of Incident

Puncture wound to the heel of the hand.

Description of Operation

Working as a process operator in a chemical processing plant.

Details of Incident

An operator received a plutonium-contaminated minor injury to the heel of his right hand when he struck his hand on a contaminated tool.

Nature of Injuries or Loss

Decontamination measures were administered to rid the wound of the contamination. There was no evidence of plutonium absorption.
Minor Exposure To Radioactivity

Richland, Wash., July 1, 1961

Nature of Incident

Employees were exposed to fission products.

Description of Operation

Chemical Processing Plant.

Details of Incident

Contamination spread from a break in a condensate line in a chemical processing plant. Three employees were exposed to fission products as a result of the incident.

Nature of Injuries or Loss

No significant exposures. Two autos were contaminated. Decontamination cost $2,000—$3,000.

Contamination Incident

Richland, Wash., Aug. 16, 1961—Ref: —61-34

Nature of Incident

Nine employees received varying amounts of radioactive contamination.

Description of Operation

Dismantling old laboratory equipment in a process building.

Details of Incident

A construction force was removing a plastic greenhouse enclosing a hood over a conveyor when the incident occurred. After the work area and greenhouse were surveyed and no contamination detected either inside or outside, the monitor authorized removal of respiratory protection and the dismantlement of the greenhouse.

A short time after the operation began, a radiation survey indicated a contamination spread.

The workers, unaware that the tape which they were removing covered old tape which was placed over holes in the conveyor, removed the tape used to seal the greenhouse to the side of the conveyor and inadvertently removed the old tape also, causing the spread of radioactive contamination.

Nature of Injuries or Loss

The contamination was contained within the immediate area inside the building and work in other portions of the building was not affected (cost $5,100).

Contamination on the employees varied from 1,000 d/m to 40,000 d/m. All men were decontaminated and released for work.
Plutonium-Contaminated Cut

Richland, Wash., Oct. 4, 1961

Nature of Incident

Plutonium-contaminated cut to an employee’s finger.

Description of Operation

Chemical processing area.

Details of Incident

A chemical process operator received a cut to his finger during cleanup work in a processing area.

Nature of Injuries or Loss

Decontamination measures were administered to rid the wound of the contamination. The employee returned to work the next day.

Radioactive Contamination Accident

Miamisburg, Ohio, Oct. 20, 1961—Ref: —61-26

Nature of Accident

Radioactive material was released through the accidental breakage of glass laboratory equipment while being hand-carried.

Description of Operation

Decontamination of glass apparatus used in a laboratory experiment.

Details of Accident

After an experiment was completed, an employee was instructed to decontaminate glass apparatus used in the experiment. On the way back from the decontamination area, the employee carrying the glass apparatus (see sketch) containing polonium was accidentally bumped by another employee, causing him to drop a small glass tube. The tube shattered, spreading polonium contamination over the immediate area.

Before the apparatus was removed from the decontamination area, a health physics employee checked the apparatus and found no level of activity on the outside. No check was made of the inside of the glass tubing.

Nature of Injuries or Loss

The employee carrying the apparatus received a body burden of approximately 1.4 times the maximum permissible continuous concentration for polonium.

The point at which the incident occurred is a heavily traveled corridor and this aided the rapid spread of activity throughout the building. The contamination was one of tracking and transfer rather than of being airborne.

Operations in the building were down for approximately two-thirds of a day for decontamination. The cost of decontamination was $590.
The employee carrying the apparatus received, by way of the respiratory tract, a body burden of polonium approximately 1.4 times the permissible level.

**Beta Burns**

Oak Ridge, Tenn., Oct. 27, 1961—Ref: —61-29

*Nature of Accident*

Metallurgy technician received beta burns to his fingers while handling an irradiated fuel specimen.

*Description of Operation*

An employee performed a chipping operation on a small portion of a fuel specimen for an experiment. The work was done by means of holding the specimen in a pair of forceps with his left hand and chipping the surface with a knife held in his right hand. (The employee had been verbally instructed to perform the operation remotely in a cell; he elected to perform the work manually.)

*Details of Accident*

Due to the irregular shape of the fuel specimen, the mold (a silicone rubber molding compound around the specimen) had to be slit to remove the specimen by flexing. This was accomplished with a knife and the mold was then flexed by the left hand. After flexing the mold, the specimen was not completely released. The technician then removed the specimen with the thumb and index finger of the left hand and placed it in a box located on the floor of the cell. (A similar operation was performed two days later by the same employee.)

The gamma alarm sounded momentarily during this operation; however, the employee apparently made no attempt to monitor the specimen.

*Nature of Injuries or Loss*

The employee received an estimated beta dose of 1200 rad to the tips of the thumb, index, third and fourth fingers of the left hand. On his right hand, a dose of 900 rad, the tip of the thumb, side of index finger and side and tip of the third finger were involved. No permanent disability was anticipated.

**Nuclear Excursion**

Oak Ridge, Tenn., Nov. 10, 1961

*Nature of Accident*

An unplanned minor nuclear excursion occurred in a critical experiment facility.

*Description of Operation*

A criticality experiment involving 75 kg. of enriched uranium metal (approximately 93% uranium 235).
Details of Accident

A criticality excursion occurred as enriched uranium metal, neutron-reflected and moderated by hydrogen, was being assembled. The excursion was caused by a too rapid approach of the two pieces of metal constituting the experiment.

Nature of Injuries or Loss

There was no personnel exposure or property damage. The energy release was estimated to be between $10^{15}$ and $10^{16}$ fissions. Fission product contamination, both airborne and contained in the metal, decayed sufficiently overnight to allow unhindered continuation of the experiment.

Remarks

The incident occurred in a critical experiment laboratory specifically designed to accommodate such occurrences, since events of this nature cannot be considered entirely unexpected in an experimental facility of this sort.

Reactor Fuel Damage Accident

Idaho Falls, Idaho, Dec. 12, 1961—Ref:—61-36

Nature of Accident

A fission break caused shutdown of the reactor.

Description of Operation

Operation of a test reactor.

Details of Accident

The fission break involved the escape of fission products from fuel elements into the reactor cooling water system. The reactor was shut down immediately, about three hours after having achieved criticality. The power level at the time of the shutdown was 90 megawatts. The fission break was caused by a severe restriction in the flow of primary cooling water to several elements in the northeast quadrant of the core. The flow restriction, in turn, was caused by the remnants of a sightbox which had been left in the reactor tank when the top head was put in place. The sightbox, an open-topped, triangular box about 8 inches by 5 inches deep, was made of clear acrylic resin and was used during in-tank maintenance work to eliminate visual distortions caused by ripples on the water. Upon startup, the sightbox was forced down on top of the core by primary water flow, where it broke up and partially melted over the top (inlet) end of the elements, blocking coolant flow.

Nature of Injuries or Loss

Nineteen fuel elements were withdrawn, examined and replaced with new elements. Of the 19 elements withdrawn, eight indicated only a small portion of any fuel plate melted. There was no damage to core structural components or any other portion of the reactor system. Approximate cost was $16,000.

Emission of activity from the reactor stack increased following the incident but was not regarded as a health hazard, either on or off the National Reactor Testing Station site.
Radiation Exposure To Fingers And Hand

Aiken, S. C., Dec. 13, 1961

Nature of Incident

A laboratory technician exposed the thumb and fingers of his right hand to radiation.

Description of Operation

Decontamination and reassembly of a hot cell.

Details of Incident

The technician entered the cell to take a timed turn of 40 seconds in a periodic decontamination and reassembly of the cell. With his right hand the employee picked up, and held for about 3 seconds, a black piece of irradiated fuel metal that had been hidden behind a modified lead brick used as a base plate for changing finger pads of the master-slave manipulator. The technician initially mistook the small metal fragment for a black rubber finger pad of the manipulator. Immediately upon picking it up, he suspected the true identity of the metal and promptly dropped it and left the cell.

Nature of Injuries or Loss

The hand exposure was estimated at about 20 rad.

Plutonium Puncture Wound

Richland, Wash., Dec. 19, 1961—Ref:—61-33

Nature of Incident

An employee received a superficial plutonium puncture wound on the finger of his right hand.

Description of Operation

An electrician was doing some wiring inside of a hood.

Details of Incident

An electrician was doing some wiring inside of a hood (where radioactive materials are handled) when the end of a wire pierced his glove.

Ordinarily, a minor contamination (.006 microcuries) of this kind would not be reported. However, a news release was made.

Nature of Injuries or Loss

The wound was decontaminated and the employee returned to work.

Low Level Release Of Radioactivity

Nature of Incident

Stack release of radioactive material.

Description of Operation

Purging of a stack gas sampling line.

Details of Incident

A release of contaminated particulate material, composed principally of ammonium nitrate, occurred at a plant’s separation facility during the purging of a stack gas sampling line at the facility stack. The particulate material drifted from the exclusion area and gave rise to a detectable level of contamination of 163 vehicles in an onsite parking lot.

Nature of Injuries or Loss

The maximum surface readings on cars were less than 0.5 milliroentgens per hour. The vehicles were decontaminated by washing. No detectable personnel exposure resulted.

Radiation Exposure


Nature of Incident

Quarterly radiation overexposure.

Description of Operation

Recovery operation.

Details of Incident

During the recovery operation in the SL-1, a health physicist received the exposure.

Nature of Injuries or Loss

The employee received 3.2 rem one quarter and 3.9 rem another.

Nuclear Excursion

Richland, Wash., April 7, 1962—Ref: —62-11

Nature of Accident

An unplanned nuclear excursion occurred in a plutonium processing facility.

Description of Operation

Cleanup and plutonium recovery from debris accumulated in the bottom of an unshielded processing system hood. The system can be considered as unshielded. The system had been shut down for a month to conduct the cleanup operation.
Details of Accident

Criticality was due to the inadvertent accumulation, in a sixty-glass transfer tank, of approximately 1500 grams of plutonium in 40–50 liters of dilute nitric acid solution. The sequence of events which led to the accumulation of the plutonium in the tank cannot be stated positively. However, it is believed that, when a tank valve was opened, the solution from another process vessel overflowed to a sump (through a disconnected overflow which no one was aware of) and was drawn into the transfer tank (which was under the negative pressure of the vent system) through a temporary line between this tank and the sump.

When the excursion occurred, radiation and evacuation alarms sounded. All but two personnel left the building immediately, according to well prepared and rehearsed evacuation plans. Fortunately, neither of the two remaining was in close proximity to the involved system nor in a high radiation field.

The course of the nuclear reaction involved initial criticality ($10^{14}$ fissions); a subsidence; one or more later peaks; and, after approximately one-half hour, a declining rate of fission which terminated in a subcritical condition, 37 hours later. The total number of fissions was approximately $8 \times 10^{17}$.

Nature of Injuries or Loss

Of the 22 persons in the building at the time, four were hospitalized for observation. These four were the only employees in the room with the system. Three were easily identified in a “quick sort” count by survey instruments. They were the system operators and were in close proximity to the excursion. These individuals received estimated maximum radiation exposures of 110, 43 and 19 rem. None showed symptoms definitely referable to their radiation exposures. The fourth was sent to the hospital only because he had been moderately near the source. There was no contamination as a result of the excursion. Some fission product activity, airborne via the vent system and the exhaust stack, was detected in the atmosphere for a brief period after the accident.

The physical damage amounted to less than $1,000.

Radioactive Gas Release


Nature of Incident

Gas release from a stack.

Description of Operation

Reservoir recycle facilities.

Details of Incident

During the unloading of radioactive gas from a pressure container, a malfunction occurred releasing gas out of the stack.

Nature of Injuries or Loss

There were no detectable assimilations by on-site personnel and no detectable area contaminations were noted.
Radiation Exposure

Pittsburgh, Pa., Apr.–June 1962–Ref: —62-21

Nature of Incident
None.

Description of Operation
Performing work with an X-ray spectrometer.

Details of Incident
During the calibration of an X-ray spectrometer, an employee was exposed to radiation.

Nature of Injuries or Loss
The employee received a total exposure of 8.1 rem for the calendar quarter April to June.

Radiation Exposures


Nature of Incident
Three employees exposed to gamma and neutron radiation while handling plutonium in a glovebox line.

Description of Operation
Chemical processing area.

Details of Incident
Three chemical operators were exposed to radiation while working in the chemical processing area of plutonium metal production.

Nature of Injuries or Loss
The chemical operators slightly exceeded the 3-rem-per-quarter exposure rate (3.1; 3.3; 3.4 rem). Greater than 70% of the total dose was attributed to neutron radiation.

Plutonium-Contaminated Cut


Nature of Incident
Plutonium-contaminated cut.

Description of Operation
Maintenance work in a processing plant.
Details of Incident

A plant operator received a plutonium-contaminated cut on his right index finger. The operator was cleaning debris under a pump in the loadout area.

Nature of Injuries or Loss

The employee was taken to the area first aid station where decontamination procedures were initiated. Less than 10% maximum permissible body burden remained at the wound site. He returned to work the same day.

Plutonium-Contaminated Puncture Wound

Richland, Wash., June 2, 1962—Ref:——62-17

Nature of Incident

Plutonium-contaminated puncture wound.

Description of Operation

Maintenance work in a processing plant.

Details of Incident

A pipefitter received a plutonium-contaminated puncture wound in the left index finger while performing maintenance work in a hood.

Nature of Injuries or Loss

The employee was taken to the area first aid station where decontamination procedures were initiated. Less than 20% maximum permissible body burden remained at the wound site. He returned to work the same day.

Radiation Exposure


Nature of Incident

Exposure to radiation.

Description of Operation

Performing cleanup work.

Details of Incident

An employee slightly exceeded the 3-rem-per-quarter exposure rate while performing cleanup work on the SL-1 recovery.

Nature of Injuries or Loss

The employee received 3.1 rem.
Radiation Exposures

Puerto Rico, July 24, 1962—Ref: —62-23

Nature of Accident

Seven employees were accidentally exposed to radiation from irradiated fuel elements.

Description of Operation

Setting up an experiment in a gamma exposure room.

Details of Accident

A crane operator mistakenly thought he had been given the all-clear signal to move a rack of hot fuel elements into a position against the aluminum window, which separates the exposure room from the reactor pool. The room was to be vacated and the shield door closed before positioning the fuel elements against the window. The gamma room door could not be seen from the crane operator’s position.

When the crane operator began moving the fuel elements into the window position, the 10 mr monitor near the gamma room door tripped off an alarm. The reactor supervisor immediately ordered the elements moved away from the window, terminating the incident.

Nature of Injuries or Loss

The estimated exposure time of the individuals was \( \frac{1}{4} \) seconds. The seven employees’ exposures were 100 rem, 58 rem, 24 rem, 18 rem, 18 rem, 8 rem and 4 rem. There were no radiation injuries as a result of the accident.

Radiation Exposure

Miamisburg, Ohio, July 26, 1962—Ref: —62-24

Nature of Accident

Radioactive plutonium oxide was accidentally discharged into the room atmosphere.

Description of Operation

Opening calorimeter cans.

Details of Accident

During the opening of a calorimeter can in an open laboratory, the lid blew off to a height of about two feet above the table top. This sudden release of pressure forced radioactive dust (plutonium oxide) particles out into the room atmosphere. Five employees were in the room at the time.

Nature of Injuries or Loss

Contamination was dispersed throughout the laboratory and adjacent rooms. Decontamination costs were $4,243. Maximum total body burden for any person was about 0.24 micro­curies of plutonium.
Radiation Exposure


Nature of Incident

None.

Description of Operation

Roving health chemistry monitor.

Details of Incident

An employee, assigned to weekend duties as a roving health chemistry monitor, received a neutron exposure as indicated on his film badge. The activities of the employee, as recorded in the laboratory monitor log, did not show any occurrences of unique situations involving radioactivity during the period of interest.

Nature of Injuries or Loss

The employee's film badge indicated an exposure of 3.5 rem neutron.

Radiation Exposure


Nature of Incident

None.

Description of Operation

Recovery operation.

Details of Incident

An employee exceeded the 3-rem-per-quarter exposure rate due to a greater quantity of material being handled in his area than normally.

Nature of Injuries or Loss

The employee received 4.86 rem.

Plutonium Contamination

Aiken, S. C., Oct. 1, 1962

Nature of Incident

Puncture wound to the hand; contamination with radioactive material.

Description of Operation

Glovebox line.
Details of Incident

A separation operator sustained a puncture wound through a glove while cleaning out the drybox. The incident occurred when he picked up a piece of a broken wrench which had been corroded, apparently, to a sharp point.

Nature of Injuries or Loss

Decontamination measures were administered to rid the wound of the contamination. Urine and blood monitoring demonstrated minimal absorption of radioactive material.

Fire In Nuclear Power Plant


Nature of Accident

Minor explosion and fire in a reactor steam generator tank.

Description of Operation

Nuclear power plant (portable, medium-power pressurized-water reactor).

Details of Accident

The incident occurred during startup following a shutdown which had been caused by a faulty electronic power level indicator. The inspection disclosed that electric cables and pipe insulation in the steam generator tank had been scorched and that protective cans for control rod instrumentation in the reactor tank had been damaged.

It has been determined that release of hydrogen due to system leakage caused local buildup of hydrogen in the stagnant area of the steam generator containment tank and was followed by ignition, fire and possible detonation. There was no overt manifestation of the incident until after plant shutdown and entry into the containment tanks for inspection had been accomplished.

Data and analysis of the accident causes and sources of combustible material indicate that hydrogen was the combustible agent. There are three significant sources of hydrogen in the plant.

The short circuit was the probable cause of ignition. Other possible causes of ignition are: the presence of catalytic “promoters,” such as nitrogen peroxide formed by irradiation of air inside the tanks, or ammonia, which is used for pH control of the shield water, or possible buildup of static electricity at the point of vapor leakage through valve packing on a pressurizer datum column block valve.

Air mixing in the containment tanks was generally fair with some stagnant pockets. The area in which the fire occurred was such a stagnant pocket, permitting hydrogen content to build up locally rather than mix into the entire volume.

A detector for combustible mixtures was installed in the general area of the fire, but through an operational error, it was not in operation at the time of the incident. Hydrogen content of the tank air at the time of the incident is not known and was not being monitored by any means except by the above-mentioned inoperative detector.

Nature of Injuries or Loss

No personnel were injured and there was no release of radioactive materials or unusual radiation in the area.
Radiation Exposure


Nature of Incident
None.

Description of Operation
Glovebox line in a plutonium facility.

Details of Incident
In the last two weeks of the quarter, a chemical operator handled a greater quantity of material through his area than he ordinarily handled. This caused the employee to be exposed to high spontaneous neutron radiation in amounts more than normally expected.

Nature of Injuries or Loss
While the operator was at the gloveline, he received an accumulated radiation exposure of 3.3 rem (80% neutron radiation).

Reactor System Sight Glass Ruptures


Nature of Accident
A glass plate on a rotameter ruptured.

Description of Operation
Operation of a reactor.

Details of Accident
A high-pressure glass plate (sight glass) on the rotameter for the delayed neutron monitor on the main D₂O flow system ruptured during normal operation of a reactor.

The failure was detected by activity monitors which responded to the low level activity of the D₂O. The reactor was manually scrammed from low power, and fast cool-down procedure was initiated. The line was isolated by manual closing of isolating valves in the rotameter line.

Nature of Injuries or Loss
Plastic suits were used to protect personnel from the activity of the released D₂O. There was no contamination or significant exposure to personnel in this action. No significant radioactivity was released.

Approximately 700 pounds of D₂O were vaporized while 3,400 pounds were recovered. ($13,200).
Release of Radioactivity


Nature of Incident

Short-lived fission product released to atmosphere from reactor primary cooling system due to a minor fuel element fission break.

Description of Operation

Reactor.

Details of Incident

Slight increases in radioactivity levels in a reactor area caused temporary evacuation of personnel from certain work areas as a protective measure.

Nature of Injuries or Loss

No personnel hazard at the site or offsite and no significant exposures.

Depleted Uranium Escapes At Gaseous Diffusion Plant

Oak Ridge, Tenn., Nov. 13, 1962

Nature of Incident

Uranium hexafluoride gas was released from a storage cylinder.

Description of Operation

Radioactive gas being removed from a 2.5-ton cylinder.

Details of Incident

During vaporization of a 2.5-ton cylinder of UF₆, a valve connected to the storage cylinder failed, permitting the release of the gas. There were two employees in attendance at the time of the release, who immediately evacuated. An emergency team, fully equipped and masked, returned to the cylinder and plugged the leaking valve.

Nature of Injuries or Loss

Two of the emergency team members received minor chemical burns. After treatment, the men returned to complete their shift. There was no significant internal deposition of uranium in the employees, and no unusual off-site air concentration occurred.

Radioactive Gas Release


Nature of Incident

Gas release from a stack.
Details of Incident

During the unloading of a pressurized container, a compression fitting failed, causing a leak of radioactive gas.

Nature of Injuries or Loss

There were no detectable assimilations by on-site personnel and no detectable area contaminations were noted.

Radioactive Gas Release


Nature of Incident

Gas release from a stack.

Description of Operation

Recovery.

Details of Incident

During the loading of a pressurized container, a leak developed around the packing of a valve.

Nature of Injuries or Loss

There were no detectable assimilations by on-site personnel and no detectable area contaminations were noted.
ACCIDENTS INVOLVING FATALITIES
IN AEC ACTIVITIES 1961-1962

Accidents occurring in atomic energy operations in this country during the 20-year period 1943 through 1962, which includes the AEC’s predecessor, the Manhattan Engineer District, may be conveniently divided into three groups: those in no way unique to the use of atomic energy or its products, such as falls, electrocutions, motor vehicle accidents, etc.; those involving radioactive materials, such as fires, explosions, and environmental contamination; and those resulting in radiation exposure to workers.

During this period, there have been a total of 238 fatalities resulting from the above groups of accidents. Six of these fatalities were from accidents which were attributable to nuclear causes. Three of these were the direct result of exposure to a massive dose of nuclear radiation, two occurring during chain reactions in experimental critical assemblies and the other in a criticality accident.

The immediate causes of death of the three remaining fatalities were the physical effects (i.e., blast, flying missiles, etc.) associated with the SL-1 nuclear accident on January 3, 1961; however, the radiation levels associated with that accident were extremely high and probably would have been fatal.

The figure of 12 deaths for 1961 includes the three military personnel (also included in military statistics) who were killed in the SL-1 explosion.

Following are brief descriptions of the fatalities occurring during 1961-62.

**Fatal Fall**

Los Alamos, N. Mexico, Jan. 24, 1961—Ref: —61-4

*Nature of Accident*

Fell from bunker roof while cleaning up debris after an explosive test shot.

*Description of Operation*

Assistant firing site leader was attempting to pull a small metal part from a piece of wood.

*Details of Accident*

Just before the employee fell, another employee saw him about three feet from the roof edge with his foot on a piece of wood, attempting to pull a small metal part from it. Slip marks found on the edge of the roof indicated that he apparently lost his balance while pulling on the metal part and toppled off the roof onto the concrete pad below.

*Nature of Injuries or Loss*

The employee died of severe brain damage and hemorrhage resulting from the fall.
Head-On Collision


Nature of Accident
Motor vehicle.

Description of Operation
Driving a motor vehicle.

Details of Accident
A Government-owned vehicle and a privately owned vehicle collided head-on. The privately owned vehicle was proceeding southeast in the proper lane at the time of impact. The Government-owned vehicle left skid marks for 148 feet in the proper lane, then crossed the center line, leaving skid marks of 47 feet to the point of impact. There were no eyewitnesses, as both drivers and a passenger in the privately owned car died without regaining consciousness.

Nature of Injuries or Loss
The driver of the Government-owned car was killed; the driver and passenger in the privately owned car were killed; damage to the Government vehicle was $2500; damage to the privately owned vehicle $2900.

Overcome By Solvent Fumes

Los Alamos, New Mexico, Feb. 14, 1961—Ref: —61-6

Nature of Accident
Overcome by solvent fumes.

Description of Operation
Cleaning a vacuum annealing furnace shell.

Details of Accident
A technician was using a commercial solvent, containing a methyl chloroform base and an inhibitor, from an open coffee can to clean oil and grease with steel wool and rags from the interior surfaces of a vacuum annealing furnace shell. The shell was located in an open room and had one 15" and three 6" diameter ports 28" from the bottom. Approximately a quart of the solvent had been used when the technician was found about 50 minutes after the supervisor had last checked the work.

Nature of Injuries or Loss
The technician was pronounced dead shortly after arrival at the local medical center.
Instrument Tower Collapsed

Oak Ridge, Tenn., Mar. 10, 1961—Ref: —61-8

Nature of Accident
Tower fell.

Description of Operation
Instrument tower being erected.

Details of Accident
During erection of an instrument tower, as the last 10-foot section was being placed into position, the top section of the tower broke off. Two tower erectors working at the top of the tower were hurled to the ground.

Nature of Injuries or Loss
One man was killed instantly; the other died more than eleven months later as a result of the injuries sustained from the fall.

Painter Falls From Scaffold

Pittsburgh, Pa., March 16, 1961—Ref: —61-9

Nature of Accident
A scaffold rigged for painting overhead structure and ceiling collapsed.

Description of Operation
Painting overhead structure and ceiling.

Details of Accident
Four men were standing on a scaffold, painting the overhead structure and ceiling, when one of the cables supporting the scaffold broke, plunging the men to the floor 20 feet below.

Nature of Injuries or Loss
One painter was killed; three others received fractures and multiple contusions.

Tractor Rolled Backwards


Nature of Accident
Tractor rolled backwards crushing employee.
Description of Operation

Unloading a tractor from a low-boy trailer.

Details of Accident

A low-boy trailer was being backed into position preparatory to the unloading of a cat­
pillar tractor-dozer from the trailer. A heavy equipment operator was on the rear of the
trailer unleashing the tractor, when it rolled backwards off the trailer, crushing the operator.

Nature of Injuries or Loss

The heavy equipment operator was killed instantaneously.

Motor Vehicle Accident

Los Alamos, New Mexico, Sept. 7, 1961—Ref: —61-20

Nature of Accident

Motor vehicle.

Description of Operation

Driving a motor vehicle.

Details of Accident

The vehicle was overturned on a curve. The driver had been ejected from the vehicle and
was found dead.

Nature of Injuries or Loss

The employee was killed in the accident.

Flash Fire Causes Fatality


Nature of Accident

Flash fire.

Description of Operation

Classified Contract.

Details of Accident

A flash fire occurred in a dryroom filled with stacks of trays containing chemically
treated paper. A woman was taking some trays from a stack and placing them on a transfer
cart when the fire occurred. The fire spread rapidly to other stacks, and the flames enveloped
the room. The room had smoke detection equipment but no sprinklers. The probable cause of
the fire was ignition by friction or static ignition of the paper.
Nature of Injuries or Loss

Nineteen of 47 employees assigned to the work area were given emergency or first aid treatment and four were admitted to hospitals. Of the latter, one died three days later. The total damage amounted to $131,210.

Crushed By Concrete Form


Nature of Accident

Large concrete form fell carrying man with it.

Description of Operation

Positioning 16' x 16' forms for concrete walls.

Details of Accident

A carpenter climbed the outside of a 16' x 16' concrete form weighing 2600 pounds, which had just been positioned by a motor crane. Observers saw the top of the form move, and the form began to fall away from the reinforcing steel. Companion workers tried to check the movement of the form from their position on the floor below, but the inertia was too great and they had to move aside to avoid being crushed. The carpenter faced away from the direction of the form fall, pulling his head above the top edge of the form, and rode the form down. His chest was caught between the top of the form and a vertical reinforcing steel mat running parallel to and 15' away from the wall in question.

Nature of Injuries or Loss

The carpenter was killed instantaneously.

Furnace Explosion


Nature of Accident

Explosion.

Description of Operation

Metals processing.

Details of Accident

An explosion occurred in a metal reduction furnace, causing a blinding white flash, followed by a fireball and a spray of hot liquid. Two operators working approximately 35 feet from the furnace were severely burned.

Nature of Injuries or Loss

The employee with the greater degree of burns died twelve days later. Damage to the furnace and building amounted to $15,500.
**Trench Cave-In**


*Nature of Accident*

Trench cave-in.

*Description of Operation*

Excavating for, laying and partially backfilling a 12" cast iron mechanically joined water pipe line adjacent to and parallel with the side of the road.

*Details of Accident*

Three men were in the trench waiting for a section of pipe. Two of them were trapped when a large section of the trench wall caved in. Other workmen were able to free one of the men quickly. The other pipeman’s chest was crushed by the weight of a large solid section of the cave-in.

*Nature of Injuries or Loss*

The pipeman died as the result of injuries and suffocation.

**Pipefitter Falls**

Argonne, Ill., March 29, 1962—Ref: —62-7

*Nature of Accident*

Pipefitter walking atop a pipe fell 21 feet.

*Description of Operation*

Plugging holes in an 18" pipe.

*Details of Accident*

A pipefitter was walking atop a pipe 18 inches in diameter with 2 inches of insulation covering the pipe. The insulation was secured in place and did not slip on the pipe. No one saw the pipefitter fall, although two people saw him while in descent. Five persons in the building at the time stated he made no outcry during the 21-foot fall.

*Nature of Injuries or Loss*

The pipefitter suffered fatal injuries.

**Coal Pile Cave-In**

Paducah, Ky., June 20, 1962—Ref: —62-18

*Nature of Accident*

Coal cave-in.
Description of Operation

Attempting to force coal to enter a reclaim hopper.

Details of Accident

The coal had formed a natural bridge over the reclaim hopper and no coal was moving from the yard to the bunker via the conveyor system. While using rods to break the bridge formation, the pile gave way, covering the two employees working with the coal. One was able to free himself and summon aid. The other employee was unable to free himself, and although he was freed by emergency personnel and first aid administered within a matter of a few minutes, he failed to respond.

Nature of Injuries or Loss

The employee died of asphyxiation.

Explosion In Oil Circuit Breaker Tank


Nature of Accident

Explosion.

Description of Operation

Maintenance crew checking a drained oil circuit breaker tank.

Details of Accident

During a routine maintenance process, an electrical maintenance supervisor peered into the manhole of a drained 1500-gallon capacity A-phase oil circuit breaker tank. While he was doing this, there was an explosion, coupled with a hot, searing blast which blew the supervisor about ten feet away from the opening, where he landed on his back. Two other men were knocked over. An orange-colored flame was seen extending 25-30 feet into the yard. As reconstructed from available information, the supervisor had an extension cord in his hand and was putting it into the opening when the explosion occurred.

Nature of Injuries or Loss

The electrical maintenance supervisor died nine days later from the second degree burns received at the time of the explosion.

Fireman Killed In Power Wagon Accident


Nature of Accident

Motor vehicle.
Description of Operation

Operating power wagon while on routine fire patrol.

Details of Accident

A fireman, while driving a power wagon on routine fire patrol applied his brakes, went into a skid, slid into a 4-foot embankment, and then slid across a 22-foot wide road. As the wheels came into contact with the road shoulder, they dug in, and the vehicle rolled over 1\(\frac{1}{4}\) turns to the left, coming to rest on its left side.

Nature of Injuries or Loss

The fireman died instantly; damage to the power wagon, $1,179.