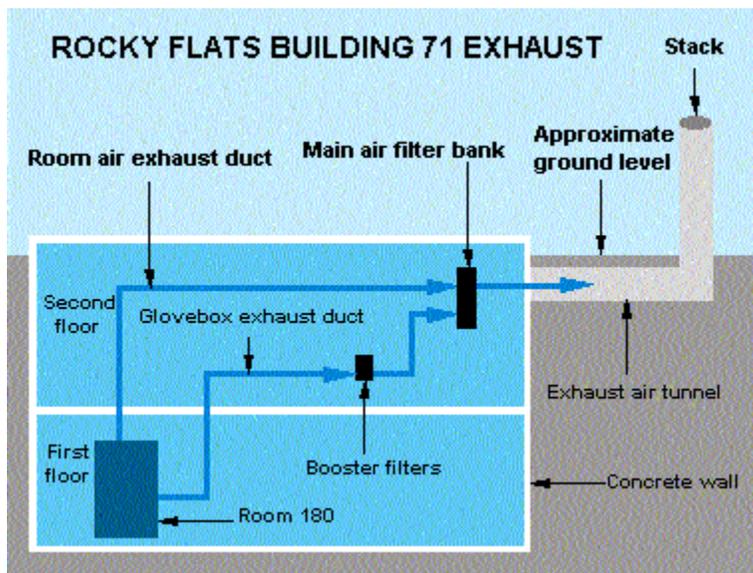


## 1957 Fire

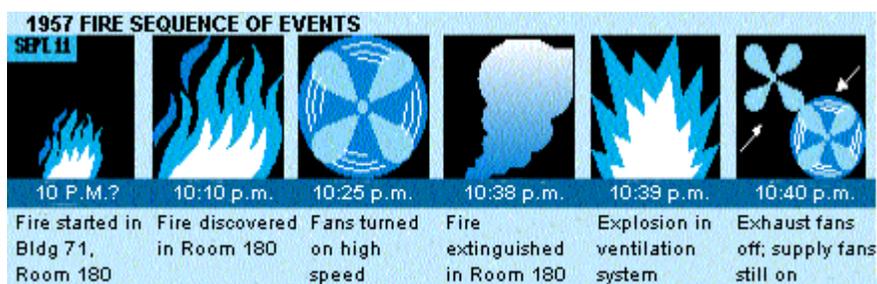


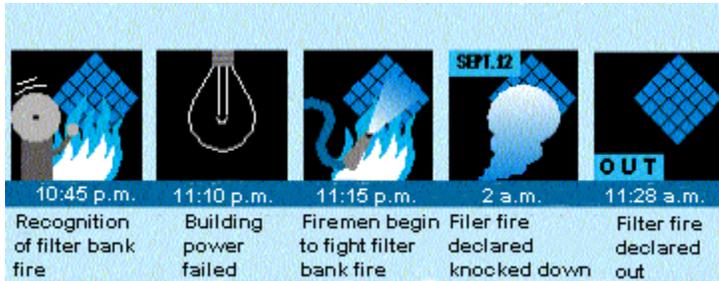
### Introduction

Researchers conducting Phase II of the Historical Public Exposures Studies carefully investigated several key releases of contaminants to the air from the former Rocky Flats Nuclear Weapons Plant.

The first, and one of the most serious releases of plutonium from the plant, occurred on the night and early morning hours of September 11-12, 1957. A fire started at about 10 p.m. by spontaneous combustion of plutonium stored inside gloveboxes in Room 180 of Building 71 (now called Building 771). Building 71 was the original plutonium processing building at Rocky Flats. Firefighters first tried to put the fire out in Room 180 with carbon dioxide, but those efforts failed. Eventually water was used to extinguish the fire at 10:38 p.m. Meanwhile, the fire spread through the ventilation system and into the main air filter bank of Building 71. That fire lasted three to four hours and was extinguished by water. The filter fire was declared "knocked down" at 2 a.m. on September 12, and at 11:28 a.m. the fire was declared "out."

Gloveboxes are enclosed containers designed with view panels and portholes. The portholes are sealed with protective rubber gloves. Workers put their hands in the gloves, reaching through the portholes to handle radioactive materials inside the gloveboxes without being exposed to plutonium dust.





Although plutonium burns slowly, much like charcoal, the heat generated caused material in a glovebox, and the plastic walls of the box, to catch fire. The fire destroyed many of the paper filters in the filter bank that were designed to prevent plutonium from escaping into the atmosphere through the building's stack. The destruction of the filters allowed plutonium dust and smoke to go directly into the environment.

During the studies, researchers from Radiological Assessments Corporation and members of the Health Advisory Panel obtained the public release of significant new information about the fire. The Department of Energy also assisted in locating and declassifying hard-to-find information at the site.

With feedback and direction from the public and members of the Health Advisory Panel, researchers developed a new and comprehensive understanding of the 1957 fire and the subsequent plutonium releases it caused.

### **Why was it difficult to find out how much plutonium was released?**

There are several reasons why uncertainties remain about the amount of plutonium released from the 1957 fire.

- Little data about the fire existed. For example, there were no measurements of the releases during the fire;
- Plant officials at the time of the fire did not investigate key questions about the progress of the fire in adequate depth;
- Although workers wrote personal accounts of their experiences and observations at the time, few of the personnel could be located in 1999 to review and discuss their accounts;
- Many important aspects of the fire were poorly documented at the time;
- No samples were taken from the air duct surfaces that led from the gloveboxes to the burned-out air filters;
- Immediately following the fire, plant officials' priorities were focused on restarting production, not analyzing the fire; and
- Only a small number of air, vegetation and soil samples near the plant were collected and analyzed for radioactivity after the fire.

In addition, the fire took place before sensitive and specific methods had been fully developed to distinguish plutonium from other radioactive materials that also emit alpha particles.

Despite limitations on reconstructing the 1957 fire events, researchers uncovered historic data and information that were previously unavailable to the public. This additional information and consultation with experts, including a nationally recognized fire expert, allowed the researchers to reconstruct a plausible fire scenario and to estimate the amount of plutonium released.

The researchers determined that approximately 63 kilograms (kg) of plutonium were in the room where the fire occurred and that 13-21 kg were actually involved in the fire. It is estimated that between 40 and 500 grams (or 2.9 and 36 Ci) of plutonium-239, -240 were released into the air and carried off-site. The median estimate was about 300 grams (or 20 Ci).

The release estimate includes large uncertainty expressed as a range of numerical values within which the actual number is likely to fall. This range reflects the difficulties encountered in reconstructing the 1957 fire events and releases.

### **How did plutonium travel off-site as a result of the 1957 fire?**

Plutonium particles were released into the air during the fire, moving up through the tall stack of Building 71. Winds carried the plutonium dust and smoke away from the plant and into surrounding areas.

Fire investigators found no detailed records of off-site air sampling for the period of the fire. Assessment of how the plutonium moved off-site was based almost entirely on computer air dispersion modeling. An air dispersion model is a mathematical representation using wind speed and direction, and other information to estimate how material suspended in air traveled downwind from the release point (the Building 71 stack). The model predicts concentrations of material near ground level where people breathe the air.

### **How were people exposed to plutonium from the 1957 fire?**

People living downwind of the Rocky Flats Plant during the fire, September 11-12, 1957, could have been exposed to plutonium in several ways. The most important exposure pathway was inhalation of plutonium in the air. Particles can cause damage to tissues when inhaled or ingested. Plutonium radiation (alpha particles) is unable to penetrate the outer layer of skin; therefore, plutonium that remains outside the body is not an exposure hazard.

Some plutonium was deposited onto the soil downwind of the plant and could have been ingested later by children who played in the dirt. Inhaled plutonium poses a greater human health risk than ingested plutonium, most of which passes through the gastrointestinal tract without being absorbed. However, ingestion may have been the only exposure from the fire for small children born after the event.

Researchers estimated the risks of cancer to persons in the study area who were possibly exposed from the fire. The highest risks were to persons who were exercising or were outside working in areas where the plume of plutonium particles was near the ground.

### **What were the cancer risks to people living or working off-site?**

Researchers calculated the cumulative cancer risk of plutonium released from the plant. This information is available in the Rocky Flats Historical Public Exposures Studies *Summary of Findings*.

### **Study Overview**

Research concerning the release of plutonium from the 1957 fire at Rocky Flats was part of a comprehensive study of all major contaminant releases from the plant. The Rocky Flats Historical Public Exposures Studies involved nine years of research including identification and assessment of past releases of radioactive materials and chemicals from the former Rocky Flats Nuclear Weapons Plant. The researchers estimated the cancer risk to residents living or working in surrounding communities during the plant's operation from 1952 to 1989.

The project was administered by the Colorado Department of Public Health and Environment and overseen by a 12-member Health Advisory Panel appointed by former Governor Roy Romer.

Phase I of the Historical Public Exposures Studies, a toxicologic review and dose reconstruction, began in 1990 and concluded in 1994. ChemRisk, a division of McLaren/Hart Environmental Engineering, conducted Phase I. Radiological Assessments Corporation conducted Phase II, a toxicity assessment and risk characterization, from 1992 to 1999.