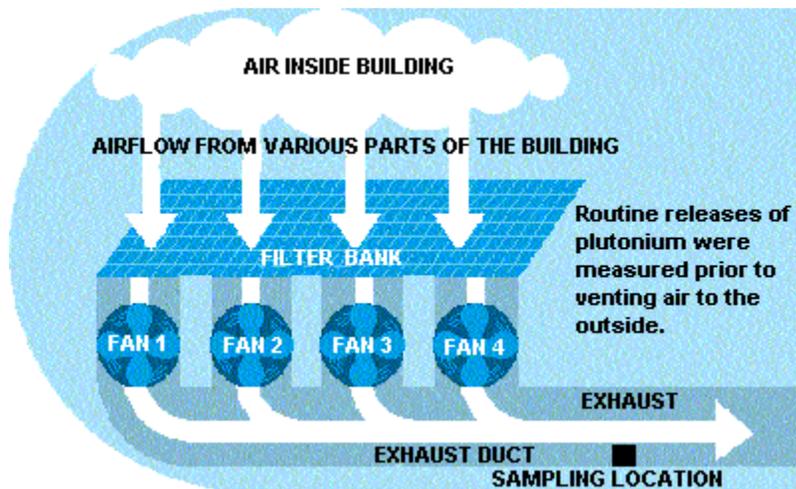


## Routine Releases of Plutonium



## Introduction

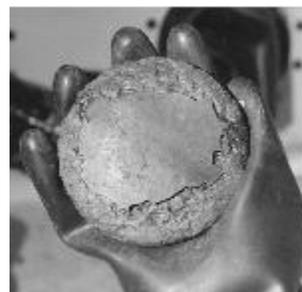
The former Rocky Flats Nuclear Weapons Plant is a U.S. government facility built in 1951, located in Jefferson County, northwest of Denver. From 1952 to 1989, the plant processed plutonium to make parts for nuclear weapons, which were then transported to the government's Pantex Plant near Amarillo, Texas, for final weapons assembly.

Releases of plutonium occurred both during day-to-day operation of the plant, as well as through a number of accidents, including fires and spills. Releases from the most significant events (the 1957 fire, the 1969 fire and the 903 Area) are detailed in separate Citizen Summaries.

How plutonium was released from the plant, the quantity released from day-to-day operations, and the possible increased cancer risk to residents living near the plant were analyzed.

## What is plutonium?

Although tiny amounts of plutonium exist naturally, for all practical purposes, plutonium is a man-made radioactive metal. Different radioactive materials give off different types of radiation. Plutonium emits alpha particles. This type of radiation travels only about a quarter of an inch in the air, and even less in the human body. Either a sheet of paper or the dead outer layer of the skin is capable of stopping alpha particles. Therefore, if plutonium remains outside the body, it is generally not harmful. To cause a health risk, plutonium must be inhaled, eaten or must enter the blood through a cut in the skin. Once inside the body, its alpha particles can damage tissues. The material of most concern at Rocky Flats was weapons grade plutonium-239, -240.



The plant produced weapons triggers or "pits" from plutonium buttons, pictured above.

## How was plutonium handled at Rocky Flats?

Plutonium was the primary component of nuclear weapons parts manufactured at the plant. Processing plutonium included purifying, machining and preparing this heavy metal for the manufacture of "pits," components of nuclear weapons.

Plutonium was handled inside sealed gloveboxes at Rocky Flats. Gloveboxes are tight systems with Plexiglas view panels and portholes sealed with protective gloves. Workers reached through the portholes into the gloves to handle radioactive materials. Blowers were used to draw air from the gloveboxes through a series of ducts and filters before it was released into the atmosphere through a tall stack or roof vents. This combination of sealed gloveboxes and filtered airflow was designed to protect the worker and the outside environment from plutonium contamination.

### **How was plutonium released during day-to-day or routine operations at the Rocky Flats Plant?**

Small particles of plutonium became suspended in the air during the manufacturing processes at Rocky Flats. These small particles traveled from the gloveboxes and through the air ventilation systems in buildings. High efficiency filters were in place to trap most of the particles, but some escaped into the outside air.

Monitored, day-to-day releases of plutonium occurred in the 1950s and 1960s, primarily from Buildings 71 (later renamed Building 771) and 776-777. Smaller amounts of plutonium were released from roof vents of other buildings at the plant.

Many smaller fires and other incidents on-site also were examined. Researchers concluded that releases of plutonium from these events and consequent off-site exposure to the public were considerably less than those from the three major release events.



Small particles of plutonium were discharged routinely to the atmosphere from the tall stack and from various building vents.

### **How much plutonium escaped during day-to-day operations?**

Releases from the smaller fires and incidents are included in calculations of the amount of plutonium from day-to-day or routine releases from the stack and building vents. The total amount of plutonium-239, -240 released from 1953 to 1989 was between 1.2 and 3.4 grams (or 0.086 to 0.24 Ci), with the median value of 1.7 grams (or 0.13 Ci).

### **How were residents in nearby communities exposed?**

Breathing air that contains plutonium particles was the primary way in which people were exposed. The amount of plutonium that makes its way to the lungs depends on the size of the particles inhaled. Small particles tend to penetrate more deeply into the lung and tend to remain there, exposing lung tissue to long-term alpha particle radiation. Plutonium also can move from the lungs to the bloodstream and be transported to the liver and bone, remaining there for many years. The primary health effect from exposure to low doses of plutonium is an increased risk of lung, liver and bone cancer and leukemia.

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

Researchers calculated the cumulative cancer risk of plutonium released from the plant. The information is available in the *Summary of Findings*.

## How can I get more information about the studies?

The report, *Estimated Exposure and Lifetime Cancer Incidence Risk from Routine Plutonium Releases at the Rocky Flats Plant; Independent Analysis of Exposure, Dose and Health Risk to Off-site Individuals*, written by A.S. Rood, M.S., H.A. Grogan, Ph.D., and J.E. Till, Ph.D., (principal investigator) of Radiological Assessments Corporation, provides a detailed, technical account of this topic. This Citizen Summary provides a simplified overview of the technical report. For more information on the Rocky Flats Historical Public Exposures Studies call **303-692-2636**.

## Study Overview

Research concerning the day-to-day releases of plutonium from 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.