ROCKY FLATS PLANT, URANIUM ROLLING AND FORMING OPERATIONS
(Building 883)
SE section of Plant, SE quadrant of intersection of Centrel Ave. & 8th St.
Golden vicInity
Jefferson County
Coloredo

HAER No. CO-83-R

HAER
COLO
30-GOLD.V,
1R-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
1849 C St. NW
Washington, DC 20240

HAER
COLO
30-GOLD.Y
1R-

HISTORIC AMERICAN ENGINEERING RECORD

ROCKY FLATS PLANT, URANIUM
ROLLING AND FORMING OPERATIONS HAER No. CO-83-R
(Rocky Flats Plant, Building 883)

Location: Rocky Flats Environmental Technology Site, Highway 93. Building 883 is located in the southeastern section of the Rocky Flats Plant (Plant), in the southeast quadrant of the intersection of Central Avenue and Eighth Street.

Date of Construction: 1957.

Fabricator: Unknown.

Present Owner: United States Department of Energy (USDOE).

Present Use: Uranium Rolling and Forming Operations.

Significance: This building is a primary contributor to the Rocky Flats Plant historic district, associated with the United States (U.S.) strategy of nuclear military deterrence during the Cold War, a strategy considered of major importance in preventing Soviet nuclear attack. As production of nuclear weapons increased, space in Buildings 881 and 444, (enriched uranium and depleted uranium parts manufacturing) became inadequate. Building 883 was constructed to handle additional uranium rolling and forming operations.

Historians: D. Jayne Aaron, Environmental Designer, engineering-environmental Management, Inc. (e^2M), 1997. Judith Berryman, PhD., Archaeologist, e^2M, 1997.

Project Information:

In 1995, an inventory and evaluation was conducted of facilities at the Rocky Flats Plant for their potential eligibility for listing in the National Register of Historic Places. The primary goal of this investigation was to determine the significance of the Cold War era facilities at the Plant in order to assess potential effects of the long-term goals and objectives of the USDOE. These goals and objectives have not yet been formalized, but include waste cleanup and demolition activities. Recommendations regarding National Register of Historic Places eligibility were developed to allow the USDOE to submit a formal determination of significance to the Colorado State Historic Preservation Officer for review and concurrence and to provide for management of historic properties at the Plant.

From this determination and negotiations with the Colorado State Historic Preservation Officer, the Advisory Council, and the National Park Service, a Historic American Engineering Record project began in 1997 to document the Plant's resources prior to their demolition. The plant was listed on the National Register of Historic Places in 1997. The archives for the Historic American Engineering Record project are located in the Library of Congress in Washington, D.C.

Introduction:

The Plant is one of thirteen USDOE facilities that constitute the Nuclear Weapons Complex, which designed, manufactured, tested, and maintained nuclear weapons for the U.S. arsenal. The Plant was established in 1951 to manufacture triggers for use in nuclear weapons and to purify plutonium recovered from retired weapons. Each trigger consisted of a first-stage fission bomb that set off a second-stage fusion reaction in a hydrogen bomb. Parts were formed from plutonium, uranium, beryllium, stainless steel, and other materials.

A tense political atmosphere both at home and abroad during the Cold War years drove U.S. weapons research and development. By the 1970s, both the U.S. and the Soviet Union maintained thousands of nuclear weapons aimed at each other. These weapons were staged on submarines, aircraft, and intercontinental ballistic missiles. Both the North Atlantic Treaty Organization and Warsaw Pact countries in Europe had small nuclear warheads, known as theater weapons, used as part of the Mutually Assured Destruction program. (The Mutually Assured Destruction program acted as a deterrent in that if one side attacked with nuclear weapons, the other would retaliate and both sides would perish.) The final nuclear weapons program at the Plant was the W-88 nuclear warhead for the Trident II missile. This mission ended in 1992, when President Bush canceled production of the Trident II missile.

The Plant was a top-secret weapons production plant, and employees worked with a recently man-made substance, plutonium, about which little was known concerning its chemistry, interactions with other materials, and shelf-life. The Historic American Engineering Record documentation effort focused on four aspects of the Plant and its role in the Nuclear Weapons Complex: manufacturing operations, research and development, health and safety of workers, and security.

Chronology of Building 883:

1957 Building 883 was constructed. Depleted uranium was handled in Side A; enriched uranium in Side B. Other metals such as aluminum, titanium, stainless steel, and cadmium were machined in Side A.

1958 An addition was constructed to house uranium component manufacturing and to provide additional storage space.

1962 Beryllium forming operations began in Side A.

1964-66 Enriched uranium operations were transferred to Oak Ridge Reservation; Side B remained idle until 1977.

Mid-1970s Most beryllium operations in Building 882 ceased.

1975 Foundry operations in Building 444 ceased.

1977 Manufacturing of calorimeter plates using depleted uranium began. Depleted uranium calorimeter plates were manufactured and rolled in Side A.

1970-80s Pilot-scale operations were conducted using depleted uranium to manufacture armor plates for M1A1 tanks.

1983 Construction began on the Side C addition which was to house armor plate manufacturing for the M1A1 tank.

1985 Construction of Side C was completed; full-scale manufacturing of armor plates using depleted uranium began.

1989 Operations ceased.

Building History:

Building 883 was a non-reactor nuclear facility. It was constructed in 1956 to accommodate fabrication of enriched and depleted uranium parts used in weapons. The sealed, hollow shape of the weapon components required a significant amount of rolling and forming of both types of uranium. Because space in Buildings 881 and 444, (enriched uranium and depleted uranium parts manufacturing) was inadequate, Building 883 was constructed to handle some of the uranium rolling and forming operations.

Additions to Building 883 began in 1958 with the construction of storage and uranium component manufacturing spaces. In 1972, a valve room was added. From 1983 to 1985, additions were constructed to support the manufacturing of armor plates for M1A1 tanks.

Enriched uranium was processed in Building 883 from 1957 to 1964. These operations were moved from the building to Oak Ridge Reservation between 1964 and 1966. After 1967, metalworking operations in the building primarily involved depleted uranium (U238) and binary metal (U238 alloyed). Some stainless steel and aluminum work also occurred in the building on a fairly routine basis. Beryllium, copper, and other metals and alloys were occasionally worked on in the building. Projects included rolling, pressing, and spinning classified blanks for trigger contingency and special order work; bending tubes for weapon body parts; and swaging reservoir stems.

Building Description:

Building 883 is a high-bay, single-story building with a 38' ceiling. The structure has a partial basement and a small second floor on the north and south ends. The facility is constructed of steel framing with corrugated asbestos cement exterior panels and concrete exterior walls. The floors are concrete; limited areas are covered with asbestos tile or carpet. Ceilings in the office areas are suspended acoustical tile; ceilings in the process areas are the exposed undersides of the roof. The roofs are built-up over steel decking and supported by structural steel. The entrance to the structure is along the southern end. Office areas are located on the southern end of the building, on both the first and second floors. The majority of the building's area, encompassing approximately 76,500 square feet, is contained in a high-bay metal working area. This area contains 2,000-ton presses, rolling mills, furnaces, hot salt baths, and shearing machines. Eighty percent of the area of the building has been used for metal processing.

The three processing areas on the first floor are referred to as Sides A, B, and C. The building was originally designed with two functional areas (Sides A and B) to prevent cross-contamination of radioactive enriched uranium with non-fissile depleted uranium. In 1985, the third area, Side C, was added, to support depleted uranium armor plate production and acid scrubbing operations for cleaning depleted uranium components.

The second floor contains the inlet air plenum, associated blowers, heat exchangers, and coolers. The basement area includes a utility room, process waste storage and maintenance areas, and the entrance to an underground tunnel leading to Building 881.

Building 883 is associated with manufacturing processes in Buildings 440, 444, and 460. There is one support building and a tunnel associated with Building 883. Building 879 houses the filter

plenum for Sides A and B of Building 883. A reinforced concrete tunnel connects the northwest corner of the second floor of Building 881 to the southwest corner basement of Building 883. Originally, the tunnel was used to transport enriched uranium parts and other materials between the two buildings. The tunnel is 192' x 8' x 10' with a 1'3"-thick floor slab (total floor area 1,536 square feet).

Building Operations:

Historical operations within Building 883 included manufacturing of parts from uranium and beryllium, and a series of special projects involving various metalworking operations. Manufacturing processes included rolling and forming of enriched uranium, depleted uranium, uranium-niobium alloys (binary metal), and beryllium into parts for weapons production. Actual manufacturing processes depended on the type of metal used and the desired final form.

Operations included rolling, shearing, forging, pressing, roller leveling, grinding, punching, bending, welding, heating, annealing, and cleaning. Metal was annealed in salt baths or in furnaces with argon atmospheres. Vapor degreasing, grit blasting, water washing, and nitric acid etching were used during the cleaning process. Other processes conducted in Building 883 included inspection, non-destructive testing, weighing, shipping of fabricated parts, and receipt of raw materials used to fabricate, inspect and clean the parts.

The flow of materials into, within, and from Building 883 varied according to the type of material. Enriched uranium was cast in Building 881, sent to Side B of Building 883 for rolling and forming, and returned to Building 881 for machining and inspection. Depleted uranium was cast in ingots in Building 444, sent to Side A of Building 883 for rolling and forming, and returned to Building 444 for machining and inspection. Depleted uranium products manufactured in Building 883 were shipped to Building 444 for subsequent machining operations.

Depleted and Enriched Uranium Component Manufacturing

Building 883 received depleted uranium (U238) that consisted of either virgin stock from off-site vendors or recycled scrap generated from site processes. The U238 ingots or billets were hot rolled and formed into various weapons parts or electrode strips, or were combined with niobium to form binary metal which was subsequently formed into weapon components. Virgin U238 ingots were weighed, immersed in a salt bath, rolled into a sheet, then sheared to length. The sheets were annealed in a second salt bath, cooled, and cleaned in water. These flat plates were either shaped into weapon components or were sheared a second time and trimmed to form electrode and electrode filler strips. The electrode strips were bent, cleaned in acid, and welded in a box configuration. The electrode filler strips were rolled, punched for boltholes, and cleaned in acid. The electrode and electrode filler strips were then transferred to Building 444.

Recycled U238 ingots were weighed, cropped, re-weighed, and heated in a salt bath. The ingots were rolled into sheets and sheared to length; the sheets were annealed, cooled, and cleaned in water. They were then sheared, cut into discs, heated, and formed into parts. A second forming, called a re-strike, was done to insure proper size. These parts were vapor degreased (cleaned using a hot solvent vapor process to remove contaminants) and sent to Building 444.

Manufacture of weapon parts from enriched uranium occurred in Building 883 from 1957 to 1964, at which time enriched uranium part manufacturing operations were transferred from the Plant to the Oak Ridge Reservation in Tennessee. Enriched uranium was cast in Building 881, then sent to Side B of Building 883 for rolling and forming. The formed enriched uranium parts were then transferred back to Building 881 for machining into final shape.

Binary Metals Parts Manufacturing
Binary metals, depleted uranium alloys were delivered to Building 883 as recycled ingots and non-recycled rolling pucks (slices off a cylindrical ingot). The binary ingots were heated in an argon atmosphere, and rolled into sheets. The sheets were either formed into shapes to make weapon components, or cut into electrode filler strips. The electrode filler strips were stamped with batch identification marks and bolt holes were punched in one end. The strips were then annealed in an argon atmosphere and quenched in water. The strips were strengthened in the roller leveler, cut to final length, and transferred to Building 444. The binary pucks were also heated in an argon atmosphere, rolled into sheets, annealed, and water quenched. The sheets were then straightened in a roller leveler and cut into discs for forming into parts. After inspection, the parts were sent to Building 444.

Beryllium Component Manufacturing
Beryllium-forming operations, which took place in Side A from 1962 to the mid-1980s, required the development of special techniques to compensate for the brittle nature of beryllium. Beryllium ingots, measuring 9" x 9", were cast in Building 444 and encased in stainless steel in Building 881. The stainless steel and beryllium sandwich was heated and rolled into sheets; stainless steel forms were cut away after the beryllium was rolled to the specified thickness. The beryllium sheets were heat-treated and pressed into the desired shapes in Building 883, then returned to Building 444 for further machining.

Operations Since 1989
Starting in 1989, Building 883 operations began to diminish. By 1993, Building 883 operations focused on rolling and pressing of classified blanks for trigger contingency (war reserve) and special order work; bending tubes for weapon body parts; and swaging reservoir stems to meet production requirements.

In 1994, Building 883 operations ceased and the building was closed.

Sources:

Colorado Department of Health. *Project Tasks 3 & 4 Final Draft Report. Reconstruction of Historical Rocky Flats Operations and Identification of Release Points (1992),* by ChemRisk. Rocky Flats Repository. Golden, Colorado.

Padron, Henry, employed at the Plant by the site contractor since 1969. Personal communication, December 1997.

United States Department of Energy. Public Affairs. n.d. *Tour Information: Rocky Flats Facilities*. Golden, Colorado: U.S. Department of Energy, Office of Communications and Economic Development.

United States Department of Energy. *Historical Release Report (HRR) (1994),* by EG&G. Rocky Flats Plant Repository. Golden, Colorado, 1994.

United States Department of Energy. *Final Cultural Resources Survey Report (1995),* by Science Applications International Corporation. Rocky Flats Repository. Golden, Colorado, 1995.