ROCKY FLATS PLANT, METAL RESEARCH AND DEVELOPMENT LABORATORY
(Building 865)
South of Centrel Ave. at the S. end of the terminus of Ninth Ave.
Golden vicinity
Jefferson County
Coloredo

HAER No. CO-83-AA

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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

HAER
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30-GOLD.V,
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HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

ROCKY FLATS PLANT, METAL RESEARCH
AND DEVELOPMENT LABORATORY HAER No. CO-83-AA
(Rocky Flats Plant, Building 865)
Located south of Central Avenue, at the south end of the terminus of Ninth Avenue.
Golden Vicinity
Jefferson County
Colorado

Photographs CO-83-AA-1 through CO-83-AA-2 were taken by various site photography contractors, dates are indicated in parentheses.

CO-83-AA-1 VIEW OF THE INSTALLATION OF AN EXTRUSION PRESS IN THE HIGH BAY AREA OF BUILDING 865. THE EXTRUSION PRESS WAS USED TO PRODUCE CYLINDRICAL BARS, HOLLOW TUBES, AND SHAPES WITH IRREGULAR CROSS-SECTIONS BY FORCING PREHEATED METAL THROUGH A DIE ORIFICE UNDER HIGH PRESSURE. (5/22/70)

CO-83-AA-2 VIEW OF THE HYDROSPINNING EQUIPMENT IN BUILDING 865. THE HYDROSPINNING PROCESS FORMED METALS INTO DESIRED SHAPES BY ROLLERS WHILE THE METAL WAS ROTATED AT HIGH SPEED. BERYLLIUM, URANIUM, REFRACTORY METALS, AND OTHER NONFERROUS METALS WERE SPUN EITHER HOT OR COLD, INTO A VARIETY OF SHAPES. (11/9/73)

HISTORIC AMERICAN ENGINEERING RECORD

ROCKY FLATS PLANT,
METAL RESEARCH AND DEVELOPMENT
LABORATORY HAER No. CO-83-AA
(Rocky Flats Plant, Building 865)

<u>Location:</u> Rocky Flats Environmental Technology Site, Highway 93, Golden, Jefferson County, Colorado. Building 865 is located south of Central Avenue, at the south end of the terminus of Ninth Avenue.

<u>Significance:</u> This building is a secondary contributor to Rocky Flats Plant historic district, associated with the U.S. strategy of nuclear military deterrence during the Cold War, a strategy considered of major importance in preventing Soviet nuclear attack. Building 865, built in 1970, was part of the Plant research and development program. The building housed metalworking equipment for the study of non-plutonium metals and the development of alloys and prototype hardware. The building serviced not only Plant requests, but also handled developmental work for other U.S. Department of Energy (USDOE) facilities such as Los Alamos Laboratory in New Mexico and Lawrence Livermore National Laboratory in California. Alloys and prototype hardware developed at the request of the Plant were used to evaluate new or proposed Plant processes. Alloys and prototype hardware developed for other USDOE facilities were used to aid in the development of new process or weapon designs for the USDOE Complex.

<u>Description:</u> Building 865 is a one-story, rectangular structure. Overall floor space is approximately 37,980 square feet. The building is divided into two areas. The north side of the building (12,000 square feet) houses offices, a laboratory, a machine shop, a maintenance shop, and a utility room. The north side of the building covers an area of 82' x 152'. The south side of the building is a high-bay area (23,000 square feet) that houses metal working operations. The high-bay area, twice as high as the north area, contains a small mezzanine that supports ventilation equipment. The high-bay area was a radiological control area, where the use of personal protective equipment was required.

Building 865 is built on a concrete slab on-grade. The exterior walls are made of up-ended precast concrete T-beams. The roof is precast concrete with polyurethane foam insulation and neoprene topping. Interior walls are precast concrete, concrete block, or gypsum board. The mezzanine has a structural steel frame. Windows present in the bay are industrial multi-paned with metal sashes.

Upgrades to the building include the addition of a second high-efficiency particulate air filter system (located in Building 867), and the addition of Rooms 171 and 172.

Building 865 has two supporting structures: Building 827, which houses a diesel generator; and Building 865A, a process-water cooling tower. Buildings 867 and 868 are exhaust plenums for Building 865.

History: Building 865, built in 1970, was part of the Plant research and development program. The building housed metalworking equipment for the study of non-plutonium metals and the development of alloys and prototype hardware. The building serviced not only Plant requests, but also handled developmental work for other U.S. Department of Energy (USDOE) facilities such as Los Alamos Laboratory in New Mexico and Lawrence Livermore National Laboratory in California. Alloys and prototype hardware developed at the request of the Plant were used to evaluate new or proposed Plant processes. Alloys and prototype hardware developed for other USDOE facilities were used to aid in the development of new process or weapon designs for the USDOE Complex.

A beryllium electrorefining cell, operated briefly during the early 1980s was designed as a one-half scale beryllium recovery experimental cell.

Operations: The building is used for fabricating prototype hardware, and developing metal alloys and processes. Operations include metalworking, machining, and metallurgical laboratory operations.

The most common metals processed were depleted uranium, steel, and aluminum. Other metals worked in the building included copper, molybdenum, beryllium, titanium, silver, niobium, tantalum, gold, iridium, platinum, vanadium, tungsten, and alloys of these metals.

Metalworking
All metalworking operations were conducted in the high-bay area. Metalworking processes included arc and vacuum induction melting, hammer forging, press forming, hydrospinning, swaging, extruding, drawing, rolling, diffusion bonding, furnace heat treating, salt bath and glove box operations, and cutting and shearing.

Metals were melted using one of two methods: arc melting and vacuum furnace melting. In arc melting, the furnance is evacuated of air. With the power turned on, an arc is struck between the electrode and a starting block placed in the mold. Heat from the arc progressively melts the end of the electrode; the molten metal is transferred across the arc and deposited on top of an ingot situated in the mold. Materials melted with this process included stainless steel alloys, depleted uranium, depleted uranium alloys, and beryllium. In vacuum melting, an electrical current is induced into the metal by an induction coil connected to a power supply. The metal charge acts as a secondary circuit for the current. The melted metal (including beryllium, depleted uranium, copper, aluminum, lead, steel) is then cast into molds.

There were several processes used to create forms or shapes for parts. Hammer forging was used to force heated metal to conform to the shape of a metal die by hammer blows. The press forming process pressed hot or cold beryllium, uranium, steel, and other ferrous and nonferrous metals into the desired shape. Hydrospinning formed hot or cold metals into desired shapes using rollers while the metal was rotated at a high speed. Swaging subjected stock (bar or tube) to a series of blows from two or four dies which rotated around the stock so that the piece was hammered from all sides.

Other methods were used to produce specific types of shapes. Extrusion was used to produce cylindrical bars, hollow tubes, and shapes with irregular cross-sections by forcing preheated metal through a die orifice under high pressure. Drawing was used to change the cross-section of metal wire, rods, or tubing by pulling the metal through a die. The rolling process, used to reduce cross-section, shaped metals by passing them between two rollers revolving at the same speed in opposite directions.

Metal parts were joined in a bonding process where thin layers of bonding material were plated on the surfaces of materials being joined. Pressure was applied to the joined surfaces (under an inert atmosphere or a vacuum) to create the bond.

Formed metal parts were furnace heat-treated in an argon or air atmosphere, or under a vacuum using electric resistance-type furnaces. Salt baths were used to heat metal pieces to a high temperature in preparation for forging, rolling, or some other type of working.

Operations involving beryllium powder were conducted inside of glove boxes. High-purity beryllium was produced, and canned (sealed in a can) in glove boxes. Beryllium chips from lathe operations were processed in two types of mills (ball mill and a fluid energy mill) to form a powder. The powder was then sealed into stainless steel containers in preparation for further processing.

A large abrasive wheel was used to reduce large billets and bar stock to a useable size for further fabrication. Sheet metal was cut to the desired shape and size using a shear press.

Machining

Machining operations included milling, grinding, drilling, and cutting operations. The machine shop was equipped with standard equipment including surface grinders, drill presses, and saws. Other equipment in the machine shop was specialized; lathes and milling machines in the shop were equipped with tracers.

Metallurgy

A metallurgy laboratory, located in the northeastern corner of the building, conducted mechanical testing of metals and prepared metal samples for examination. Mechanical tests determined the tensile properties of the metals at room, elevated, and at very low temperatures. Other tests measured hardness of the metals and alloys using various methods (Brinell, Rockwell, Knoop, and diamond pyramid). These test methods used the depth of indentation of a steel ball, or a diamond pyramid under pressure, to measure hardness.

Samples were prepared for macroscopic and microscopic examination by sawing, cutting, mounting, grinding, polishing, and etching operations. After preparation, the samples were visually examined at various magnifications and optical conditions to identify structural details, including the crystalline structure of alloys.

Miscellaneous Operations
The final use of the building was to conduct metallography laboratory work and decontamination activities for the product research and development group.

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.

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