VULCAN CRUCIBLE STEEL COMPANY, BUILDING NO. 3
100 First Street
West Aliquippa
Beaver County
Pennsylvania

HAER No. PA-278-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

HAER
PA
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HISTORIC AMERICAN ENGINEERING RECORD

VULCAN CRUCIBLE STEEL COMPANY,
BUILDING NO. 3 HAER No. PA-278-A

Location: 100 First Street
West Aliquippa, Beaver County
Pennsylvania

UTM: 17. 563940.4499060
Quad: Baden, PA, 1:24,000

Date of Construction: c.1901 (Morrow 1967)

Builder: Unknown

Present Owner: Mr. Ron Crouse, American Specialty Metals
P.O. Box 831, Willoughby, Ohio 44094

Present Use: Vacant

Significance: The steel mill equipment in Building 3 - furnaces, cutters, rolling mills, scales - was used in 1948-49 to roll uranium billets into rods for use in nuclear breeder reactors. This work was part of a nationwide fabricating effort immediately after World War II to create atomic weapons as part of President Harry Truman's 1947 Cold War policy of military supremacy over Russia.

Project Information Statement: The Former Sites Restoration Division (FSRD) of the U.S. Department of Energy (DOE), will dismantle two furnaces and a mica pit as part of site remediation and decontamination. A Memorandum of Agreement between the DOE-FSRD and the Pennsylvania SHPO stipulated HAER documentation to mitigate this adverse effect. This documentation was undertaken to fulfill this stipulation.

Alexandra C. Cole
Formerly Utilized Sites Remedial Action Program
Contract No. DE-AC05-91OR21950
Science Applications International Corporation (SAIC)
816 State Street, Suite 500
Santa Barbara, CA 93101

NARRATIVE DESCRIPTION

The site includes four large buildings interconnected to form a J shape. Building 3, measuring approximately 128 feet by 266 feet, is the widest building of the grouping, although not the longest. (See sketch plan of the overall complex). Two and one half stories high, the building sits on a raised concrete foundation. Constructed of steel trusses and frames, the building is covered on the roof and sides with corrugated sheet metal.

Building 3 is divided into two E/W bays: the west bay has a medium pitch gable roof topped by two large turret ventilators and five round ventilators; the east bay bas an off-center gable roof punctuated with skylights and topped by an elliptical ventilator that runs along the ridge. A bank of translucent corrugated fiberglass panels provides light along the west and south sides of the west bay. Large sliding double doors of corrugated metal on the north and west sides provide access to the building. Additionally there is a single door on the east side. A small one-story, shed-roof lean-to of yellow brick extends from the northeast corner, with two segmented-arch windows which have four-light fixed pane wood sash windows. Building 3 is connected at the southeast to Building 2, and at the north to Building 8. A 42" higb concrete raised loading dock extends along the southwest facade of the east bay.

The interior bays are separated by a row of I-beam posts which run north-south. Most of the original brick and dirt floor has been covered with concrete.

DESCRIPTION OF THE PROCESS USED TO ROLL URANIUM BILLETS IN BUILDING NO.3

Uranium ore from the Belgian Congo, Canada, or the Colorado Plateau was sent to the Electro Metallurgical Company (Electromet) in Niagara Falls, New York, or to the Mallinckrodt Company in Saint Louis, Missouri, for refining and forming into billets. Under Contract AT-(30-1) - 407, from the New York office of the Atomic Energy Commission, these billets, measuring 15" to 28" long, 4"-5" in diameter, and weighing 120 to 270 pounds, were sent on an "as-required" basis to Vulcan Crucible Steel Company to be rolled into 1.5" diameter rods.

The heating and rolling process occupied 20 employees, and the work took up about 20% of the plant's rolling time to do (Wallo, III, to Mott, January 20, 1981). The remainder of the time was spent rolling tool steel. Billet shipment began in July 1948. Ten tons of 4-1/4" diameter billets were sent from Electromet to Vulcan for use in rolling operations commencing September 27, 1948 (Epp, and Morgan, September 27, 1948). A further memo from P.J. Epp and J. P. Morgan, dated March 14, 1949, requested that all the 4-1/2" diameter "C" billets in stock, weighing about 40 tons, be shipped to Vulcan by March 17, 1949.

The batches of uranium billets arrived by box car, coming on the Pennsylvania and Lake Erie line to an Aliquippa and Southern railroad spur line which ran through the Vulcan property on its way southwest to the adjacent Jones & Laughlin Steel Company. This spur ended at a concrete loading dock at the south side of Building 3. The billets were off-loaded under the care of an armed guard, who then sat at a table inside Building 3 during the time the billets were transformed into rods (Vincent Sercel, interview June 21 and on-site interview June 23, 1993. The following description of the process is taken from the "Operational Process at the Mill" in "Vulcan Crucible Steel Co. Occupational Exposure to Radioactive

Dust, Visit of February 15-16, 1949" and enlarged on by Vincent Sercel). To make certain the rods were rolled to their satisfaction, employees from General Electric, the contracting company in charge of the Hanford, Washington, reactor site, the ultimate destination of the rods, technically supervised rolling operations on site in 1948 (Kirkman to Morgan, February 3, 1949).

As many billets as could be processed in a day were removed from the boxcar and taken by a buggy, a small metal-wheeled cart with V-shaped sides, to the two furnaces. The remainder of the billets remained in the boxcar to be processed the following day or days. The dirt and brick floors were covered with large steel plates, 1" thick, butted together to form a firm surface on which to wheel the buggies. Two men, a heater and heater's helper, kept the furnace temperature even and helped the buggy man load the billets into the furnace.

When the dark gray billets became black hot, they were dragged out of the furnaces with a long-handled L-shaped steel hook by the drag-down operator, placed on buggies, and rushed to the north side of the 12" rolling mill. The rolling mill consisted of a steel frame, embedded in concrete, set in a pit, with three pairs of rough rolls and two pairs of finish rolls, 12" in diameter, set side by side approximately 5' high. The process moved from west to east on the mill. Guide plates guided the rods through the rollers. Aluminum hoods, telescoping aluminum duct sections and a Vaneaxial fan were installed over the rolling mill to ventilate the area. A fixed sheet steel portion of the ventilating ductwork extended from about six feet above the mill frame through and above the roof (Belmore to Flower, September 12, 1949).

A hot billet was slammed into the first pass of the roughing roll by a man called a hooker, and came rapidly out the south side to be caught with tongs by a tong man, who in turn thrust the billet back through the roller at the next smaller aperture. The hooker again caught the billet and shot it through to the tong man. With each pass through the roughing mill, the billet, being squeezed through successively smaller holes in the rolls, became smaller in diameter and longer. After travelling through three roughing rolls, it then went through two finishing rolls, emerging as a rod 1.5" in diameter by approximately 11 to 18 feet, depending upon the original length of the billet. The entire process happened rapidly before the billets could cool and lose their malleability.

From the finish rolls the rods were dragged by tongs to the shears, where they were cut in two to fit into the quenching tank. The cut rods were then dragged to the quenching area, which consisted of a tank full of water. The rods were dropped into this tank, which both cooled them rapidly and cleaned them of scale. As the heat of the rods evaporated the water, a water pipe nearby refilled the tank. Mr. Sercel was not certain where the quenching area was, but thought it was either between the two furnaces or immediately to the south of them. He described the tank as a trough approximately 30" wide, 12' long, and 24" deep.

The rods were next taken to the receiving and shipping area to be weighed and recorded. Mr. Sercel was not certain where this transaction took place, whether in the west bay or the east bay. There are the remains of floor scales in the east bay, which may have been where the rods were weighed. Otherwise he thought they used a portable scale in the west bay. The finished rods were stored in the box car, presumably being transported out the west door of the east bay, which opened onto the raised concrete loading dock.

The rods were then taken by train to be machined and cut into 3"-4" slugs and placed in aluminum or stainless steel jackets. These slugs were then shipped to Hanford, Washington, where they were used in

reactors to produce plutonium. (Dr. Alexander Williams, telephone interview, June 17, 1993; Charles Young, telephone interview, June 23, 1993).

DESCRIPTION OF MACHINERY USED IN PROCESS OF ROLLING URANIUM BILLETS

The particular types of machinery in Building 3 which were used in the uranium rolling process in 1948-49 were two furnaces, a 12" rolling mill, a cutter pit with shears, a quenching tank, and scales ("Vulcan Crucible Steel Co. Occupational Exposure to Radioactive Dust. Visit of February 15-16, 1949"). Of this original machinery, the two furnaces, the rolling mill, and the quenching tank have been dismantled and removed from the site. The cutter pit with shears and two partial sets of scales remain in Building 3. After the uranium rolling process was discontinued in 1949, clean-up of the site was started by the AEC and finished in 1950. The two furnaces were vacuumed, the rolling mills were scraped and cleaned, and continued to be used by Vulcan for their regular steel production. When the H.K. Porter Company bought the company in 1955, these two furnaces were torn down and concrete floors were poured in Building 3. The company then built a newer furnace on one of the old furnace pads. The next owner, Universal Cyclops Inc. did not use Building 3 as a rolling plant; the rolling mills were taken out in 1978 and the building was leased to Heritage Box Company and Precision-Kidd Company for storage (Vincent Sercel; interview June 21, 1993).

The two furnaces presently in Building 3 were not used in the uranium rolling process. Furnace 1, used for heating steel to be rolled in the 10" rollers, was similar to the two furnaces used to heat the uranium billets, although according to Vincent Sercel, the ovens probably were deeper than those of Furnace 1 because they were used to heat larger pieces of steel. He could not remember how many doors there were in each furnace (Vincent Sercel, on-site interview, June 23, 1993). Furnace 2 was built by the H.K. Porter Company after 1955 on one of the two concrete foundations left after the furnaces used in the uranium process were dismantled. One empty foundation pad remains. (See Building 3 Plan for location of the machinery).

Furnace 1

Furnace 1, located in the northeast corner of the west bay, measures approximately 24'4" long by 13' wide by 8'10" high. Constructed of yellow brick, the furnace is covered with steel plates and is enclosed in a frame of 2" x 6" channel iron beams bolted together and further anchored by a series of horizontal round metal rods. There are six small ovens, arranged in pairs, with barrel vaulted ceilings on the east side of the furnace. The mouths measure 1' high by 19" wide. The depth of the ovens was not measured because as an area of suspected radioactive contamination, it was off-limits. The 8" thick doors, with "Pennsylvania Industrial Engineers, Pittsburgh, PA" embossed on them, measure 20" bigh by 26" wide, and are clad on three sides in metal and faced on the interior with asbestos. The doors were raised and lowered using a hooked rod to grab a counter-weighted pivot arm which was mounted above and connected to each door by a chain. Between each set of two doors is a glass meter to measure the air compression, and handles to regulate the dampers to control the flow of air into the furnaces.

The furnace heating apparatus, now disconnected, consisted of a series of pipes at the rear (west), bringing compressed air and a choice of either gas or oil to each oven, where the fuel mixture entered through a small hole. The furnaces were wired simultaneously for oil and gas. According to Vincent Sercel, a former maintenance man who worked for Vulcan and its successor H.K. Porter in 1941 and

from 1945 to 1988, the normal and preferred fuel was gas, but in the winter, if the weather was severe, the gas was rationed, and the company was forced to use oil, which was stored in a large circular metal tank to the west of building 3. To effect the change from gas to oil, the main gas supply was shut off, and the oil pump at the tank was activated (Vincent Sercel, on-site interview 6-23-93).

Furnace 2

Furnace 2, located in the northwest corner of the west bay of Building 3, measures 20'3" long by 13'2" wide by 6'5" high. Constructed of red brick on a raised concrete foundation, the furnace is covered with steel plates and enclosed in a frame of 2" x 6" channel iron beams bolted together and further anchored by a series of horizontal round metal rods. There are two ovens with barrel vaulted ceilings on the east side of the furnace. The mouths measure 2' 11" high by 4' 11" wide; at their base are rollers for moving trays in and out of the ovens. The doors have been removed.

Three paired 12" channel iron columns at the center and on either side of the ovens rise approximately 12', supporting a horizontal platform which holds the pulley system and electric motors which activated the doors. At the base of the flanking columns are two steel frame boxes, labelled "Olson Engineering Company", which housed the door counterweights, now missing. These were attached to the pulleys.

The furnace heating apparatus, now disconnected, consisted of a series of pipes at the north and south sides which were plumbed to bring compressed air and a choice of either gas or oil to four holes along the side of each oven, where the fuel mixture entered. Built in the 1950s, this furnace was technologically more advanced than Furnace 1 in that its doors were operated electrically rather than manually.

Suspected Mica Pit

At the southwest corner of the east bay a T-shaped area in the concrete floor, measuring approximately 31 feet long by 13 feet wide with a 6 foot by 13 foot leg, covers a suspected mica pit. The exact dimensions of the pit are not known, nor is it a certainty that a mica pit exists there. The above shape and measurements correspond to a newer section of concrete which was poured there, and the fact of its presence and location came from an informant in 1988 when Bechtel National, Incorporated (BNI) carried out a remediation program in Building 3.

A 5 foot by 5 foot excavation was made in the southern section of the suspected pit. The stratigraphy revealed that there is a 8"-10" layer of concrete over a course of bricks, which tops 15" of soil with mica flakes mixed in. Below 15" is virgin soil (Telephone interview with Marty Davis, BNI, Aliquippa, July 7, 1993). Further investigation by the Oak Ridge Institute for Science and Education (ORISE) indicated that no mica pit was found in the excavated area (Telephone interview with Eric Abelquist, ORISE, July 1993).

It appears that the use of a mica pit for cooling was not part of the process of rolling the uranium billets. According to Vincent Sercel, mica was used to cool high grade steel slowly over a period of two or three days to make it stronger. He indicated that the uranium rods were cooled quickly, and never were in the

building overnight, presumably as a security measure (Sercel, on-site interview June 23, 1993). Additional corroboration for the fact that the mica pit was not a part of the uranium processing comes from a 1949 on-site study of the process at Building 3, which indicated the rods were quenched, a technical term referring to cooling hot metal quickly in water or other liquid ("Vulcan Crucible Steel Co. Occupational Exposure to Radioactive Dust, Visit of February 15-16, 1949.").

According to Sercel, there was a mica pit in Building 1, which was used to cool the hard tool steel slowly over a matter of days, so it would not crack (Vincent Sercel, on-site interview, June 23, 1993).

Cutter pit and shears

A cutter pit, measuring 12' by 12'8" is located approximately 24 feet to the southeast of furnace 2. It consists of a small electric motor which activated the cam shaft which activated the balance wheel which activated the gears to raise and lower the shear. Two rollers and a small 2" x 2" metal guide bar, set perpendicular to the front of the shear, appear to be remnants of the mechanism used to line up the metal for being cut. The pit is partially surrounded by a protective metal panel and a metal railing with three round bars.

Compressors

Building 8, a small rectangular three-room building extending from the north end of Building 3, houses two large 2-piston air compressors, which were used to power the machinery in all buildings at the Vulcan plant. The compressed air which they produced was stored outside in accumulator tanks until it was needed, at which time it was transported by pipes to the furnaces where it was mixed with the gas or oil for the ovens. Much of the copper material has been salvaged from these machines and they have lost integrity.

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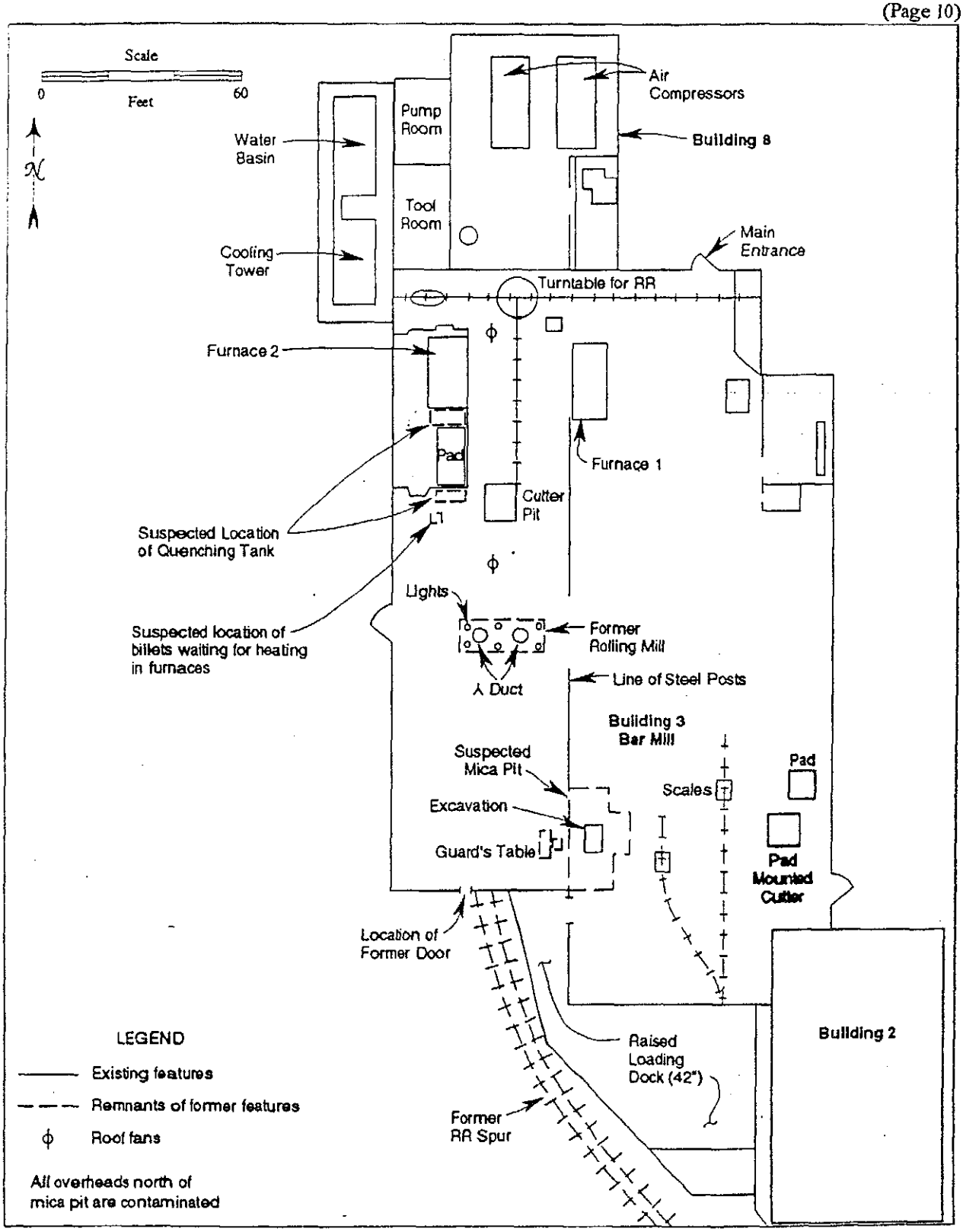

BUILDING 3 VULCAN CRUCIBLE STEEL COMPANY SITE (ALIQUIPPA FORGE).