

MALLINCKRODT CHEMICAL WORKS, Building No. 704

HABS No. MO-1929-L

(~~Mallinckrodt Inc.~~)

Destrehan Street between Hall Street and
Wharf Street attached to Building 705
St. Louis, Missouri

HABS

MD

96-SALU,

134L-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Buildings Survey
National Park Service
Great Plains Support Office
1709 Jackson Street
Omaha, Nebraska 68102-2571

HISTORIC AMERICAN BUILDINGS SURVEY
MALLINCKRODT CHEMICAL WORKS, BUILDING 704
(Mallinckrodt Inc.)

HABS
MO
96-SALU,
134L-

HABS No. MO-1929-L

Location: Destrehan Street, between Hall and Wharf streets, attached to Building 705, Mallinckrodt and Second streets, St. Louis, Missouri
USGS Granite City, Illinois-Missouri Quadrangle (7.5'), Universal Transverse Mercator Coordinates: 744695 E; 4282845 N

Present Owner: Mallinckrodt Inc.

Present Use: Radioactive Storage

Significance: One of 16 buildings at Mallinckrodt Chemical Works associated with the Manhattan Engineer District/Atomic Energy Commission (MED/AEC) – sponsored program to process uranium for use in the development of atomic weapons, Building 704 was used to recover the excess anhydrous hydrogen fluoride gas from the production of uranium tetrafluoride (UF₄) or green salt.

PART I. HISTORICAL INFORMATION

A. Physical History

1. **Date of erection:** Building 704 was built in 1950.
2. **Architect:** The architect of the building was Wigton-Abbot Corporation, Plainfield, New Jersey.
3. **Original and subsequent owners:** The Plant, of which 704 is a part, was acquired by the U.S. Atomic Energy Commission in August 1947 and was returned to MCW in January 1960.
4. **Builder-contractor:** The contractor was the Wigton-Abbot Corporation.
5. **Original Plan and construction:** Built in 1950, this two-story rectangular building (measuring 20' x 82') was an anhydrous hydrogen fluoride recovery building.
6. **Alterations and additions:** All the windows on the east and north sides have been bricked-in or boarded-up. The interior of the second floor has been removed.

B. Historical Context

Plant 7 was built in 1950 as a replacement for the green salt (UF_4) production area in Plant 4, in order to increase its capacity and quality, and to be closer to the operations in Plants 6 and 6E. Buildings 704-708 were designed by the Wigton-Abbot Corporation, Engineers and Contractors, of Plainfield, New Jersey, for the Atomic Energy Commission through their New York operations office. The complex consisted of the following buildings, of which Buildings 700, 704-707, and 708 remain:

700. Warehouse (Built in 1954)
701. Interim residue plant
703. Anhydrous hydrogen fluoride (HF) vault, and HF tank farm
704. Anhydrous hydrogen fluoride (HF) Recovery
705. Manufacture of uranium dioxide (UO_2), uranium trioxide (UO_3), and uranium tetrafluoride (UF_4)
706. Warehouse for UO_3 , UF_4
707. Ammonia (NH_3) cracking building

MALLINCKRODT CHEMICAL WORKS, BUILDING 704

(Mallinckrodt Inc.)

HABS No. MO-1929-L

(Page 3)

- 708. Magnesium metal storage and packing building
- 709. HF refrigeration equipment and pump house
- 710. NH₃ tank farm
- 711. Storage shed

To produce uranium tetrafluoride or green salt (UF₄), uranium trioxide (UO₃), an orange powder, was reduced with hydrogen to yield uranium dioxide (UO₂), a brown powder, that then reacted with anhydrous hydrogen fluoride (HF) to form green salt. This green salt was then either shipped to the gaseous diffusion plant at Oak Ridge, Tennessee, or transferred to Building 116, where it was mixed with ground magnesium metal in ceramic-lined steel containers at high heat to form uranium metal, called a "derby."

Building 705, the "green salt building," in its original configuration contained four stories, with diamond-plate metal flooring housing the continuous-process, stirred-bed reactors that produced UF₄. These reactors, measuring approximately 22' in length and 16" in diameter, oriented horizontally and connected by pipes in a series of three, were located on the east side of the building on the upper floors. UO₂ powder was fed into a small seal hopper and dropped in the top reactor by an interior screw conveyor. The powder was then moved along slowly through the reactors by interior flexible agitators, dropping from one reactor to the next through 3' long expansion joints 10" or 12" in diameter. The reactors were encased in electric resistance furnaces with temperature controls. An electric substation at the north end of the second floor provided power for this process.

Anhydrous hydrogen fluoride gas was metered to the bottom reactor and traveled upward against the UO₂, leaving the top reactor and traveling to Building 704 for recovery. The end product, green salt, fell into a small seal hopper, where it was fed to a cooling screw conveyor and then to a storage hopper. From there it was blended, sampled, and packaged to go to Building 116 for production into metal. These horizontal tube screw reactors, developed at Mallinckrodt, replaced the old open trays and box furnaces that had been used in Plant 4. Because they were completely enclosed, the workers were protected from dust and radiation, and did not need to wear respirators unless they were opening the equipment for inspection or repair. Continuous

processing equipment for converting UO_3 to UO_2 was added to Building 705, thereby allowing continuous production of UF_4 in the building.¹

The first floor of Building 705 contained not only a process area, but also a maintenance shop, two offices for the foreman and assistant foreman, a first aid room, and toilets. A north stair hall connected these offices to four offices in Building 706 that housed a guard, supplies, and technical and clerical personnel. Building 706 stored both UO_3 and UF_4 . Building 707 was the location of the processing equipment to separate NH_3 (ammonia), into hydrogen (H_2) and nitrogen (N_2). The hydrogen was then used to reduce uranium trioxide to uranium dioxide. Building 708 packaged and stored the magnesium metal used to produce uranium metal.² Building 704 was used as an anhydrous hydrogen fluoride gas recovery building.

PART II. ARCHITECTURAL INFORMATION

A. General Statement

1. **Architectural character:** Building 704 is a post-World War II concrete block industrial building.
2. **Condition of fabric:** The fabric is in poor condition.

B. Description of Exterior

1. **Overall Dimensions:** Building 704 is a two-story rectangular building measuring 20' in width x 82' in length. It is connected to the east side of Building 705.
2. **Foundation:** The foundation is concrete.
3. **Walls:** The walls are concrete block.
4. **Structural system, framing:** Building 704 uses steel I-beam construction.

¹ Knowlton Caplan, "Top-Flight Health Program Pays Off in Healthier People," *Uranium Division News*, June 1962: 38; Charles D. Harrington and Archie E. Ruehle, *Uranium Production Technology* (New York: Van Nostrand Company, Inc., 1959), 218-222; Mallinckrodt Inc., "Columbium-Tantalum Plant Characterization Plan" (St. Louis: Mallinckrodt Inc., 1993), A-2-4; Mont G. Mason, "History and Background Relative to the Radiological Re-Monitoring of Mallinckrodt by the Energy Research and Development Administration" (St. Louis: Mallinckrodt, Inc. 1977), 17-18; personal communications, S. Tuthill, Retired consultant, Technical Committees and Quality Standards, Mallinckrodt Inc. [December 12, 1996], H. Yeager, Manager, Destrehan Street Plant, Mallinckrodt Inc. Retired. [December 12, 1996].

² Construction drawings MCW Nos. 3614-15 through 3614-18. Mallinckrodt Inc. Engineering Department, 10 March 1950.

MALLINCKRODT CHEMICAL WORKS, BUILDING 704

~~(Mallinckrodt Inc.)~~

HABS No. MO-1929-L

(Page 5)

5. **Porches and steps:** The east side has one concrete porch with five stairs and metal pipe-railing.
6. **Chimneys:** There are no chimneys.
7. **Openings:**
 - a. **Doorways and doors:** Building 704 has three exterior doors. On the north side is one large overhead wooden door with a row of glass panes. On the east side are a single wood door on the first floor and a single door on the second floor, which has been boarded up.
 - b. **Windows:** Multi-paned, fixed and transom industrial windows in metal sashes are located on the north and south sides. On the east side on the first floor, three windows have been bricked-in; on the second floor, one window has been bricked-in and three others have been boarded-up.
8. **Roof:**
 - a. **Shape, covering:** The flat roof is covered with built-up roofing.
 - b. **Cornice, eaves:** The parapet walls are topped with glazed tile coping.
 - c. **Dormers, cupolas, towers:** There are no dormers, cupolas, or towers.

C. **Description of Interior**

The interior was inaccessible because of radioactive wastes stored there.

1. **Floor plans:** There is one room. Originally there were two stories, with the second floor connected to Building 705. It is now blocked off from Building 705 and has only one floor.
2. **Stairways:** There are no stairways.

MALLINCKRODT CHEMICAL WORKS, BUILDING 704

(Mallinckrodt Inc.)

HABS No. MO-1929-L

(Page 6)

3. **Flooring:** The building has one floor that has been covered with a rubber mat.
4. **Wall and ceiling finish:** The walls are covered with paint. The ceiling consists of concrete panels.
5. **Openings:** There are no openings.
6. **Decorative features and trim:** There are no decorative features and trim.
7. **Hardware:** There is no hardware.
8. **Mechanical equipment:**
 - a. **Heating, air conditioning, ventilation:** The type/existence of a heating system is unknown.
 - b. **Lighting:** The lighting is fluorescent ceiling fixtures.
 - c. **Plumbing:** There are no bathrooms.
9. **Furnishings:** There are no furnishings.

D. Site:

1. **General setting and orientation:** Plant 7, of which buildings 700, 704, 705, 706, 707, and 708 are a part, is located on the eastern edge of the Mallinckrodt Inc. property, aligned linearly in an east-west direction on the south side of Destrehan Street.
2. **Historic landscape design:** The setting is industrial, and there is no landscaping.

PART III. SOURCES OF INFORMATION

- A. Original Architectural Drawings:** Original drawings for Building 704 are located at Mallinckrodt Inc., Engineering Department, Building 91-2. The earliest architectural drawings, dated 10 March 1950, were for the construction of 704, 705, 706, and 707 which include:

MCW No. 3614-15 First Floor Plan
MCW No. 3614-16 Second Floor Plan

MALLINCKRODT CHEMICAL WORKS, BUILDING 704

(~~Mallinckrodt Inc.~~)

HABS No. MO-1929-L

(Page 7)

MCW No. 3614-17 Third Floor Plan
MCW No. 3614-18 Fourth Floor Plan, Roof Plan

B. Bibliography:

Caplan, Knowlton. "Top-Flight Health Program Pays Off in Healthier People." *Uranium Division News*. June 1962: 36-39.

Construction drawings MCW Nos. 3614-15 through 3614-18. Mallinckrodt Inc. Engineering Department, 10 March 1950.

Harrington, Charles D., and Archie E. Ruehle. *Uranium Production Technology*. New York: Van Nostrand Company, Inc, 1959.

Mallinckrodt Inc. "Columbium-Tantalum Plant Characterization Plan." St. Louis: Mallinckrodt Inc., 1993.

Mason, Mont G. "History and Background Relative to the Radiological Re-monitoring of Mallinckrodt by the Energy Research and Development Administration." St. Louis: Mallinckrodt, Inc., 1977.

Tuthill, Dr. Samuel. Retired consultant, Technical Committees and Quality Standards, Mallinckrodt Inc. [December 12, 1996]. Personal communication.

Yeager, Harold. Manager, Destrehan Street Plant, Mallinckrodt Inc. Retired. [December 12, 1996]. Personal communication.

PART IV. PROJECT INFORMATION

This HABS documentation project was undertaken as mitigative recordation required by Section 106 of the National Historic Preservation Act of 1966. The United States Department of Energy Former Sites Restoration Division plans to demolish the buildings.

The documentation was prepared by Alexandra C. Cole, architectural historian at Science Applications International Corporation (SAIC), Santa Barbara, California, in February 1997. Large-format photography was done by Bruce Harms of Louis Berger and Associates, Inc., Marion, Iowa, in August/September 1996. Measured floor plans were prepared under the supervision of Michael Poligone of Bechtel National Incorporated (BNI), Oak Ridge, Tennessee, in December 1996.

*FOR SITE PLANS SEE MO-1929 FIELD NOTES