

MALLINCKRODT CHEMICAL WORKS, Building No. 705
(~~Mallinckrodt Inc.~~)
Destrehan Street between Hall and Wharf Street
attached to Buildings 704 and 706
St. Louis, Missouri

HABS No. MO-1929-M

HABS
MD
96-SALU,
134M-

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 705
(~~Mallinckrodt Inc.~~)

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- Location:** Destrehan Street, between Hall and Wharf streets, attached to Building 704 and 706, Mallinckrodt and Second streets, St. Louis, Missouri
- USGS Granite City, Illinois-Missouri Quadrangle (7.5'), Universal Transverse Mercator Coordinates: 744677 E; 4282845 N
- Present Owner:** Mallinckrodt Inc.
- Present Use:** Storage first floor, upper floors vacant
- 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 705 was used to produce uranium tetrafluoride (UF₄) or green salt.

PART I. HISTORICAL INFORMATION

A. Physical History

1. **Date of erection:** Building 705 was built in 1950.
2. **Architect:** The architect of the building was Wigton-Abbot Corporation, Plainfield, New Jersey.
3. **Original and subsequent owners:** Plant 7, of which 705 is a part, was acquired by the U.S. Atomic Energy Commission in August 1947 and was returned to Mallinckrodt Chemical Works (MCW) in January 1960.
4. **Builder-contractor:** The contractor was the Wigton-Abbot Corporation.
5. **Original Plan and contraction:** Built in 1950, this four-story rectangular building, measuring 80' x 122', was used for the manufacture of green salt (UF₄).
6. **Alterations and additions:** The original configuration of Building 705 contained second, third, and fourth floors, of diamond plate metal, that held the processing equipment. A large open space at the west end contained a bridge crane, used for operations and repairs. Currently, the second and third floors have been removed, leaving one large open space.

B. Historical Context

Plant 7 was built in 1950 as a replacement for the green salt (UF₄) 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

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- 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
- 708. Magnesium metal storage and packing building
- 709. HF refrigeration equipment and pump house
- 710. NH_3 tank farm
- 711. Storage shed

To produce uranium tetrafluoride or green salt (UF_4), uranium trioxide (UO_3), an orange powder, was reduced with hydrogen to yield uranium dioxide (UO_2), 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 UF_4 . 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. UO_2 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-foot 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 upwards against the UO_2 , 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

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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 hallway 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

PART II. ARCHITECTURAL INFORMATION

A. General Statement

1. **Architectural character:** Building 705 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 705 is rectangular in shape and measures 80' in width x 122' in length.
2. **Foundation:** The foundation is concrete.
3. **Walls:** The walls are concrete block.
4. **Structural system, framing:** Building 705 uses steel I-beam framing.
5. **Porches and steps:** The north side has one concrete porch, concrete steps with steel plates embedded in the top, and pipe railings.

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.

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6. **Chimneys:** There are no chimneys.
7. **Openings:**
 - a. **Doorways and doors:** Building 705 has five exterior doors. On the north side is an open doorway with the door missing. On the south side is a metal overhead door and a metal door single door that lead to a high concrete loading dock at the rear. On the east side are overhead metal doors and a metal single door with four wire-glass upper panes.
 - b. **Windows:** Multi-paned fixed and transom industrial windows in metal sash, with cast-concrete sills, are located on the north, east, and west sides. On the north side, second floor, one window has louvers; and on the east side two windows have been boarded-up.
8. **Roof:**
 - a. **Shape, covering:** The building has a flat roof. A covered metal passageway connects Building 705 to Building 117 at the third floor level.
 - 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**

1. **Floor plans:** There are six rooms. Three offices and a bathroom on the north side, off the stair hall to the west, are connected by a long hallway. At the rear is a large room with a smaller room, the former maintenance shop, cut out of it, with concrete block walls.
2. **Stairways:** The stairways on the north and south are metal, with metal railings.
3. **Flooring:** The ground floor is concrete. Three additional floors, of diamond-plate metal, have been removed. The central section of the

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second floor is new corrugated metal, comprising the roof of the first floor. The office floors on the first floor are covered with 9" square asbestos tiles.

4. **Wall and ceiling finish:** The walls are covered with paint. The ceilings are concrete panels.
5. **Openings:** The doors, metal with 9" wire-glass upper windows, are located in the large open space comprising floors 2 through 4. There are twelve metal doors, four on the east side, four each on the north and south sides leading to the stairwells. Two overhead metal doors and two metal personnel doors, in addition to those mentioned above, lead to the second floor generator.

On the first floor are two large openings with overhead doors on the west wall connecting to Building 706, and a large opening into the smaller room on the north side. A single metal door on the north side leads to the stair hall. A single metal door on the south side of the large room leads to the south stair hall and to the loading dock.

On the north end of the first floor, the offices and bathroom have metal doors with large glass upper panes. The offices have multi-pane fixed and transom windows on the hallway side.

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 building was heated with steam heat from Building C in Plant 1. A generator with two metal roll-up doors and a metal personnel door was located on the northeast corner on the second floor. All equipment has been removed.
 - b. **Lighting:** The lighting consists of hanging fluorescent fixtures as well as hanging lights with green porcelain conical shades.
 - c. **Plumbing:** There are no bathrooms.

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9. **Furnishings:** There are no furnishings. All the processing equipment has been removed.

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 705 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
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.

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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