

PRATT & WHITNEY PLANT, MAIN MANUFACTURING BUILDING
(Pratt & Whitney Plant, Building No. 1)
1500 & 2000 East Bannister Road
Kansas City
Jackson County
Missouri

HAER MO-118-A
HAER MO-118-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
MIDWEST REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
601 Riverfront Drive
Omaha, NE 68102

HISTORIC AMERICAN ENGINEERING RECORD

PRATT & WHITNEY PLANT Main Manufacturing Building (Pratt & Whitney Plant, Building No. 1)

HAER No. MO-118-A

Location: 1500–2000 East Bannister Road, Kansas City, Jackson County, Missouri

Date(s)
of Construction: 1942 – 1943

Present Owner: U.S. Department of Energy National Nuclear Security Administration, and the General Services Administration

Present Use: The National Nuclear Security Administration (NNSA) and the General Services Administration (GSA) share occupancy of the Manufacturing Building. This also includes Building No. 2, which is historically part of the entire Main Manufacturing Plant and currently divided between NNSA and GSA. The NNSA utilizes the building for machining processes, electromechanical operations, laboratory, and storeroom operations. The Flood Control monitoring system is located in the NNSA area. GSA occupies about 50 percent of the building for offices and storage.

Significance: The enormous Main Manufacturing Plant is an excellent example of the famous “Warspeed” construction system developed by Albert Kahn Associated Architects and Engineers, Detroit. It was with the Pratt & Whitney Plant, that Kahn incorporated the firm’s newly conceived concrete arch. Kahn developed this multiple arch roof system as a response to the War Production Board’s limitations on the use of structural steel during the war. The Main Manufacturing Plant, the largest building within the complex, was constructed using load-bearing arches, each 40’ wide, with movable forms. This nearly 3 million square-foot building is representative of some of the largest integrated projects in the war construction program, being virtually under one roof. It remains a landmark of American industrial design. The plant was responsible for manufacturing and testing the novel 3,400 horsepower, R-2800-C engines.

Report prepared by: Cydney Millstein, principal, architectural historian
Architectural & Historical Research, L.L.C., Kansas City, Missouri

Mary Ann Warfield, cultural historian, Kansas City, Missouri

Date: April 9, 2012

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Construction: 1942-1943
2. Architect/Engineer: Albert Kahn Associated Architects and Engineers, Detroit, Michigan
3. Builder/Contractor/Supplier: Long-Turner Construction Company, Kansas City
4. Original Plans: Yes
5. Alterations and Additions: Yes (Part II: Section B)

B. Historical Context

Designed in 1942 and completed in 1943, the Main Manufacturing Building was constructed by using movable concrete forms and represents the Warspeed construction technique developed by Albert Kahn during World War II.¹ This nearly 3 million square-foot building was the location of the Pratt & Whitney Aircraft Plant, responsible for manufacturing the novel 3,400 horsepower (max), R-2800-C engines.² At the onset of the construction of the Pratt & Whitney complex, there was a severe shortage of both lumber and steel. Albert Kahn had to adjust his design to utilize concrete without the steel rods normally used as reinforcement. He turned to the load-bearing capacity of the arch, which did not need reinforcing rods, but instead used wire mesh. Kahn stepped away from the truss-style roof system, which had been the standard in his designs for both automobile and aircraft plants up to this time. Because of his innovation in roof design, the Pratt & Whitney Plant exemplifies Kahn's ability to quickly redesign a project to accommodate for unforeseen circumstances such as material shortages, which were so prevalent during the years of World War II.³ The building also demonstrates Kahn's ability to span monumental interior spaces.

¹ A beam and slab design is used over the mezzanine area.

² An extension on the northeast corner provides for test cell area and tear down and final assembly section. These units, originally designed by Kahn as part of the Manufacturing Plant, are discussed below.

³ Tracy Wood, "Concrete Arch Roof for Kansas City Factory," *Civil Engineering*, August 1943, Vol. 13, No. 8, 363-364.

PART II. ARCHITECTURAL INFORMATION

A. General Statement

As the Main Manufacturing Building, this nearly 3 million square-foot irregularly shaped brick-faced structure with cinder block backing, two stories in height with a factory mezzanine, represents one of the largest integrated projects, virtually under one roof, during the construction program initiated during World War II.

1. Architectural Character: Warspeed Construction
2. Condition of Fabric: Excellent

B. Description of Exterior

Designed by Albert Kahn in May 1942 and completed in 1943, the Manufacturing Building measures fifty-one bays (2,026' 11", west to east) by twenty-five bays (1,083' 5", north to south). The Main Manufacturing Building consists of one-story and part basement construction except for two sections of two stories or mezzanines. The main façade faces south and features five entrances that lead to administration offices located in an 80-foot-wide area, totaling 500,000 square feet. While the columns in the office portion are spaced every 20' (with cantilever designed slabs), the manufacturing portion of the plant makes use of load-bearing arches, each 40' wide, originally constructed by using movable concrete forms.⁴ Railroad tracks were located at the east and west facades of the building for shipping and receiving, respectively. Original steel-framed (multi-paned at the main façade and industrial sash at the remaining facades) fenestration, separated by brick piers, has been replaced with fixed steel frame units with tinted glass. Original steel, rolling overhead doors, mainly located at the receiving docks at the west façade, have also been replaced with doors of a similar material and design. This irregularly shaped brick-faced structure with cinder block backing, two stories in height with a factory mezzanine, represents one of the largest integrated projects in the war construction program, being virtually under one roof.

Other character-defining features of the Main Manufacturing Plant include a continuous cast stone sill at each floor of the south façade, secondary entrances, exterior stairs at the east and west facades, a continuous concrete loading dock and clerestory windows, separated by thin concrete piers, at the north façade.

⁴ A beam and slab design is used over the mezzanine area.

C. Description of Interior

The interior of the Main Manufacturing Plant, as noted above, combined administrative offices with a large manufacturing facility. Floors in the office/administration area were concrete with asbestos tile while the main manufacturing/factory area featured wood block flooring. As per Kahn's plans, the following describes the original use of the building: Basement: Offices were located in the southern-most portion, with a receiving room at the far, east end. The bulk of the space north of the office area featured six cafeterias, kitchens, women's and men's locker rooms and toilets, first-aid rooms, fan rooms, and chain conveyors. Employee entrances were located at the basement level.⁵ First Floor: This floor was generally divided into four main areas (moving west to east) to include receiving (termed rough stores and bar stock), the manufacturing area, finished stores, assembly and engine box storage. Second Floor: Office, administration and training rooms. A factory mezzanine, located at columns 39-44, is extant.⁶

It is important to note that the original volume of space has been retained. No concrete columns have been replaced. However, there have been storage and equipment mezzanines and suspended platforms added through the years.

Due to restricted access, it was not possible to examine the interior of the building in its current state, except for a select number of corridors and office rooms that can only be accessed with an escort.

D. Site

The Main Manufacturing Plant is located at the southwest section of the complex to the east of Troost Avenue and to the north of Bannister Road. The building is surrounded at the west, north and east by additional industrial buildings and structures. A large surface parking lot is located to the southeast and north facade of the building.

⁵ Employees entered through one longitudinal and two transverse corridors in the basement. All corridors are 19.5' wide. Stairways at frequent intervals lead to working areas on the ground-floor level. See Aircraft Engines: "Pratt & Whitney Aircraft Corporation, Kansas City, MO." *Factory Management and Maintenance* 103 (April 1945), B62-65. Extending north from the northeast corner of the main building is a series of thirty-two test cells, three dynamometer test cells and four special test cells.

⁶ Operations of the Pratt & Whitney plant were conducted on a single floor at ground level, with the exception of the mezzanine floors over about 10 percent of the area. Of the total floor area, approximately 70 percent was devoted to manufacturing, 15 percent to rough stores, 10 percent to finished parts receiving, assembly and shipping and 5 percent to inspection. The mezzanine floor was allocated to inspection and a portion of the active manufacture. See R. H. Kaufmann and N. A. Kieb, "Electrical Distribution System of the Pratt & Whitney Plant," *Power Plant Engineering*, May 1945, 79-80.

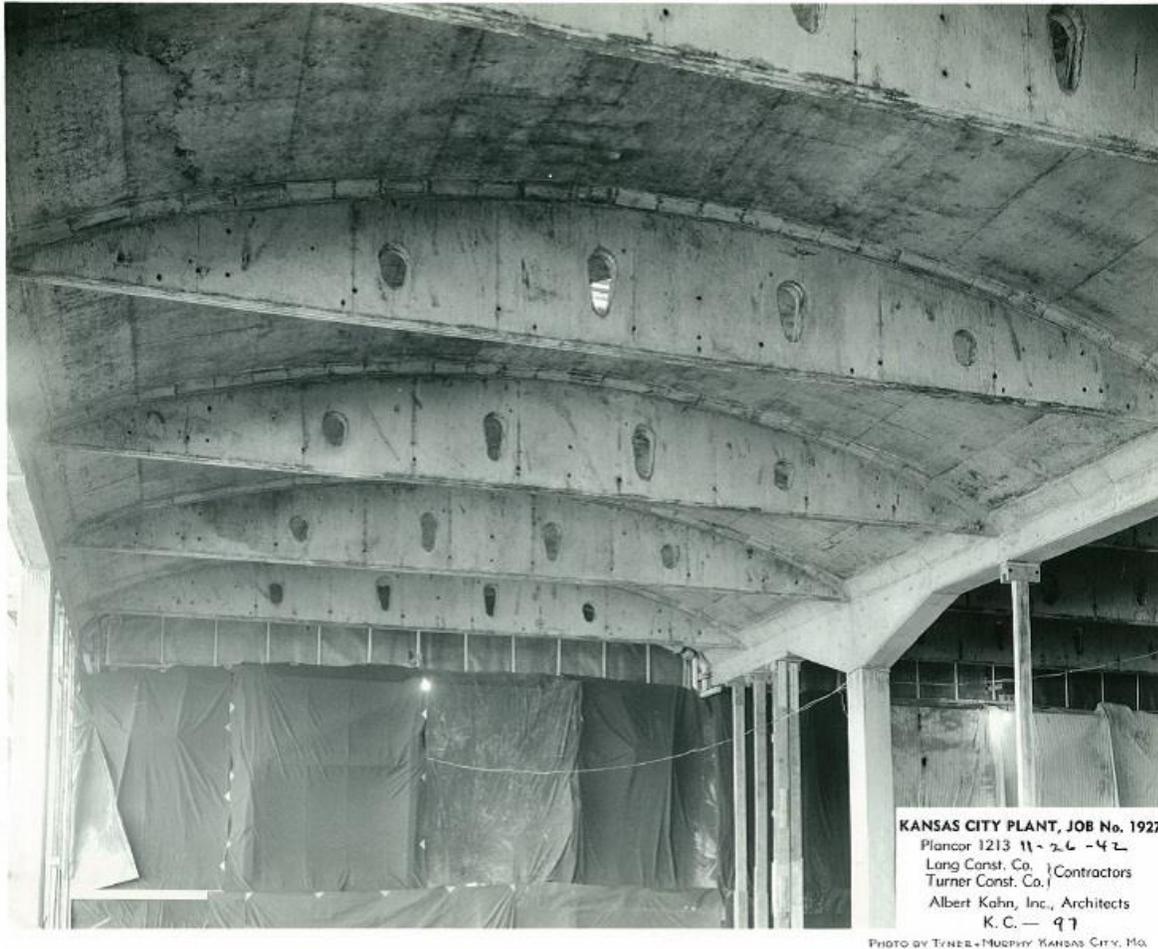
PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 5)



Concrete formwork for arch roof
Date: September 9, 1942

Source: Albert Kahn Associates, Inc., Detroit, Michigan

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 6)



View of the underside of the arch roof between columns Z and AA
Date: November 26, 1942

Source: Albert Kahn Associates, Inc., Detroit, Michigan

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 7)



KANSAS CITY PLANT, JOB No. 1927
Planor 1213 1-28-43
Long Const. Co. } Contractors
Turner Const. Co. }
Albert Kahn, Inc., Architects
K. C. — 166

PHOTO BY TYNER + MURPHY, KANSAS CITY, MO.

The Main Manufacturing Plant under construction, view facing northwest
Date: January 28, 1943

Source: Albert Kahn Associates, Inc., Detroit, Michigan

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 8)



The Main Manufacturing Plant under construction, view facing northwest
Date: April 16, 1943

Source: Albert Kahn Associates, Inc., Detroit, Michigan

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 9)



Basement, southwest corner of the Main Manufacturing Plant, view facing north
Date: January 7, 1943

Source: Albert Kahn Associates, Inc., Detroit, Michigan

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 10)



Factory floor area in the southeast end of the Manufacturing Plant, view facing north
Date: May 28, 1943

Source: Albert Kahn Associates, Inc., Detroit, Michigan

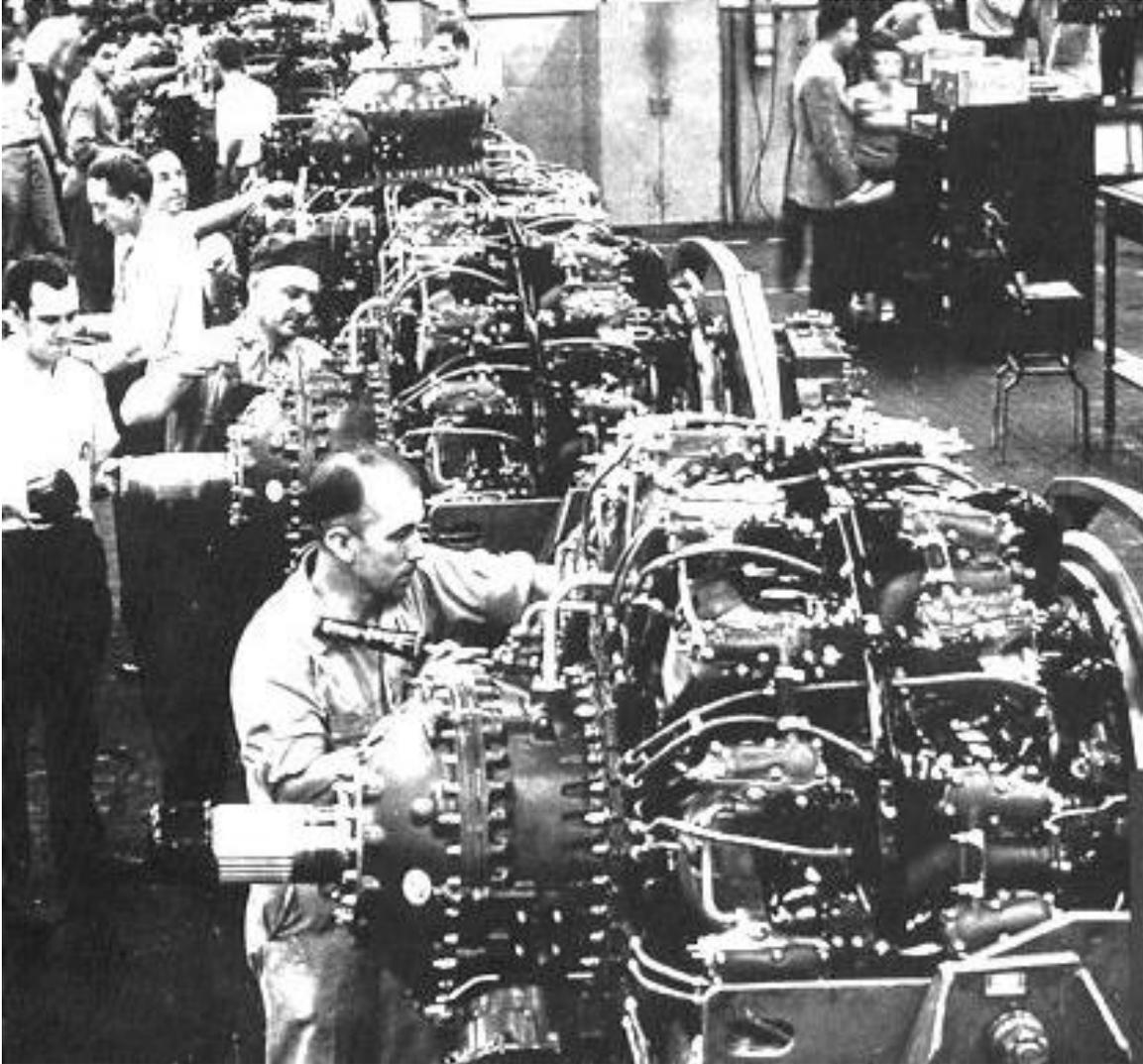
PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 11)



Employee Cafeteria 3A
Date: August 5, 1943

Source: Albert Kahn Associates, Inc., Detroit, Michigan

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 12)

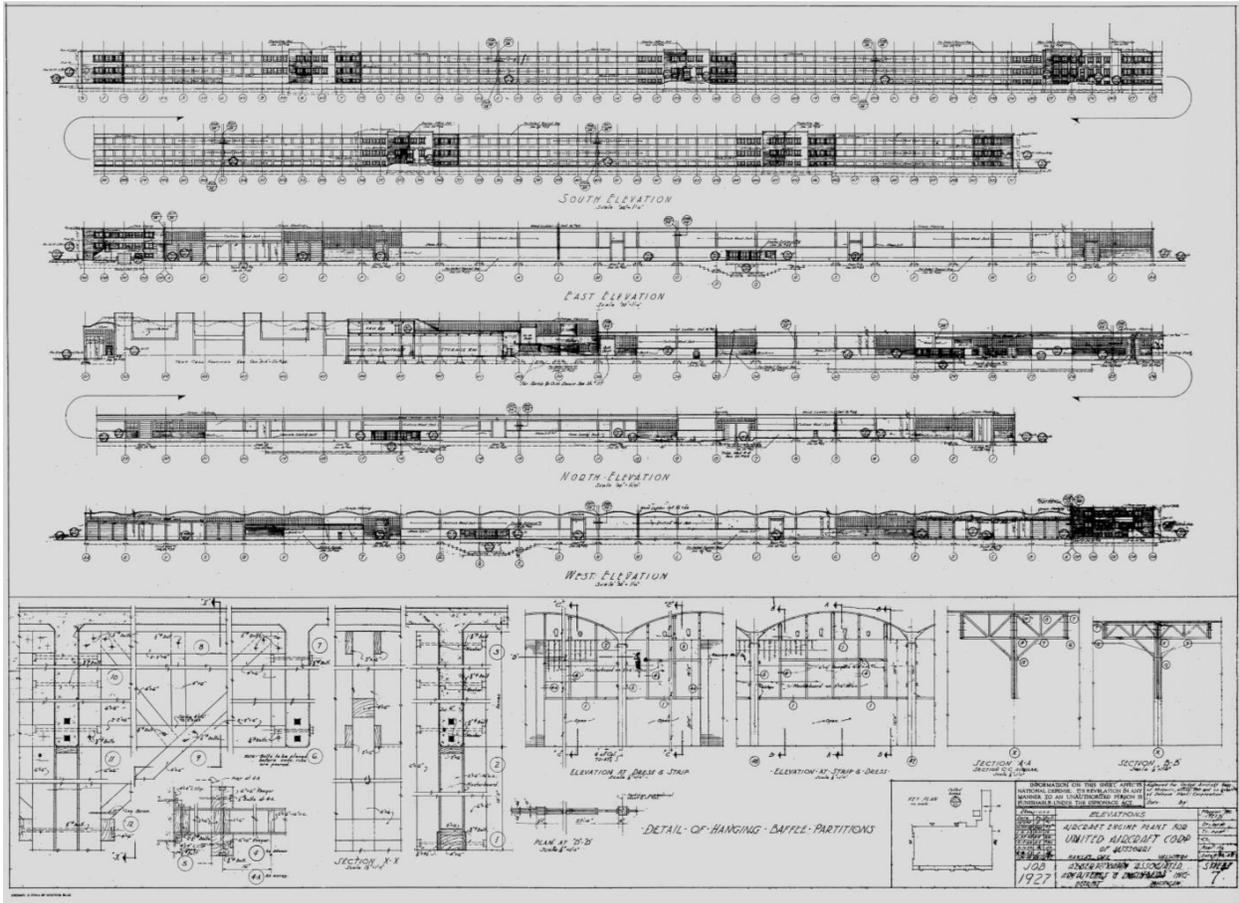


Pratt and Whitney Double-Wasp engine assembly line before being packed and shipped to the battlefronts of the world.

Date: October 1944

Source: Archives, National Nuclear Security Administration, Kansas City, Missouri

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 13)

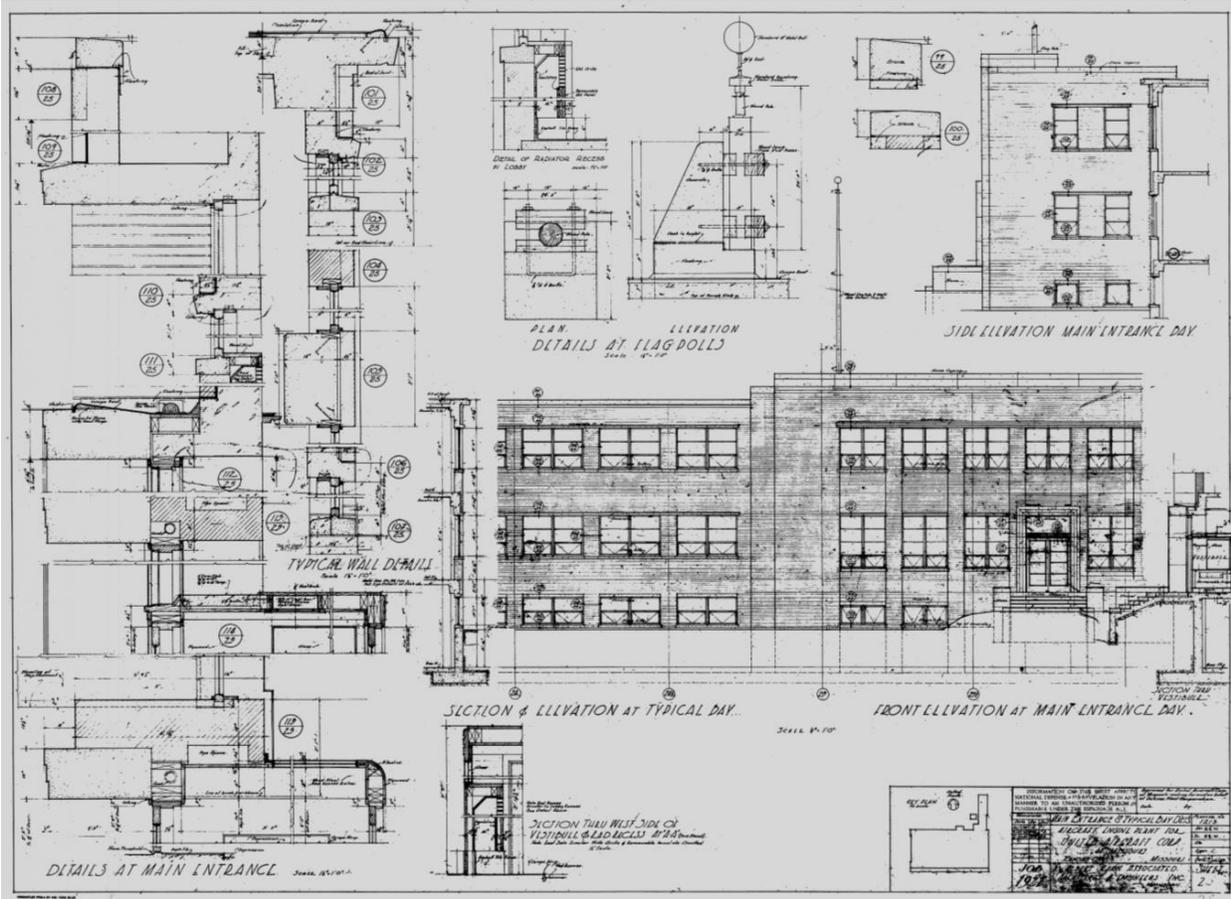


Elevations
Aircraft Engine Plant for United Aircraft Corporation of Missouri

Albert Kahn Associated Architects & Engineers, Inc.
Sheet 7
Job 1927
Date: September 21, 1942

Source: Archives, National Nuclear Security Administration, Kansas City, Missouri

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 14)

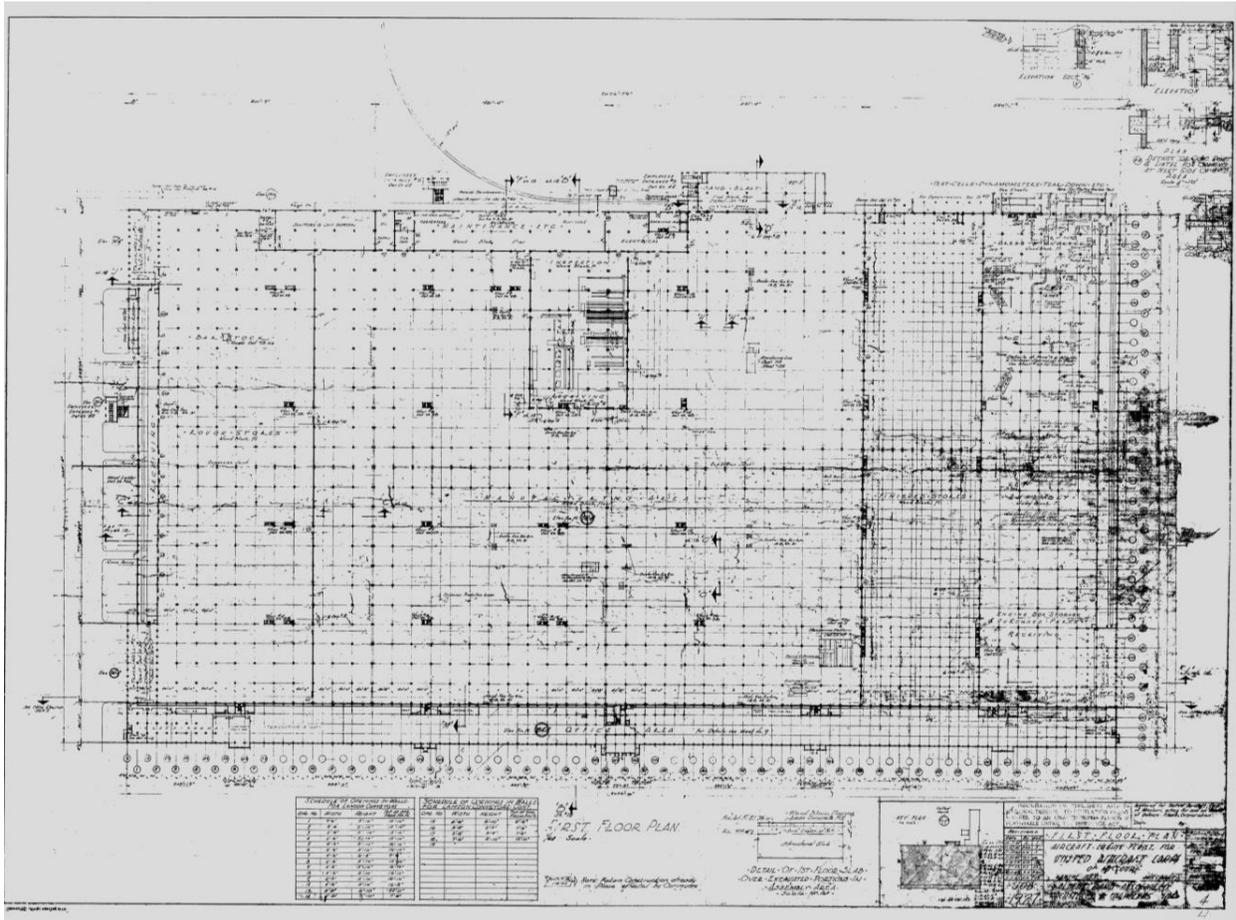


Main Manufacturing Building
Main Entrance and Typical Bay Details
Aircraft Engine Plant for United Aircraft Corporation of Missouri

Albert Kahn Associated Architects & Engineers, Inc.
Sheet 25
Job 1927
Date: September 6, 1942

Source: Archives, National Nuclear Security Administration, Kansas City, Missouri.

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 15)



Main Manufacturing Building
First Floor Plan
Aircraft Engine Plant for United Aircraft Corporation of Missouri

Albert Kahn Associated Architects & Engineers, Inc.
Sheet 4
Job 1927
Date: September 7, 1942

Source: Archives, National Nuclear Security Administration, Kansas City, Missouri.

PRATT & WHITNEY PLANT
Pratt & Whitney Plant
Main Manufacturing Building
(Pratt & Whitney Plant, Building No. 1)
HAER No. MO-118-A
(page 16)

PART III. BIBLIOGRAPHY

Kahn, Albert. Archives, Albert Kahn and Associates, Detroit, Michigan.

Kahn, Albert and Associates. "Factory Construction." *Architectural Forum*. October 1942.

Kahn, Albert Associated Architects & Engineers, Inc. Plans for Aircraft Engine Plant for United Air Corporation of Missouri. Various dates. Job No. 1927. Archives at Albert Kahn Associates, Detroit, Michigan.

Plans. Archives. National Nuclear Security Administration. Bannister Federal Complex. 1500-2000 East Bannister Road, Kansas City, Missouri.

Wood, Tracy (Kahn Assoc.). "Concrete Arch Roof for Kansas City Factory." *Civil Engineering* 13 (August 1943).