MILWAUKEE VETERANS ADMINISTRATION MEDICAL CENTER, BUILDING NO. 106
(Milwaukee Veterans Administration Medical Center, Smoke Stack)
5000 West National Avenue
Milwaukee
Milwaukee County
Wisconsin

HABS No. WI-303-E

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40-MILWA,
42E-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY
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HISTORIC AMERICAN BUILDING SURVEY

MILWAUKEE VETERANS ADMINISTRATION
MEDICAL CENTER

BUILDING NO. 106
(Smoke Stack)

HABS NO. WI-303-E

Location: Milwaukee Veterans Affairs Medical Center
5000 West National Avenue
Milwaukee, Wisconsin 53295
U.S.G.S. Map Quad: Milwaukee, Milwaukee County
U.T.M.: Zone 16, Easting 420441, Northing 4763900

Present Owner: Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420

Present Use: Not in use

Significance: Building 106, Smoke Stack, is a reinforced concrete chimney constructed in 1922 to serve the engine and boiler house of the Northwestern Branch of the National Home for Disabled Volunteer Soldiers. It replaced the original brick chimney built in 1895 when the coal-fired engine and boiler house was constructed. It is significant as an integral component of the operation of the engine and boiler house as a central station for generating electricity and heat for the buildings of the Northwestern Branch, and as evidence of the expansion of the branch in the early 1920s under the direction of the Veterans Bureau, established in 1921. The use of a central station on the grounds of the branch eliminated the need for separate fuel supply and heating facilities for individual buildings, and allowed the expansion of the electric service. The use of the smoke stack spans the last years of the National Home for Disabled Volunteer Soldiers, the establishment of the Veterans Administration, and the creation of the Department of Veterans Affairs.

PART I: HISTORICAL NARRATIVE

A. Historical Context

The National Home for Disabled Volunteer Soldiers, called the National Asylum from 1865 to 1872, was established through Congressional legislation on March 3, 1865. The National Home was intended to be a facility which would provide domiciliary care for disabled Union veterans (Cetina, passim). In its initial form, the National Home provided only minimal medical care and was more concerned with saving

the destitute and dependent disabled veteran from the degradation of the poorhouse. In 1866-1867, the National Asylum was organized initially into three branches: the Eastern Branch at Togus, Maine; the Northwestern Branch at Milwaukee; and the Central Branch at Dayton, Ohio. More liberal eligibility requirements and the increasing use of the National Home as an old-age facility and hospital put pressure on the Board of Managers and Congress to add new branches between 1865 and 1921. The National Home was eventually expanded with new branches, including the Southern Branch, Hampton, Virginia, 1870; the Western Branch, Leavenworth, Kansas, 1884; the Pacific Branch, Santa Monica, California, 1887; the Marion Branch, Marion, Indiana, 1889; the Danville Branch, Danville, Illinois, 1897; the Mountain Branch, Johnson City, Tennessee, 1901; and the Battle Mountain Sanitarium, Hot Springs, South Dakota, 1902.

As new branches were established and the older ones enlarged, the Board of Managers continually upgraded the branch facilities with new mechanical and fire protection systems, such as elevators, electric lighting, and fire escapes and extinguishers, to make life at the National Home as comfortable as possible for the aging and disabled veterans. A major aspect of this upgrading was the construction of central heating and power stations to replace individual building boilers and undersized electric service. Central stations were built at the Eastern Branch in 1894, at the Central Branch in 1886, at the Southern Branch in 1909 (an earlier boiler house had been built in 1887), at the Western Branch in 1886, at the Pacific Branch in 1897 with additional work between 1897 and 1909, at the Marion Branch in 1900 (electric light plant) and 1902-1903 (heating plant and plant expansion), at the Danville Branch in 1898, at the Mountain Branch in 1903, and at Battle Mountain in 1906 (Annual Report, 1916, pp 155-270).

In 1895, a new central engine and boiler house was built at the Northwestern Branch based on the design of the Milwaukee architect, Henry C. Koch. Koch was the architect of several buildings constructed at the branch from the 1870s through the 1890s: the hospital and convalescent barracks (Building 6, 1879 and 1881), the Ward Memorial Hall (Building 41, 1881), barracks (Buildings 5 and 7, 1884 and 1888), quarters for the surgeon (Building 17, 1887), the chapel (Building 12, 1889), and the central warehouse (Building 20, 1895). Koch was one of the most productive architects in Milwaukee in the last quarter of the nineteenth century, being responsible for the buildings of the Milwaukee County Insane Asylum and Hospital (1878), all Milwaukee public schools between 1873 and 1881, the Milwaukee City Hall (1892-95), and over fifteen county courthouses in Illinois and Wisconsin.

Koch's design for the engine and boiler house was a T-shaped structure with a 33 '-0" x 52'-0" coal shed and the 53'-0"x105'-0" boiler house located parallel to the railroad tracks, and the 48'-0"x73"-0" engine house connected to the south side of the boiler house through a narrow passageway. The original smoke stack of the central plant was located in the 15'-0"x16'-6" space between the boiler and engine houses in the area of the connecting passageway. Original drawings for the central plant show three different smoke stacks of varying heights (58', 77', and 82'), different stack tops, and two differing stack sections (round and octagonal). The consistency in the building design and the difference in the stack design found in the drawings suggests that Koch was not the designer of the original smoke stack. The smoke stack was probably designed by a mechanical engineer who sized the stack to correspond to the draft required for the boilers and engines housed in Koch's building.

Smoke stacks ("tall chimneys") are used to obtain a sufficient air flow to maintain steady combustion in boilers, and to discharge gaseous waste from the combustion at a height which removes the smoke from the plant surroundings (Wilson, 1). The height of the stack is determined by the relationship between the temperature and density of the air inside the stack and the temperature and density of the air outside the stack. High temperature and low density inside the stack with low temperature and high density outside the stack could result in a downflow of air from the atmosphere into the stack, extinguishing combustion in the boilers. It is necessary to size the stack to create the correct draft or upward movement of exhaust from the boilers to overcome the possibility of air inversion. The sizing of stack height and diameter requires a thorough knowledge of thermodynamics, and the heat and air volume output of boilers. In the nineteenth century, as steam power was increasingly used, formulae were developed for use by mechanical engineers in determining stack specifications (Gebhardt, passim).

The thermodynamic requirements for smoke stacks are used to design the height and diameter, wall thicknesses, internal liner size and material, and stack top. The height had to be great enough to create sufficient draft, but not so high as to allow the gases to cool and fall down into the stack. The base diameter and wall thickness had to be sufficient to support the load of the upper portions as well as to resist the pressure of the gases entering through the breeching from the boiler flue. The wall thickness decreased with height to reduce the weight of the stack. An internal liner, usually constructed of refractory brick, was built inside the stack to resist the heat of the rising gases. The exterior stack wall and the liner were separated by an airspace which allowed for the expansion of the liner while preventing contact with the exterior wall. The airspace also acted as

an internal chimney space for the rise of heat absorbed by the liner to reduce thermal expansion and cracking of the exterior stack. The detailing of the stack top was an important component in the wind resistance of the stack and in the ability of the stack to vent gases in windy conditions. The typical stack top had a convex projection within a few feet of the stack top; this feature acted as a wind deflector which directed wind up from the stack top and down onto the stack wall. By redirecting wind flow, the exiting gases would ideally rise in a vertical plume from the stack.

As the number of boilers and engines were increased to meet demand for heat and electricity, and as the output of the boilers and engines increased through developing technology, the load on a smoke stack increased dramatically. Two results occurred with the increased load on an undersized smoke stack. The boilers did not have adequate draft and operated inefficiently, and the higher temperatures produced by the larger boilers caused expansion in the smoke stack which was beyond the original design limits, resulting in the deterioration and collapse of the brick liner and cracking of the external stack. Such failure would require the demolition of the undersized stack and replacement with a larger stack.

As a result of World War I, the number of veterans eligible for care at the National Home increased by over four million. The Bureau of War Risk Insurance was created on October 6, 1917 to provide for the administration of veterans' compensation, medical and hospital services, rehabilitation, and insurance (Weber and Schmeckebier, 4). As veterans' claims increased at the close of World War I, the responsibilities of this organization were divided with two other agencies: the United States Public Health Service to provide medical and hospital services, and the Federal Board for Vocational Rehabilitation for rehabilitation programs. In March 1921, funds were appropriated for the Secretary of the Treasury to construct more government hospitals. In April 1922, the United States Veterans Bureau, formed in 1921, assumed responsibility for fifty-seven hospitals operated by the Public Health Service; nine hospitals being constructed by the Treasury Department were transferred as well (Weber and Schmeckebier, 16-17). One of these nine hospitals was a new 500-bed tuberculosis facility (Building 70) built at the Northwestern Branch in 1922-23.

The 1895 engine and boiler house at the Northwestern Branch had to meet increased demand between 1895 and 1920 with the installation of more and larger boilers and dynamo engines. The additional demand on the existing stack was too great and a second stack was built (Building 106) in 1922. In 1933, a three-story, 38'-8"x52'-2" addition was built on the west end of the original boiler house to be used as

a coal bunker and fuel receiving room to meet the increased demand for fuel for the boilers and engines. This expansion of the central heating and power plant corresponded to the increased demand put on the plant by the construction of the Hospital Annex (Building 43) in 1932. Drawings from 1933 and 1941 show the original 1895 smoke stack and the 1922 smoke stack located side by side on the south side of the boiler house. The 1933 drawing indicates that the original brick stack was not in use and that the opening for the breeching to it had been bricked up. The 1941 drawing indicates that the original stack was in the process of demolition, and that the west wall of the original passageway between the boiler and engine house was to be pushed out in the area of the original smoke stack to create a locker room.

The Smoke Stack (Building 106) is a 200'-0" (grade to top) reinforced concrete smoke stack, having a 14'-0" diameter at the level of the breeching (flue opening) and a 8'-0" diameter at the top. The stack stands on a 26'-0" octagonal reinforced concrete base; no drawings were found which give information on the stack foundations. Two openings are located in the lower 20 feet of the stack: a 24"x36" access door one foot above grade on the west side, and a 5'-0"x12'-0" breeching connection (flue opening) nine feet above grade on the north side. The greatest concentration of steel reinforcing material is found in this lower area where the openings are located. Clusters of ten 3/4"x 24'-0" bars per cluster were placed on either side of the breeching opening. Double steel rings made of four 3/4"x13"-0" bars were placed five feet above grade and four rings placed eight feet above grade below the breeching opening. Above the opening, four rings were placed at 21 feet above grade with two more rings at 23 feet above grade.

The smoke stack is made up of an outer wall of reinforced concrete 13" thick at the base and 5" thick at the top. The diminishing thickness of the wall was accomplished through the method of slipform construction in which a circular formwork with adjustable rings was used. As the slipform was raised for successive concrete pours, the rings were tightened to decrease the diameter of the form, resulting in the even decrease in the wall thickness. Evidence of the series of concrete pours may be seen at the regularly-spaced formwork marks on the shaft of the smoke stack. The stack was lined with a 4" thick liner made of refractory brick. A two-inch airspace separated the exterior wall and the liner; this three-part arrangement continued to a height of 68'-0", at which point the brick liner terminated. The liner was not needed beyond this point because the temperature of the gases had cooled to a level which caused little thermal damage to the concrete stack. The top of the stack has a decorative necking above which a projecting band forms a ledge two feet below the stack top.

B. Building History

1. Date of Construction: 1922

The construction of Building 106 in 1922 is related to the obsolescence of the original smoke stack built in 1895. Drawings for the 1895 boiler house on file in the Engineering Office show the original brick smoke stack to have been between 58 and 82 feet high, with a twelve-foot wide octagonal plan, having walls three feet thick. The 1922 smoke stack was over 120' taller and much more tapered in section.

2. Engineer/Contractor: The engineer and contractor of Building 106 are unknown.

3. Building Use: Smoke Stack, 1922-1988

PART II: ARCHITECTURAL INFORMATION

A. General Statement

1. Architectural Character

Building 106 is an astylistic utilitarian structure which conforms to the standard definition of a smoke stack. The structure is a tall cylindrical chimney, constructed in reinforced concrete, which is attached to the heating and power plant through a riveted steel breeching. Its height creates a draft which allows the exhaust of gaseous waste from the heat and power generation in steam boilers located inside the plant.

The heating and power plant consists of five units: a three-story unit on the northwest corner which was built in 1933 as a coal bunker; a two-story boiler house which is located parallel to the railroad tracks, built in 1895; a one-story engine house which connects to the boiler house off its south side; a small brick and concrete block addition is located off the west wall of the engine house; and the smoke stack.

The smoke stack has a small 24"x36" steel door located in the north side, just above grade. This door provides access to the base of the chimney interior. Such access was necessary for inspecting the interior condition of the stack, and for introducing a heat source to establish a draft when the boilers had been shut down and the air inside the stack had cooled. The stack is connected to the heating and power plant through the breeching, a riveted steel element which connects the flue line of the boilers inside the plant with the interior of the chimney. The shaft of the stack has regularly-spaced

lines which are the evidence of the slipform used in construction of the outer reinforced concrete chimney.

2. Condition of the Fabric

The overall condition of the exterior reinforced concrete stack is poor. A deep crack runs from the lower corner of the hinge side (south) of the access door to below grade. Vertical cracks are found at regular intervals around the exterior of the reinforced concrete chimney. These are the result of the heat expansion of the exterior chimney due to extremely high internal temperatures.

The breeching and the access door have extensive rusting. The concrete beneath the access door has been deeply stained by the rusting of the door.

The internal condition of the stack could not be examined, but the vertical cracks on the exterior indicate that the brick liner has failed. Such failure could result in the collapse of the liner and the accumulation of fallen bricks inside the base of the stack.

B. Description of Exterior

1. Overall Dimensions

Building 106 is 200 feet high above grade with a base diameter of 14 feet and 8 feet at the top. The wall is 13 inches at the base, and 5 inches at the top.

2. Foundations: concrete footings under octagonal reinforced concrete base

3. Walls: reinforced concrete

Vertical cracking has been caused by thermal expansion due to the failure of the brick liner. Regularly-spaced slipform marks are visible.

4. Structural System: reinforced concrete exterior with brick liner supported on concrete foundation

5. Openings:

A 24"x36" steel access door is located on the west side at one foot above grade. A 5'-0"x12'-0" opening for the breeching is located on the north side at nine feet above grade.

6. Roofs: none

C. Description of Plan:

1. Floor Plan: The smoke stack has an octagonal base. The stack is made up of an outer reinforced concrete circular wall, and an inner brick liner. The two are separated by a 2-inch airspace.

2. Flooring: none

3. Walls and Ceilings: none

D. Site:

The Veterans Affairs Medical Center site is roughly square in plan. The railroad track runs east-west, cutting the site roughly in half. The original buildings of the National Home for Disabled Volunteer Soldiers straddle the railroad tracks. The heating and boiler plant is located at the approximate center of these buildings, on the south side of the railroad tracks which made the delivery of coal to the heating and power plant very efficient.

PART III: SOURCES OF INFORMATION

A. Architectural Drawings:

Engineering Service, Veterans Affairs Medical Center, Milwaukee, Wisconsin
1) 1895 original drawings
2) 1922 drawings for installation of steam water heaters
3) 1933 drawings for boiler house addition
4) 1941 drawings for proposed steel windows and modification of boiler house
5) undated drawings of reinforced concrete smoke stack (Building 106)

B. Bibliography:

1. National Home for Disabled Volunteer Soldiers

Annual Reports of the Board of Managers. National Home for Volunteer Disabled Soldiers. Washington, DC: Government Printing Office, 1866-1930.

Proceedings of the Board of Managers. National Home for Disabled Volunteer Soldiers. Washington, DC: Government Printing Office, 1866-1930.

2. Historic Preservation Documentation

Mollenhoff, Gjore. "National Home for Disabled Volunteer Soldiers [Milwaukee]." National Register of Historic Places Nomination, eligible 1/9/80.

Potter Lawson Pawlowsky. Historic Preservation Plan. Clement J. Zablocki VA Medical Center, Milwaukee, Wisconsin, 1988.

3. References

Cetina, Judith G. A History of Veterans' Homes in the United States, 1811-1930. Cleveland, OH: Case Western Reserve University, unpublished dissertation, 1977.

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Grochowski, Walter S. An Historical and Descriptive Study of the Domiciliary at the Veterans Administration Center, Wood, Wisconsin. Chicago: Loyola University, unpublished thesis, 1949.

Hartman, William Y. History of the Veterans Administration Center, Wood, Wisconsin. Wood, WI: Veterans Administration, 1963.

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Raafat, Aly Ahmed. Reinforced Concrete in Architecture. New York: Reinhold, 1958.

Schodek, Daniel L. Landmarks in American Civil Engineering. Cambridge, MA: MIT Press, 1987.

Weber, Gustavus A., and Schmeckebier, Laurence F. The Veterans Administration, Its History, Activities, and Organization. Washington, DC: Brookings Institution, 1934

Wilson, Robert. Boiler and Factory Chimneys and Lightning Conductors. London: Crosby Lockwood, 1877.

PART IV: PROJECT INFORMATION

The Department of Veterans Affairs intends to demolish Building 106 (Smoke Stack) as a part of the renovation of Building 45 (Heating and Power Plant) into storage. The deteriorated condition of Building 106 is a safety hazard to the use of Building 45. Building 106 is a contributing structure in a historic district that has been determined eligible for listing in the National Register of Historic Places. Therefore, Building 106 is being documented to satisfy stipulations in a Memorandum of Agreement between the Wisconsin State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, and the Department of Veterans Affairs, to provide the Historic American Building Survey (HABS) with documentation of the building so that there will be a permanent record of its history and appearance.

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