United States Department of Interior
National Park Service

National Register of Historic Places
Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900A). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name **A.O. Smith Corporation Headquarters Historic District**

other names/site number Tower Automotive

2. Location

street & number	3025 West Hopkins Street and 3533 North 27th Street	N/A	**not for publication**
city or town	Milwaukee	N/A	**vicinity**

state Wisconsin **code** WI **county** Milwaukee **code** 079 **zip code** 53216

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this X nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property X meets _ does not meet the National Register criteria. I recommend that this property be considered significant X nationally _ statewide _ locally. (_ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

In my opinion, the property _ meets _ does not meet the National Register criteria.
(_ See continuation sheet for additional comments.)

Signature of commenting official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:
entered in the National Register.
____ See continuation sheet.
determined eligible for the National Register.
____ See continuation sheet.
determined not eligible for the National Register.
____ See continuation sheet.
removed from the National Register.
other, (explain:)

Signature of the Keeper

Date of Action

5. Classification

Ownership of Property
(check as many boxes as as apply)

	private
X	public-local
	public-State
	public-Federal

Category of Property
(Check only one box)

	building(s)
X	district
	structure
	site
	object

Number of Resources within Property
(Do not include previously listed resources in the count)

contributing	noncontributing	
3	1	buildings
		sites
	1	structures
		objects
3	2	total

Name of related multiple property listing:
(Enter "N/A" if property not part of a multiple property listing.)
N/A

Number of contributing resources previously listed in the National Register
0

6. Function or Use

Historic Functions
(Enter categories from instructions)
Commerce/Trade: Business
Industry: Manufacturing Facility

Current Functions
(Enter categories from instructions)
Vacant/Not In Use
Industry: Manufacturing Facility

7. Description

Architectural Classification
(Enter categories from instructions)
Late 19th and 20th Century Revivals: Neoclassical Revival
Modern Movement: Art Deco/International Style
Other: Astylistic Utilitarian/Industrial

Materials
(Enter categories from instructions)
foundation stone, concrete
walls brick, limestone, glass, aluminum, Benedict stone, concrete
roof rubber
other

Narrative Description

(Describe the historic and current condition of the property on one or more continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for the National Register listing.)

X A Property is associated with events that have made a significant contribution to the broad patterns of our history.

_ B Property is associated with the lives of persons significant in our past.

_ C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

_ D Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

_ A owned by a religious institution or used for religious purposes.

_ B removed from its original location.

_ C a birthplace or grave.

_ D a cemetery.

_ E a reconstructed building, object, or structure.

_ F a commemorative property.

_ G less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Industry
Engineering
Invention

Period of Significance

1910-1972

Significant Dates

1910, 1920, 1931, c. 1945, 1956, 1960

Significant Person
(Complete if Criterion B is marked)

N/A

Cultural Affiliation

N/A

Architect/Builder

Titus Diethelm, Holabird and Root, Olmstead Brothers (landscape plan)

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographic References

(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous Documentation on File (National Park Service):
_ preliminary determination of individual listing (36 CFR 67) has been requested
_ previously listed in the National Register
X previously determined eligible by the National Register
_ designated a National Historic landmark
_ recorded by Historic American Buildings Survey #
_ recorded by Historic American Engineering Record #

Primary location of additional data:
X State Historic Preservation Office
_ Other State Agency
_ Federal Agency
_ Local government
_ University
Other
Name of repository:

10. Geographical Data

Acreage of Property 13.6

UTM References (Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	16T	422895	4770526
2	16T	422789	4770567
3	16T	422778	4770410
4	16T	422606	4770406

X See Continuation Sheet

Verbal Boundary Description (Describe the boundaries of the property on a continuation sheet)

Boundary Justification (Explain why the boundaries were selected on a continuation sheet)

11. Form Prepared By

name/title Kate Bissen, Preservation Associate
organization Preserve, LLC **date** 02/15/2022
street & number 5027 N Berkeley Boulevard **telephone** 262-617-1408
city or town Whitefish Bay **state** WI **zip code** 53217

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps A USGS map (7.5 or 15 minute series) indicating the property's location.
A sketch map for historic districts and properties having large acreage or numerous resources.

Photographs Representative black and white photographs of the property.

Additional Items (Check with the SHPO or FPO for any additional items)

Property Owner

Complete this item at the request of SHPO or FPO.)

name/title	Dave Misky				
organization	Redevelopment Authority of the City of Milwaukee			**date**	09/23/2021
street & number	809 North Broadway			**telephone**	414-286-5730
city or town	Milwaukee	**state**	WI	**zip code**	53202

Summary

The A.O. Smith Corporation Headquarters Historic District, located on Milwaukee's northwest side includes four remaining buildings, one guardhouse structure, and portions of the surrounding landscape plan that anchored the southeast corner of the A.O. Smith headquarters and factory complex from 1910 to 1997. The buildings primarily face east on North 27th Street between West Townsend Street to the south and West Hopkins Street to the north. These buildings housed A.O. Smith's executive offices, global headquarters, and their highly prized Research and Engineering Departments, as well as the world's first automated assembly plant. Initially notable for its contributions to the automotive industry as a manufacturer of automobile frames, A.O. Smith went on to apply their innovative welding techniques and mastery of metal to other industries, including brewing, agricultural storage, oil, and water heating, and played a significant part in both World Wars.

At the north end of the district is Building 1A (1910, contributing), which was the first building constructed on the sprawling campus when the company relocated from Milwaukee's Walker's Point neighborhood. Building 1A was once attached to the first manual frame assembly plant on the site (Building 1, North Plant, razed). South of Building 1A is Building 65, commonly referred to as the Research and Engineering Building (1931, contributing), designed by master architects of national significance Holabird and Root. It is one of the first, if not the first, buildings in the world with full-height curtainwalls of large plate glass in aluminum frames, and the first to use extruded aluminum for this purpose. It also retains one of the finest art deco lobbies in Wisconsin, and a portion of the landscape plan designed by Olmstead Brothers, a noted landscape architecture firm founded by Frederick Law Olmstead. A guardhouse structure (non-contributing) was added at the gate across the drive directly south of Building 65. This drive runs east-west and provides vehicle access from North 27th Street to the west yards and parking areas. At the south end of the district facing North 27th Street is Building 36 (1920, contributing), which also fronts West Townsend Street and is the only remaining building associated with the company's groundbreaking automatic automobile frame assembly plant. Building 36 and its many additions (including Building 38, razed 2012) were typically referred to as the South Plant. Unfortunately, a bland precast concrete-paneled addition was added to the east side of Building 36 in 2000, obscuring much of the east façade. The rest of the building remains intact, including the brick, four-story bar that housed the Engineering Department before the construction of Building 65. Building 35, a long, narrow industrial shed that served as a substation for the South Plant, is located between an inset part of Building 36's south façade and West Townsend Street. It was absorbed into a more modern structure c. 1975 and is non-contributing.

The west side of the district is predominantly designated by drives, fences, and parking slabs that provide rear vehicle and staff access to the subject buildings. The district is bordered by a wide swath of lawn and brownfield bisected north to south by a rail corridor with an extant spur connecting to the west elevation of Building 36.

More on the district's development and history is included in Section 8 of this document.

Site and Setting
(See Figures B and E for a labeled plan and aerials photograph)
The A.O. Smith Corporation Headquarters Historic District is located approximately five miles northwest of Milwaukee's central business district in an area known as the 30th Street Industrial Corridor. This area, connected to the Port of Milwaukee and the rest of the region by rail, saw fast-paced industrial expansion in the early 1900s as Walkers Point, Menomonee Valley, and downtown industrial areas became too crowded and ill-suited for larger manufacturing facilities. The area was originally called Schwartzburg after its German immigrant founder and later incorporated as the Village of North Milwaukee in 1897. It extends roughly five blocks east and west from North 30th Street between West Highland Boulevard to the south and West Silver Spring Drive to the north, although today industrial activities are interspersed with housing, commercial activities, and institutional uses.

The sprawling A.O. Smith campus was once the largest manufacturing facility in the 30th Street Industrial Corridor, with more than 140 acres bounded by North 27th Street and West Hopkins Street to the east, North 35th Street to the west, West Townsend Street to the south, and West Capitol Drive to the north. The campus was bisected by the Chicago, Milwaukee, and St. Paul Railway, running north-south, which had several spurs into the A.O. Smith factories to facilitate shipments. The railroad connected the Milwaukee Road's main line through the Menomonee Valley with the Beer Line railroad between Milwaukee and La Crosse.[1]

Over 150 buildings once comprised the A.O. Smith campus, including factories, offices, design and engineering facilities, laboratories, testing facilities, machine shops, employee services, engine rooms and substations, foundries, cafeterias, a staff hospital, and buildings constructed for specialized manufacturing processes. The industrial complex that once surrounded the district is largely demolished, with most of the manufacturing buildings razed in 2012 by the City of Milwaukee after A.O. Smith ceased operations at the site and the buildings underwent years of neglect and deferred maintenance. The remaining buildings represent the most intact and architecturally significant, concentrated at the southeast corner of the site. A few red brick factory buildings constructed in the 1940s and used primarily for the glass-lined pipe and related pipe manufacturing are also extant across the rail corridor at the southwest corner of the original campus. The brownfield between the two clusters of extant buildings is over a thousand feet wide at its narrowest point, and nearly two thousand feet wide at its widest. This cluster of buildings is potentially eligible for separate listing due to its association with oil pipeline manufacturing but is too far removed from the subject district to include

[1] Thomas H. Fehring, *The Magnificent Machines of Milwaukee and the Engineers Who Created Them* (North Charleston, S.C.: CreateSpace Independent Publishing Platform, 2017), 257.

in a continuous district.

Nearby industrial buildings are typically clustered and surrounded by large car and freight parking areas, storage yards, and other vacant land. Vacant land is typically characterized by dirt, cracked concrete, sand, or gravel with only "volunteer" grass, shrubs, and trees. The area surrounding Building 1A and the east and north sides of Building 65 are the only planted and managed landscape on the former campus. In short, the character of the immediate site context is that of a neighborhood and landscape in transition.

In 1931, when Building 65 was completed, Olmstead Brothers (the firm owned by Frederick Law Olmstead's sons John and Frederick Jr.) executed a landscape planting plan for the front lawn and sidewalks between the east façade of that building and 27th Street. The plantings continued up to the south face of Building 1A and are partially intact, including bushes, trees, narrow sidewalks, and a managed lawn. In 1960, a canopy was added to Building 65 and the areas flanking the canopy were turned into hardscape patios with low surrounding walls (extant).

A narrow drive separates Building 65 from Building 36. A small, astylistic guardhouse was built on this drive in 1969 to monitor vehicle access to the site. The guardhouse dates to the modern era and replaces a previous 1969 guardhouse along this drive. It is a non-contributing structure.

Main Office, Building 1A, Contributing
Building A1 is two stories tall with a partially exposed basement and a flat roof surrounded by a masonry parapet. While the stylistic elements are Neoclassical Revival Style, these elements are predominantly applied at the cornice and entrances. The building is rectangular in plan with several projections. Two bays each at the north and south end project from the east elevation for the full height of the building. A one-story volume at the main entrance also projects from the east elevation. An entry portico (historic but not original) projects from the south elevation, and the stair and former connector with Building 1 projects from the west elevation.

Building 1A sits on a split-faced Indiana limestone foundation with exposed watertable laid in a random coursed ashlar pattern. This extends up to the first-floor windowsills. Warm brown face brick comprises the rest of the building's facades, with color varying from ochre to maroon. Wood single-hung windows are arranged in groups of three with Indiana limestone sills and steel headers. Windows have a shorter upper sash and thick meeting rail with applied trim so as to appear as a single casement window with transom above. The center window in each group of three is slightly wider, but not so much as to take on a Chicago Style window appearance. At corners and pilasters, an inlaid stone inverted isosceles triangle is placed to align with the upper sash of the window units. Above the second-floor windows, a deep cornice is supported by scrolled console brackets. The cornice and console brackets are painted white. The parapet continues above the cornice to a limestone coping.

East Elevation
The east elevation, the primary elevation, is arranged symmetrically about the main entrance, a projecting one-story volume connected by sidewalk to 27th Street. The elevation is nine bays, with the two end bays on each of the north and south ends projecting approximately eight feet. Each bay has a group of three wood windows on each floor. All the basement window openings on the east elevation are infilled with glass block with honed Indiana limestone headers and sills set into the split-faced Indiana limestone watertable. A continuous Indiana limestone sill course sits atop the watertable and forms the first floor window sills. A soldier course of brick borders the bottom edge of the brick wall surface above the water table. At the corners of the projecting north and south sections, this soldier course meets a honed Indiana limestone block projecting slightly from the wall face.

At the projecting bays (bays one and two and bays eight and nine), the three wood windows are mulled together on each floor. Brick is recessed in the spandrel area between the first and second floors and on either side of each bank of windows up to the second-floor steel lintel. The spandrel between the first and second floor windows is decorated with a basketweave brick panel with a slightly protruding brick course at top and bottom. The Indiana limestone window sill of the second floor windows is partially supported by alternating projecting brick units arranged in a dentil band. A rowlock course sits above the first and second floor steel lintels. As described previously, an inset Indiana Limestone inverted triangle is positioned at the south pilaster of bay one and the north pilaster of bay two. The scrolled console brackets alternate between a taller version above brick and a shorter version above windows. There are two tall console brackets on either side of this triangle detail, and one between bays one and two. In each bay, the two shorter console brackets are aligned with the vertical mullions dividing the three window units. Inset rectangular Indiana limestone block is positioned in line with the header course above the steel second-floor window lintels, one on each corner of the south pilaster of bay one, and one on each corner of the north pilaster on bay two. The inset stone elements help articulate the corners of the projecting volume. On the north side of bay two and the south side of bay eight, a single window unit is placed between pilasters with one tall console bracket at the corner, one short console bracket centered above the window, and no triangle detail. The windows are otherwise the same as those described on the rest of the building.

At the eighth and ninth bays, first floor, the window frames and sashes are the same, but the glass is leaded with a four-by-six pattern in the lower sash and a four-by-three pattern in the upper. This decorative window type corresponds with the original location of the president’s office suite which was later converted to an executive board room.

The decorative treatment of the five middle bays is similar to the projecting end bays. A soldier brick course runs continuously along the top edge of the watertable. The groups of windows are slightly recessed with a similar basketweave panel at the spandrel between the first and second floor units.

Each pilaster has the inset inverted triangle detail aligned with the top sash of the second-floor windows, and the inset rectangular honed Indiana limestone block to accentuate the corners. One exception to this is the south pilaster of bay three and the north pilaster of bay seven, which do not have the triangle detail due to the shortened width and the inside corner formed by the projecting end bays. Unlike the end bays, the banks of three windows at the middle bays are separated by brick vertical bands, one brick unit in width. The sills under each group of three windows are continuous, supported by dentil bands. The windows are otherwise the same as those described elsewhere on the building.

The main entrance projects approximately eight feet at the first floor of the center bay (bay five) with an additional landing and three honed Indiana limestone steps between limestone cheek walls down to the sidewalk. The entrance volume incorporates many of the details of the rest of the east elevation, including the Indiana limestone water table, honed limestone corner blocks, and soldier course above the water table. The entrance door projects slightly, with corner blocks at the water table and under the small Indiana limestone cap. Another soldier course runs above the Indiana limestone door frame, which is curved. The door leaf was replaced as part of the interior remodel (1956) and retains mid-century typical hardware. The original surrounding divided sidelights and transom remain intact (this entrance is boarded on the exterior but was able to be examined on the interior). Above the door opening, set within a header course frame with Indiana limestone corner blocks, is a honed Indiana limestone block engraved with "A.O. Smith Co." The parapet steps inwards from the corners with limestone corner brackets in a scroll design similar to the console brackets. The Indiana limestone coping is supported by alternating projecting brick ends in a dentil band. The roof of this projecting entrance volume is gabled and covered with rubber roofing, although this is only apparent from the side as the slope is concealed by the parapet. A wood casement window with two horizontal mullions dividing it into three equal lights is located on the north and south side of the projecting entrance.

South Elevation
The south elevation is a secondary elevation composed of three bays. These bays are identical to the center bays (bays three through seven) described on the east elevation, including stone water table, window and spandrel articulation, triangle and cornice details, parapet, etc. The one variation is that the basement windows in the first (west) bay of the south elevation are not replaced with glass block. The east pilaster at the front corner of the building is wider than the others, with two of the inverted diamond-shaped inset stone blocks.

The major feature of the south elevation is the projecting arched portico, which is an early modification to the building, constructed within the period of significance. The portico does not appear on the 1910 original building drawings but is in place by 1931 when Holabird and Root incorporated it into the site plan for Building 65. The portico extends from the center bay of the south elevation and is constructed with four corner piers supporting wide arches spanning the open east, west, and south sides. The Indiana limestone watertable continues around the base of each portico column. The masonry matches the rest of the building but appears to be set in a non-matching mortar.

Inside the portico, the three window openings are retained as in all the other bays, but a modern-era glass door is installed in the center window opening. This door location is original. The parapet of the portico is stepped, taller at the corner columns and lower above the arches. All sides are capped with an Indiana limestone coping. The roof drains to the southwest corner where a copper scupper remains. The downspout has been removed. At the corner of each portico column, twelve courses below the coping, a diamond-shaped block of Indiana limestone is inset and surrounded by a brick frame.

Three concrete steps lead up to the concrete landing that fills in most of the portico. Another step is located at the south elevation door. New cement steps, landing, and side supporting walls, were poured within the portico in 1931 when the small parking area and sidewalks were added between Building 1A and Building 65 and the walkway between the two buildings was established. A painted steel guardrail with simple pickets extends the full width of the opening between the columns on the east and west sides of this platform. A mid-century era steel rail extends up the center of the portico stair. The ceiling underneath the portico is textured plaster and a simple flush-mounted light fixture is located at the center of the ceiling.

West Elevation
The west elevation is a secondary elevation with no visibility from public rights of way. It is roughly composed of seven bays, although these are predominantly defined by window groupings, with a projecting stair and utility volume located between bays three and four (counted north to south). This projecting volume used to form the connection with Building 1. The watertable up to the first-floor windowsills and cornice with console brackets continue across the entire west elevation. Limestone windowsills and steel headers are typical throughout this elevation. The limestone corner blocks and soldier course above the watertable are also typical at this elevation.

Sometime between 1930 and 1950, an addition was inserted between the north half of Building 1A's west elevation and Building 1's east elevation (see Figure G). This building was initially a single-story infill (Building 21), and later made into a two-story infill. By a 1968 update to the Sanborn map, it had been demolished. The remnants of this history are still evident on the north half of the west elevation. The bricked-in openings in bays one through three on the north side of the projecting stair volume date to this addition. The basement windows are infilled with concrete masonry units. The three first-floor window openings are infilled with cream common brick with red brick rowlock courses. The remnants of the infill building's one-story roof are still evident in the tar deposits above the first-floor window headers of Building 1A. The second-floor window units at the north half of the west elevation are bricked in with red brick. The remnants of the infill building's second story addition are still evident in the tar deposits above the second-floor window headers of Building 1A. Unlike the other elevations, these window bays are flush with the main façade. There are no recessed window sections or spandrels with basketweave brickwork on this elevation. The copper downspout between the second and third bays has been replaced with an aluminum downspout.

The projecting stair volume is utilitarian, with doors and windows located as needed to form the necessary connections between Building 1A and the factory space in Building 1. The basement opening to Building 1, which was framed in steel angles, has been infilled with concrete and backfilled with dirt and grass. The first-floor opening is infilled with plywood and framing. It has two intact square casement windows positioned above it. Other windows on this elevation are boarded up. The third-floor opening is infilled with particle board. Remnants from roofing materials and other sealants are typical throughout where previous buildings were connected. The copper downspout at the southwest corner was replaced with aluminum. The cornice has two tall console brackets at each end of the west elevation, and six short console brackets between them. Additional roofing material has been applied to the exterior side of the parapet wall above the cornice.

The north and south sides of the projecting volume have few openings. On the north, an opening surrounded by an area of non-matching red brick in modern-era mortar has been infilled. On the south side, four double-hung punched window openings are placed according to the stair and landing locations, not aligning with the other window groupings on other sides of the building. A non-historic plywood door has been created in a historic opening at the mid-level landing between the basement and first floors.

To the south of the projecting stair volume, windows are intact. Windows match those types described elsewhere on the building: single-hung wood units with a taller lower sash and a thick, built-up meeting rail. Similar to the north side of the west elevation, there are no recesses for the window sections and no basketweave panel detail at the spandrel. The tall console brackets do line up with the column lines as described on the other elevations, with shorter console brackets lining up with the narrow brick bands between windows.

There are four bays south of the projecting stair volume. The furthest north has one window unit, the second and third have the same group of three window units as described elsewhere, and the southernmost bay has two window units of equal width. Downspouts are located between the second and third bays and at the south corner. Steel basement windows are intact on this section of the west elevation.

North Elevation
The North Elevation is very similar to the south elevation and the center bays of the east elevation. It includes the same features that continue around the rest of the building, including the Indiana limestone watertable up to the first-floor windowsills, the soldier course of brick above the watertable

and limestone corner blocks, the cornice with console brackets, and the inverted triangle detail at the top of pilasters. Like the south elevation, it is composed of three bays, and the east front corner pilaster is wider with two of the inverted triangle details at the top. The windows are set back slightly with the basketweave detail at the spandrel between the first and second floor. The windows are the same style as that described elsewhere on the building, wood single-hung units with a thick built-up meeting rail, limestone sill, and steel header. The basement windows have been infilled with glass block at this elevation.

The main variation on this elevation corresponds to the first-floor board room. Sometime before 1930, the large room at the northeast corner of the first floor was remodeled, resulting in the installation of a fireplace and alterations of the locations of the north-facing windows. New, wider windows were installed on the north elevation first floor, breaking up the rhythm of the existing groups of three. The two original windows between them were bricked in using a basketweave pattern, set back to retain the original rough opening. The center window on the east bay of the second floor was also bricked in using a basketweave pattern for the chimney flue. The chimney extends above the parapet, but the original stone coping is retained to continue the flat line of the parapet. Overall, the change is sensitively done, occurs to a secondary elevation, preserves the original window openings where possible, and does not detract from the character of the building. It was executed early in the building's history, well within the period of significance.

Roof
The flat roof drains at a low slope toward scuppers on the west elevation. It is covered in a bituminous membrane that extends up the parapet walls. The chimney at the north wall face is in good condition. Several mechanical chases run across the roof, but do not project up high enough to be visible from the public right of way.

Interior
The building's interior was modified several times during the period of significance to accommodate the changing needs of the A.O. Smith Corporation. As the company grew, many offices and departments outgrew their original location in Building 1A and were relocated to other buildings. Building 1A was the location of the executive offices until c. 1960, when they were relocated to Building 65. 1A remained in use for several public-facing departments, including the sales department, resulting in a high level of finishes regardless of the type of renovation that occurred.

The basement of the building was originally used as a chemical laboratory and has retained a utilitarian purpose and character ever since. The only stair access to the basement is through the projecting west stair volume. The basement has exposed concrete floors, exposed masonry walls (some coated with parging) and exposed steel columns and beams. The mostly open space is divided into separate areas by steel screen partitions with matching gates. On the east side of the basement, several rooms are partitioned using structural clay tile with steel fire doors or wood paneled doors, all intact. One room on the east side of the basement contains intact concrete utility sinks. Two employee restrooms are retained (the majority of fixtures have been removed). A historic built-in vault is retained on the west side of the basement. Mechanical equipment, pipes, and conduit form a maze on the ceiling.

Most of the first and second floor are the result of a remodel in 1956, still within the period of significance. The result of the remodel is that much of the interior very clearly dates to a later period than the exterior. The historic stair south of the lobby, the west stair, and the boardroom and offices at the north end of the first floor are the oldest intact spaces in the building other than the basement.

On the first floor, the main entrance (east elevation) leads to a vestibule and then to a lobby, both with curvilinear walls and coved ceilings. The rest of the first floor is organized along a central corridor with a center spur leading to the west stair tower and connection with the razed Building 1. This interior organization along the central T-shaped corridor is similar to that shown on original drawings, despite the subsequent remodel.[2] In the original drawings, the junction of the spur to the main north-south corridor is made with chamfered walls, while in the 1956 remodel drawings this transition is made with curved walls.

The west side of the building is mostly divided into office spaces with outer offices for administrative staff. The wall separating the corridor from these administrative spaces is divided horizontally with a long ribbon window that curves around at the corridor spur to connect to the razed Building A1. This wall used to have a wood veneer finish but has since been painted over (a section of exposed veneer is intact on the second floor). Other than the lobby and stair, most of the rooms on the east side of the central corridor are toilet rooms or single offices. The historic boardroom is located in the northeast corner, and another large office suite is located in the southeast corner off of this corridor. The rest of the executive offices are located on the north side of the building. Offices and corridors have either painted wood veneer or plaster or gypsum board walls, narrow baseboards, and carpeted floors. Doors are predominantly metal, and where they are set in walls with the ribbon window, the door has a horizontally proportioned rectangle window corresponding with the ribbon window's height. Flooring was originally wood plank in offices and secondary spaces and quarry tile in public areas such as the main corridors, lobby, and toilet rooms. Areas of flooring appear to be intact under modern-era carpet; extent of intact tile and wood is unknown.

The historic main stair hall, located near the center of the east side of the building, is original to the building. It features an intact chair rail, intact plaster walls, and a cast iron stair with painted cast iron

[2] Titus Diethelm, "A.O. Smith Co.'s New Plant: Plan of New Office Building," architectural drawing, first and second floors, October 21, 1909, last revised March 10, 1910.

decorative posts, balusters, and risers. The treads are slate, and the bottom post ends at the second stair, so that the lower two stairs curve out into the stair hall. The west stair is also original to the building, featuring the same painted cast iron decorative posts, balusters, risers, and slate treads. The walls of the west stair shaft are exposed masonry instead of plaster.

The executive boardroom at the northeast corner is the most decorative space of the building's interior. It is located in what was previously the president's office suite, and dates to c. 1930. Doors and walls are covered in white oak panels with faux wood beams extending across the plaster ceiling. Radiators are covered in decorative paneled benches. At the pilasters, two Doric columns with console brackets support the wood ceiling beams. The room is oriented toward a fireplace on the north wall with a stone surround, set in a projecting wood-paneled volume flanked by flat wood pilasters with doric capitals. The boardroom side of doors is paneled to match the surrounding walls so that they almost disappear when closed. Leaded windows also contribute to the higher finish of the space. The carpeting and drapes are not historic.

The second floor is organized almost identically to the first floor, except offices are located along both sides of the central corridor north of the main stair hall on the east side (this area is occupied by bathrooms on the first floor). In some areas of the second floor, the wood veneer wall finish on the corridor walls is left unpainted, more in keeping with the period of installation. The ceilings at the second floor are dropped, sometimes below the upper window sash, but held back about one foot so as not to damage the window. The central corridor terminates at the offices on the north and south end of the second floor and retains its spur to the west stair/connection with Building 1 (razed). Other than the unpainted veneer, the doors, finishes, carpet, etc. are all similar to the second floor.

This north half of the second floor was originally open and occupied by the drafting and engineering departments. Once these departments were relocated to Building 65, it was gradually filled in with offices.

Research and Engineering Building, Building 65, Contributing
The Research and Engineering Building is a seven-story, steel framed, International Style building with a U-shaped plan that surrounds a two-story glass-ceilinged exhibition atrium on three sides. When the building was completed in 1931, its stylistic expressions and innovative use of materials to achieve that expression was ahead of its time. The steel structure is composed of hollow built-up columns, open latticed girders, and "battledeck" steel plate subfloors. In addition to seven floors, there is a fully below-grade basement. An attic houses mechanicals and equipment to support the specialized lab functions for which the building was designed (equipment heavily modified or removed).

The primary orientation of the building is to the east, although the north, south, and east facades have similar rhythmic expression and materiality. The architect clearly considered the low-rising surrounding context and intended for the side elevations (north and south) to be as expressive and interesting as the street-facing east elevation; these side elevations are highly visible from main thoroughfares due to the building's height over its neighbors. The west and open courtyard facades are a complimentary language utilizing the same color as the limestone but are much less expressive and clearly secondary. The overall character of the building is defined by a folded curtainwall that extends vertically without interruption from just above grade up to the cornice flanked by vertically-emphasized Indiana limestone corners. The building sits on a short base of a black polished concrete and granite composite material referred to in original publications as Benedict Stone.

North, South, and East Elevations
The north, south, and east elevations are nearly identical, with the only variations being the projecting Benedict Stone main entrance at the center of the east elevation and the number of bays per facade. Each side has a pattern of A-B-A, although the A section expression wraps each corner so that when viewed from an angle the Indiana limestone end sections form a monolithic corner block.

The A sections are characterized by two Indiana limestone piers extending from the Benedict Stone base up to an aluminum sheet metal coping. These piers are divided by a continuous vertical band of extruded aluminum curtainwall from the base up to the aluminum coping. The curtainwall is flat with square mullions dividing it into three vertical sections. Each vertical section is slightly canted toward the center of the elevation. At each floor, a tall band of glass is topped with a shorter teal glass spandrel panel set into the curtainwall system, with two teal spandrel panels at the top of the building. This curtainwall expression is quite common today but was unusual if not unheard of in 1931 when construction was completed.

The B section is divided vertically into six shallow V-shaped projections on the east elevation and eight folds per the north and south elevations. The V-shaped bays are articulated by a fluted vertical aluminum channel at the valley between each fold and thin, almost imperceptible aluminum frames at the peak of each fold. Each glass panel is eight by thirteen feet and framed with narrow aluminum mullions. Cast aluminum base units and narrow spandrel strips define each floor but are intentionally delicate, subservient to the vertical channels to reinforce the vertical expression. A pressed sheet aluminum cornice caps the B section curtainwall.

West Elevation and Open Courtyard Elevations
The west elevation consists of two identical full-height Indiana limestone volumes (continued around the west corners of the north and south elevations) flanking a lower two-story barrel-vaulted volume in the center. The Benedict Stone base continues around the west elevation. The end volumes are monolithic tan brick with a center vertical stripe of punched openings. The verticality of the primary elevations is carried onto the west elevation through a tan brick spandrel in plane with the windows, creating a vertical cleft up the center of each side volume that terminates at the head of the seventh-

floor opening. A secondary entrance is located at the base of each window column and doors at upper floors once allowed access to bridges that connected with the other factory buildings (no longer extant).

The two-story section in the center is designed with the intent of providing additional natural light to the skylight exhibit space on the first two floors. The parapet follows the barrel vault of the glass ceiling. Five aluminum-framed windows are divided into nine vertically oriented rectangles by mullions equally spaced across the center section. The windows are separated by narrow sections of wall. Both the seven-story and two-story sections feature limestone sills and steel lintels.

The courtyard-facing north, south, and west elevations are composed of cream common brick with limestone sills and steel lintels at punched window openings. All courtyard-facing openings are arranged similar to the main west elevation in a vertically accented grid with spandrels between windows recessed to create vertical stripes terminated at the head of the seventh-floor windows.

A pair of doors in the south bay of the west elevation once connected to a bridge over the drive and Building 65A beyond. Building 65A and the connecting bridge were razed in 2012.

Roof
The roof of the seven-story volume is flat, decked with concrete tiles covered with a rubber membrane. Aluminum sheet metal coping continues over the parapet wall and serves as flashing for the roof. Projecting volumes extend past the roof height at the center and each end of the U-shape plan to house mechanical and elevator equipment as well as provide roof access. Mechanical equipment installed on the roof is not visible from the ground. Penthouses are anchored toward the courtyard and not visible from the primary elevations.

The building also featured an original, mechanized window washing system (extant) to fit between the folds of the main curtainwall elevation suspended from the roof.

The roof of the two-story exhibit atrium is one-large barrel vault with seven large arched beams dividing the wire glass skylight.

Interior
The entrance vestibule is composed of mill finish aluminum in fluted panels (other anodized and powder-coated finishes were not yet developed for architectural aluminum). Lamps recessed in extruded aluminum ribs comprise an integrally lighted metal ceiling. The floor is black terrazzo.

The lobby and elevator banks are designed in the Art Deco style. The lobby wall treatment is a narrow, fluted wainscot of black enameled steel and dark blue-green terrazzo panels above, alternating with vertical aluminum fluted columns. The extruded aluminum cornice features a wide flat design with very fine offsets; the ceiling is rough-finished plaster. The black terrazzo floor contains a spiraling pattern of glass plates that were originally illuminated from beneath. The elevator lobby uses many of the same features of the main lobby but the green Formica panels are exchanged for black enamel steel.

The illuminated lobby floor (Figure M) represents the unique mastery of art deco style employed by the architects. It is described in the November 1931 publication of *The Architectural Forum* as follows:

"All the light comes from glass panels worked into the design of the floor. Beneath the glass setting, and concealed below the terrazzo of the floor, but above the steel floor plates, 40-watt lamps outline the glass panels of varied shapes and sizes… The effect is very striking and produces ample light for general illumination. Floor lamps augment the general lighting at tables and davenports producing a home-like atmosphere."[3]

The floor lighting fixture and terrazzo patterning is intact today, although many of the glass and bulb elements are broken.

The two-story interior exhibit hall (Figure O) on the inside of the U features a twenty-ton traveling crane which was intended for display, testing, and demonstrations. The space was intended to be flexible for the display and testing of multiple units and featured movable walls and removable floor panels. Modern partitions which terminate before the ceiling were added along the sides to contain specific exhibits.

The upper floors are largely intact, although condition deteriorates significantly as one moves up the building. The giant windows, single panes of quarter-inch glass nine feet wide by thirteen feet tall, provide ample natural light. Evidence of remodels is present, with materials and styles dating to various decades of the building's operation.

Structural open-span trusses provide forty-five-foot-wide spans without internal columns, which was intended to provide the greatest flexibility of interior space (Figure Q). Partitions were intended to be easily reconfigured. The only permanent partitions in the building are located at stairs, elevators, toilet rooms, locker rooms, and the main entrance lobby. The original moveable partitions were solid to the top of the doors with glass clerestories above and constructed of two steel plates sandwiching sound-deadening material (Figure P). Many of these partitions remain throughout the building; their location has likely changed given their intended use. The girders and columns are hollow, acting as runs and

[3] "Research and Engineering Building of the A.O. Smith Corporation," *The Architectural Forum*, LV, No. 5 (November 1936), 608.

chases to enclose piping and ductwork, further opening the interior space (Figure T). Specific aspects of the materials, architectural, and engineering design are described in further detail in Section 8.

Unfortunately, deferred maintenance caused significant roof leaks, resulting in buckled parquet flooring, deteriorated plaster, and compromised structure. Only portions of the parquet flooring remain. Transite (asbestos-cement) panels, a brand-new, cutting-edge material in 1930, were used throughout, most notably to line the hollow columns that doubled as mechanical shafts. These panels pose a hazard and require sensitive remediation.

South Plant: Building 35, Non-Contributing and Building 36, Contributing
Building 36 was initially constructed to house A.O. Smith's automatic frame assembly plant and was frequently modified during the period of significance, resulting in contributing additions at the north and south side and a noncontributing modern-era addition on the east side. Building 35 began as a separate substation building nestled between the south additions to Building 36 and has gradually grown so that it now abuts Building 36. Together, this collection of buildings and additions was known as the South Plant to differentiate it from the campus's other automotive frame assembly plant (Building 1, North Plant, non-extant) connected to Building 1A. The interiors of the building are used by the current tenant for train car assembly; access for interior photography was not permitted. The continued industrial use has resulted in very few alterations to the main production space.

Building 36 East Wing, Production and Research and Engineering Departments (pre 1930)
The original Building 36 plant building was T-shaped and divided into two main sections: a brick four-story, flat-roof industrial loft building forming the top of the T at the east end and a single-story industrial shed building forming the vertical part of the T running east-west. The building's astylistic, utilitarian design makes modest nods to the more decorative Neoclassical Style of Building 1A through Indiana limestone accents. The buildings are predominantly brick with slight color variation from light red to sienna, and the roofs have all been reclad with rubber roofing membrane that continues over the roof monitors and skylights.

The original South Plant is obscured by the adjacent additions (many dating to the period of significance), but the north and south elevations of the east industrial loft wing provide a sense of the original building's style and ornament. The historic red brick north elevation is divided into three bays with evenly spaced openings that align vertically on each floor. A band of non-original concrete begins at the paved driveway and extends approximately thirty inches up the elevation. Several modifications have been made to the first-floor windows and doors. In the east bay, the first-floor window has been infilled with glass block, and the opening size has been reduced to accommodate a modern-era door has been added next to it. A large overhead door in the center bay has been removed and the opening infilled with red brick that is a close match to the historic brick in size and color variation. The window opening in the west bay has been infilled with brick with a modern-era door aligning with the opening edge. A simple sign with the name of the current tenant has been mounted in the center bay and miscellaneous cameras and security lights have been affixed to the façade.

The first floor is separated from the upper floors at the north elevation by an Indiana limestone belt/sill course. A second matching belt course forms a band above the fourth-floor windows. Between these belt courses, the bays are articulated by pilasters with recessed spandrels and brick window surrounds between the belt courses on floors two through four. A simple Indiana limestone cornice caps the elevation below a short brick parapet up to the Indiana limestone coping. In each side bay, upper floor windows are paired twenty-four-light industrial steel sash units with a mixture of glass types and transparencies. In the center bay, two of these twenty-four-light units flank a thirty-six-light unit. Windows on the second and fourth floor have operable ventilators. All windows have an Indiana limestone sill and steel lintel concealed by a row of soldier-course brick. A tall Indiana limestone diamond is inset within the brick spandrels between each of the upper floor windows, aligned with the mullions between window units. The center bay has two diamonds per spandrel.

The south elevation was originally nearly identical to the north elevation but has been modified as follows. The first-floor openings in the side bays have been infilled with brick. A modern-era door has been added to the east of the east bay's infilled window. The center bay has been enlarged to accommodate a large overhead door. At the second floor, the window above this overhead door has been infilled to allow for the larger door's lintel and tracks. The window in the east bay at the second floor has been covered with plywood, and the window in the west bay has been replaced with a large louvered grille. The same grille was installed in the third-floor unit above. The rest of the windows are intact and match those on the north elevation.

The east and west elevations of the industrial loft wing are partially visible above the abutting rooftops. They are twenty bays long with large industrial steel sash windows of the same configuration as the center bays on the north and south elevation. The upper belt course and cornice are continuous around the entire industrial loft wing. Two end bays project slightly from the rest of the façade at each of the north and south ends of the east elevation.

Building 36 West Wing, Automatic Frame Assembly Plant

The main industrial shed building forming the vertical part of the T is predominantly intact, although it is largely obscured by Building 35 to the south and the 1960 addition to the north. The tall single-story space is capped by sawtooth roof monitors running the full east-west length of the building and peaking at the same height as the four-story east wing. The original red brick of the south elevation is partially visible above Building 35. The south elevation is thirty bays wide, and each bay is articulated by a brick pier. Stylistically, the building closely resembles the east wing with industrial steel sash windows supported by Indiana limestone sills and topped with steel lintels concealed behind a row of soldier brick. Only the top band of windows is still visible. Within each bay are two twenty-four-light windows flanking a central thirty-six-light window. An Indiana limestone belt course runs the entire length of the building above the soldier course window heads and visually separates the lower wall face from the brick parapet. The parapet terminates at a terra cotta camelback coping.

The north elevation is dominated by the three-story, flat-roofed 1960 addition. This addition extends the full length of the industrial shed wing. The addition is predominantly unadorned brick with punched openings. At the east end of the addition, near the industrial loft wing, a long ribbon window at the second and third floor reinforces the horizontality of the addition. At the second floor, several window units have been replaced with aluminum. The historic four-light casements are still intact at the third floor. These windows are positioned above a recessed dock that has been partially infilled with newer brick walls.

The west half of the north addition is also utilitarian in design, with a band of concrete extending about thirty inches up the brick façade. Eight sets of aluminum windows in groups of threes are evenly spaced across the rest of the addition, centered above louvered grilles that may have been placed at former window locations.

The interior production space is largely intact, including exposed steel columns and trusses, exposed concrete floors, and exposed masonry walls. Modifications to the floor were made to provide access to the underside of rail cars and for the installation of equipment specific to the building's current industrial use.

For most of the building's history, a large industrial loft building (Building 38, 1920) abutted the west end of Building 36. This building was razed in 2012, and a tall, narrow airlock was installed to allow train cars to enter and exit the building without significant heat loss. This airlock addition and the west end of the remaining exposed end that had connected to Building 38 were clad in corrugated metal panels.

In 2000, a boxy, flat-roofed, two-story addition was built to the east of the historic South Plant industrial loft building. The addition has a rectangular floor plan with a narrow projecting volume on the south façade. All sides are clad with precast concrete panels. Aside from a few first-floor emergency exit doors, the only perforation at the first floor is a large overhead door at the west end of the north façade. At the second floor, aluminum casement windows located in every third bay at the second floor of the north, east, and south facades.

Building 35, Substation
Building 35 began as a separate two-story gabled shed building south of Building 36, constructed in the negative space formed by that building's T-shaped plan and serving as a substation for the South Plant. Originally there was a narrow yard separating the two buildings, but Building 35 was

reconfigured and enlarged several times between the 1930s and 1960s. By the early 1970s (likely just after the period of significance), Building 35 had expanded to its present size, extending all the way north to the south façade of Building 36 and all the way west to Building 38 (razed).

Building 35 is astylistic and unadorned, with a long, blank red-brick south façade with few openings or other surface details. The brick façade is broken up vertically by control joints and horizontally by narrow concrete bands that wrap around the south and east facades at the sidewalk, above the door headers, and at the coping. Three simple steel fire exit doors are spaced evenly at the first floor of the south facade. A large paneled overhead door dating to the building's 1970s iteration is the only opening in the east elevation. The west elevation, which once abutted Building 38, was reclad in corrugated metal panel when that building was razed in 2012, similar to the other South Plant west elevation wall faces. It is unknown whether any of the earlier iterations of Building 35 remain within the present building, but the building is considered noncontributing as most visible features and the primary south façade design were not present until after the period of significance.

Building Inventory

Map Key*:	Address:	Historic Name:	Date:	Class**:	Style:
1A	3025 West Hopkins Street	Main Office	1910	C	Neoclassical Revival
35	3533 North 27th Street	South Plant Substation	c. 1975	NC	Astylistic
36	3533 North 27th Street	South Plant	1920	C	Neoclassical Revival
65	3025 West Hopkins Street	Research and Engineering Building	1930	C	Art Deco/ International Style

* See Figure B for a district map
** Class Key: C = Contributing, N = Non-Contributing

Summary Statement of Significance
The A.O. Smith Corporation Headquarters Historic District is nationally significant under Criterion A for its contributions to Engineering and Industry during its use by the A.O. Smith Corporation. Between 1910 and the 1960s, the men and women at A.O. Smith made significant contributions to automobile production, automated manufacturing processes, and welding techniques, and were key to the development of several notable innovations and products. The southeast portion of the campus in particular served as the brain center of the organization that invented and reinvented products that were exported from Milwaukee to the nation and eventually to the world. The Research and Engineering Building (Building 65) is also nationally significant under Criterion C in the areas of Architecture and Engineering as a highly intact example of an experimental use of multiple types of aluminum as an exterior treatment, including the first full glass multi-story curtainwall in the United States. It is also significant as one of the earliest examples in the United States of the International Style applied to a multi-story building, designed by architects of national significance Holabird and Root (Chicago). The buildings within the district have primary roles in supporting A.O. Smith's dedication to and prioritization of engineering and innovation.

After its split from bicycle parts maker C.J. Smith in 1910, the A.O. Smith Company constructed Building 1A (contributing) and the adjoining factory (Building 1, razed) to house their growing automobile frame company. They soon applied the technologies they pioneered in manufacturing automobile frames, including automated manufacturing processes and new welding methods, to expand into other industries. The arc welding process they developed had a significant impact on several industries, including agriculture, brewing, petroleum, natural gas, and commercial and residential water-heating, and dedicated manufacturing facilities for these products were added to the campus. This vast campus was initially run from Building 1A.

In 1920, when the South Plant (Building 36, contributing) was constructed, the research and engineering staff were relocated to brand new office and laboratory facilities at the east end of the plant. This put them in the perfect position to oversee and troubleshoot the automotive frame assembly plant under construction in the rest of Building 36. By 1921 they had successfully completed the world's first automated automotive assembly plant, dubbed the Mechanical Marvel. The plant increased productivity of the company's automotive frame division by an astounding 3700 percent, dropping the price of frames and making A.O. Smith the primary manufacturer of automobile frames in the country. [4]

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4 Thomas H. Fehring, *The Magnificent Machines of Milwaukee and the Engineers Who Created Them* (North Charleston, S.C.: CreateSpace Independent Publishing Platform, 2017), 280.

In 1931, the research and engineering staff was relocated from Building 36 to the newly completed Research and Engineering Building (Building 65). The state-of-the-art facility featured moveable partitions and flexible mechanical spaces, highly unusual for that time, so that engineers could create labs and testing areas best suited to whatever method or product was under development. A.O. Smith maintained an engineering staff of 400-600 at any given time, and company advertising boasted a fifty-to-one ratio of engineers to salespeople. The Research and Engineering Building was to serve as both an incubator for product development and a visual symbol of the engineering-first ethos of the corporate brand. Its bold aluminum and glass façade was in many ways analogous to the work of the 400-plus engineers occurring within it.[5]

During World War II, A.O. Smith was one of Milwaukee's largest contributors to the Allied Forces. Several of the technologies A.O. Smith contributed to the World War II effort were also developed and tested in the Research and Engineering Building, including bomb casings for large capacity bombs, a new type of aircraft propeller and landing gear, torpedo air flasks, nose frames for the B-25 bomber, and components for the atomic bomb project. Some of these components were manufactured in Building 36.

After World War II, many of the research and engineering laboratory work was outsourced to private laboratories and universities, a nationwide trend. The executive offices were moved from Building 1A to vacated laboratory space in Building 65. Building 1A remained the location of the automotive department administrative offices and continued to operate as the public face of that department throughout the period of significance. Periodic interior remodeling was executed at both administration buildings, most notably in 1956, to modernize the building and accommodate departmental changes.

Throughout the period of significance, each building within the district had a role in A.O. Smith's operations, engineering activity, and the success of its automotive division.

Period of Significance
The period of significance is 1910, the date of construction, until 1972, or fifty years prior to the date of this nomination. The A.O. Smith Corporation continued to use all four buildings as key components of their administrative departments and automotive division until 1997, when A.O. Smith built a new campus in northwest Milwaukee and relocated their headquarters and remaining plants. The primary facades retain their original appearance. Most changes that occurred after 1910 were part of the building's continued operation by the A.O. Smith Corporation and related to the company's contributions to industry and engineering. Very few substantial changes occurred after the 1956

5 Fehring, *The Magnificent Machines of Milwaukee*, 279.

remodel of Building 1A. Research did not uncover any developments or contributions that would warrant extending the period of significance past 1972 due to extraordinary significance.

Land Acknowledgement
This nomination recognizes the depth of human presence here, the ancestral homeland of American Indians for millennia, including the Menominee and Ho-Chunk tribes. From as early as the 17th century, inter-tribal conflict, Euro-American exploration and settlement, and ensuing military campaigns, all had the effect of repeated displacement of Indians of many tribal affiliations. This continuous tribal movement resulted in Wisconsin being home to many tribes who originated from other parts of the country, generating a pattern of immigration, relocation, and formation of a new homeland. Some of these tribes remain in Wisconsin; others may not, but numerous count Wisconsin as home: Brotherton, Dakota, Fox/Meskwaki, Ho-Chunk, Kickapoo, Mascoutens, Menominee, Miami, Munsee, Odawa, Ojibwa, Oneida, Potawatomi, Stockbridge, Sauk, and Wyandot tribes. We acknowledge that the property that is the subject of this nomination is located on land long occupied by American Indians, and since 1850 by the Potawatomi tribe.

Historical Context – Industry and Engineering
Milwaukee Industrial Development and the 30th Street Industrial Corridor
The city of Milwaukee is located along Lake Michigan at the confluence of the Milwaukee, Menomonee, and Kinnickinnic Rivers. The first historical recording of a community at this location was during the visit of Father Zenobrius Membre to Fox and Mascouten Indians at what is now Jones Island near the mouth of the Milwaukee River. The native population of the area grew in subsequent years, including Potawatomi, Sauk, Ottawa, Chippewa and Menominee groups. Settlers of European descent initially used the area as a seasonal trading post during winter months when conditions farther north were too harsh. As early settlement of the United States pushed west, land was forcibly taken from indigenous people, many of whom were relocated to Iowa and Kansas.[6]

The early communities of white settlers that became Milwaukee were founded in the 1830s by Solomon Juneau (Juneautown, with business partner Morgan Martin), Byron Kilbourn (Kilbourntown), and George Walker (Walker’s Point). Each claimed a piece of land and began settlements around the rivers, drawn by the large bay and deep mouth of the Milwaukee River, the deepest on the shore of Lake Michigan. Although the settlements’ growth was driven by commerce, political, religious and cultural institutions quickly followed. The Town of Milwaukee was officially established in 1839 when Juneautown and Kilbourntown combined. Walker’s Point was incorporated in 1845.[7]

[6] John Gurda, *The Making of Milwaukee* (Milwaukee: Milwaukee County Historical Society, 1999), 7.
[7] Gurda, 49.

Boosted by an influx of European immigrants, Milwaukee's population more than doubled in the four years following incorporation. By 1860, it had doubled again. After the Civil War, the trend accelerated. The economy was growing at an astounding rate. In the twenty years following incorporation, Milwaukee became Wisconsin's center of commerce. The railroad, new regional roads, and the harbor made Milwaukee a trade hub for many products, most notably wheat from the Wisconsin countryside.[8]

In the years after the Civil War, wheat began to wear out the Wisconsin soil so many farmers shifted to dairy. As market forces caused wheat to decline, manufacturing rose to take its place, driven in part by steam railroads, a national rail network, readily available raw materials, a growing immigrant labor force, and an abundance of enterprising personalities. The shift toward manufacturing, especially in port cities, corresponded with a nationwide shift toward developing and implementing new technologies. The U.S. Patent Office, established in 1790, issued four times as many patents in the 1860s as it had during its entire existence to date. The number of patents grew exponentially for thirty years, doubling in the 1870s and again in the 1880s.[9] [10]

Manufacturing grew steadily over an approximately hundred-year period that is sometimes referred to as the "Century of Progress," encompassing the years between 1860 when manufacturing and innovation exploded after the Civil War to approximately 1960, when the post-World War II economic and manufacturing boom steadied and focus of many of the manufacturing and industrial powerhouse shifted to acquisitions and the challenges of global markets. Throughout this one-hundred-year period, industrial activity tended to concentrate together in distinct neighborhoods even before zoning laws mandated these groupings. Certain areas of the city provided the ideal combination of transportation, access to affordable raw materials and parts, availability of a productive and capable workforce (through proximity or growing transit systems), access to water, and reliable energy sources to power machinery that the new and growing companies required.[11]

The first manufacturing hub was located near downtown on the banks of the Milwaukee River which provided both power and transportation of materials and manufactured products. Once steam engines became more affordable and available, manufacturing spread out to other areas. Walker's Point was the next neighborhood for industrial expansion, with sufficient industrial and manufacturing development to incubate new companies. Industry next spread into the Menomonee Valley as Walker's Point companies required larger facilities. This section of the city had the added benefit of

[8] Gurda, 103.
[9] Gurda, 117-128.
[10] Fehring, *The Magnificent Machines of Milwaukee*, 1.
[11] Fehring, *The Magnificent Machines of Milwaukee,* 1-2.

easy access to the Chicago, Milwaukee and St. Paul Railway that also ran through the valley. In the late 1800s and early 1900s, about the same time as industry expanded to the valley, wealthy citizens were vacating their vast estates north and south of the valley in favor of nearby suburban enclaves, making room for land redevelopment to house the growing workforce. Bay View became the next area for industrial expansion, spurred by the Milwaukee Rolling Mill which provided affordable iron and steel to industries along the Kinnickinnic River. Companies continued to expand from the center, moving west along rail lines to West Milwaukee, West Allis, and Waukesha; northwest along the Beer Line railroad on the west bank of the Milwaukee River; and northeast along the Chicago and North Western Railway on Milwaukee's east side.[12]

The final area of industrial expansion during the Century of Progress followed the spur of the Chicago, Milwaukee and St. Paul Railway into the 30th Street Industrial Corridor, the neighborhood where the subject of this nomination is located. As density crowded large manufacturers out of more centrally located areas, the 30th Street Industrial Corridor became a lasting location for the headquarters and manufacturing plants of several of Milwaukee's most important and enduring companies. This corridor extends along the rail tracks, traversing diagonally from 30th Street to 35th Street, in an area of town that was called Schwartzburg before it was incorporated as the Village of North Milwaukee in 1897.

Many of the companies that developed plants in this area relocated from Walker's Point, including A.O. Smith Corporation. The companies along the 30th Street Industrial Corridor represent national and international interests that loaded freight cars with products destined for purchase around the world. Several remain enduring Milwaukee-founded brands that made significant contributions to the history of industry. A large number of these 30th Street Corridor companies manufactured motor vehicles and two Milwaukee automotive companies in this area, A.O. Smith and Seaman Body, were among the city's largest employers with approximately 5,000 employers each in 1926.[13]

The first major manufacturer to move to Schwartzburg was the Meiselbach Bicycle Co., relocating from Walker's Point in 1896. Harley-Davidson co-founder William Harley was employed there for a time, acquiring knowledge of frame design that he would use in his later endeavors. Meiselbach was a robust operation employing between 365 and 600 people. They combined with several other bicycle companies in 1899, including A.O. Smith predecessor C.J. Smith of Milwaukee, to form the American Bicycle Company. When the bicycle bubble burst, the company's Schwartzburg factories switched to producing typewriters invented by another Milwaukeean, Christopher Latham Sholes. They then switched to commercial trucks and built another factory for heavy-duty trucks with friction drives.[14]

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[12] Fehring, *The Magnificent Machines of Milwaukee,* 2.
[13] Mead & Hunt, "Milwaukee Industrial Properties Intensive Survey," survey report, Madison, Wisconsin, October 2016.
[14] Fehring, *The Magnificent Machines of Milwaukee,* 258-262.

The next major company to move to the 30th Street Industrial Corridor was Merkel Manufacturing Company, which preceded Harley-Davidson in the motorcycle market. They developed the Flying Merkel, one of the most innovative early U.S. motorcycles, and developed the truss fork component, a forerunner of the modern telescopic front fork. The renamed Merkel Motor Company began manufacturing automobiles and moved to Pennsylvania in 1908.[15]

Badger Meter was established in 1905 and initially located downtown before relocating to the 30th Street Industrial Corridor. They fabricated the first frost-proof water meters that accommodated northern climates, and by 1910 they were selling 4,000 units a year. The company eventually vacated their plant but remain headquartered in Milwaukee.[16]

A.O. Smith was next to locate in the 30th Street Industrial Corridor in 1910, seeking a new location to produce automobile frames, an industry they entered as a division of their parent company, C.J. Smith and Sons. More on the history of A.O. Smith Corporation is included in the next section.[17]

Harley-Davidson, one of Milwaukee's most recognizable and enduring brands, sold their first motorcycle in 1903 and eventually became the most dominant motorcycle manufacturer in the world. In 1912, Harley-Davidson started construction on their first purpose-built factory on Juneau Avenue, about a block west of 35th Street at the south end of the 30th Street Industrial Corridor. The first factory building remains part of the large Harley-Davidson campus at that location today.[18]

T.L. Smith Company built a new factory in the 30th Street Industrial Corridor in 1916 to increase manufacturing capacity. At this factory, they developed their first high-discharge transit mixer for the construction industry. They continued to build larger mixers, eventually creating the "World's Largest Heavy-Duty Cement Mixer." T.L. Smith was part of a group of Wisconsin companies that produced seventy percent of the concrete mixers sold in the United States by 1940. They operated their 32nd Street facility until the mid-1970s.[19]

By the end of World War I, industry was booming along the 30th Street Industrial Corridor and throughout the city. In 1920, manufacturers employed nearly sixty percent of Milwaukee's labor force. In 1925, the *Milwaukee Journal* conducted a survey and found that Milwaukee County featured the largest manufacturers in fifteen industries in the United States. Many of the companies who led their

[15] Fehring, *The Magnificent Machines of Milwaukee,* 263-264.
[16] Fehring, *The Magnificent Machines of Milwaukee,* 295.
[17] Fehring, *The Magnificent Machines of Milwaukee,* 293.
[18] Fehring, *The Magnificent Machines of Milwaukee*, 266-271.
[19] Fehring, *The Magnificent Machines of Milwaukee*, 291.

industries in the 1925 survey remain national and international leaders today, including Harley-Davidson, Bucyrus, A.O. Smith, and Johnson Controls.

The last major company to move into the 30th Street Industrial Corridor was the Master Lock Company. Henry E. Soref, who founded the company in 1921, developed his padlock to protect equipment as a consultant to the military in World War I. His lock was patented in 1924 and considered far superior to others on the market while also being cheaper to produce. Soref faced increasing demand during Prohibition as his locks were used to lock up establishments selling illegal substances. They were also featured during Harry Houdini's stage act, on which Soref consulted. Struggling to find a fabricator that could manufacture the locks to his specifications, Soref decided to produce his locks himself. Master Lock built their production facilities in the 30th Street Industrial Corridor in 1939 and remained there until recently when they relocated their headquarters to Oak Creek but retain shipping warehouses at the former factory.[20]

After the bombing of Pearl Harbor, Milwaukee became an "arsenal of democracy," recognized by national defense planners for its breadth and depth of industrial activity. Through the establishment of the War Production Board, the Department of Defense turned Milwaukee into a federal priority area for protection and supply of wartime goods. The nation was able to use Milwaukee's industrial companies with very little new infrastructure or technology, allowing companies to shift production with great speed and to keep many factory workers employed when non-essential businesses were forced to reduce production or ration materials. In seventy percent of Milwaukee companies, existing technologies were used to produce war-time products, and national distribution networks were already in place. A.O. Smith was one of the largest contributors to the war effort in the city. In Milwaukee, the increase in war-time labor and factory space led to post-war economic prosperity, with an industrial output that more than doubled between 1946 and 1953.[21]

The engineering innovation that occurred in Milwaukee from 1860 to 1960 was critical to the development of the city, creating an environment of commerce and industry that provided livelihood to citizens, attracted immigrants from all over the world, and spurred many of the social and cultural institutions that remain in some form today. Many of the companies founded during this period helped Milwaukee achieve prominence in industrial design and manufacturing. This legacy survives in some form today, with many of the early companies growing into major international firms. The 30th Street Industrial Corridor remains the home of some of Milwaukee's most enduring and world-renowned brands and the birthplace of many of the city's great inventions and contributions to industry.

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[20] Fehring, *The Magnificent Machines of Milwaukee*, 299.
[21] Gurda, 232-234.

Significant Inventions and History of the A.O. Smith Corporation
Charles J. Smith-Machinist, the company that evolved into the A.O. Smith Corporation, was established by Charles Jeremiah Smith at a Walker's Point machine shop (Figure F) that specialized in making metal parts for baby carriages and other custom hardware. He was eventually joined by his sons and changed the name to C.J. Smith and Sons. In 1889, the company began making bicycle parts using a new technology they developed that allowed them to fabricate steel tubing for the frames out of sheet metal. This technology helped C.J. Smith and Sons become the largest U.S. bicycle parts manufacturer by 1895, and it later became the largest in the world.

In 1899, Charles's son Arthur O. Smith developed the world's first pressed steel automobile frame, a lighter and more cost-effective alternative to those on the market at the time. C.J. Smith's first auto frame customer was the Peerless Car Company in 1902, followed soon by Cadillac, Packard, and Oldsmobile. In 1904, Arthur O. Smith incorporated the A.O. Smith Company for the purpose of producing and marketing automobile frames and to distinguish the business from bicycle parts manufacturing. Henry Ford took notice of the fast-growing Milwaukee company and commissioned 10,000 steel frames. Most of these frames were used for Ford's Model N, the first accessibly priced, mass-produced automobile in history.[22] Ford continued to use and publicly laud the Smith frames, and soon many fledgling auto manufacturers were also coming to Smith to manufacture their frames, too. Ford eventually integrated frame production into their own assembly lines, but by then, A.O. Smith was fully entrenched in the manufacture of automobile frames and parts and had enough other customers to stay afloat. Between this early success and the rapidly growing popularity of automobiles, business was soon so robust that the company was forced to turn down orders.

Company executives decided to seek a location for a new, larger mass production facility. In 1910, a new headquarters was built, including a large frame production plant (Building 1, non-extant) and the main office building (Building 1A, 3025 West Hopkins Street, contributing). They hired Milwaukee architect Titus Diethelm to design the building. Little is known about Diethelm. He worked initially at a firm on the south side of Chicago, where he designed several apartment blocks and a few other projects before moving to Milwakee and starting his own practice.

The main office building housed most of the initial administrative functions. The executive offices, including that of Arthur Smith, were located on the first floor, north end, and the rest of the floor held the Accounting, Ordering, and Sales departments, as well as the main lobby. The second floor, which was connected to the factory through a narrow walkway, held the Engineering, Purchasing, and Blueprint departments. Departments that dealt directly with factory workers, such as Timekeeping,

[22] Charles S. Wright and Roger S. Smith, *Through Research a Better Way: History of the A.O. Smith Corporation* (Milwaukee, Wis.: A.O. Smith Corporation, 1995), 22.

Medical, and the Employment Office, were located at the east end of Building 1 just across the building connector. The basement was initially used as the chemical laboratory and retained industrial production and testing uses independent of the administrative uses on the upper floors until much later in the building's history, when the medical department was located on the east side of the basement.[23] By the completion of its new headquarters in 1910, A.O. Smith was the largest manufacturer of auto frames in North America.[24]

Arthur Smith died in 1913, and management of the business transferred to his son Lloyd Raymond Smith (Ray). By 1916, Ray incorporated the A.O. Smith Company and completed the split from its parent C.J. Smith, becoming the A.O. Smith Corporation.[25] Ray was an engineer at heart if not yet by training, and he ushered in an era of innovation that included an expansion of the engineering staff to 600, hundreds more than any of his contemporary companies of equal size. Ray Smith was known for pursuing new technologies before an application was discovered for them, sometimes at great financial risk. His risk paid off in many instances, resulting in innovations in several industries and transforming the methods of manufacturing parts for everything from automotive frames to oil pipelines to bomb casings.

As automobiles grew in popularity, production at the new plant was pushed to its limit. Ray decided to pursue a new way to manufacture frames that would automate the process and increase capacity while reducing manpower. He set his large engineering staff, under the direction of chief engineer R. Stanley Smith, to the task of designing, testing, and fabricating an automatic frame plant that could output more frames than the manual assembly plant and be run by fewer staff members.[26] Working in conjunction with the tradesmen and fabricators in the plant, Stanley Smith's engineers on the second floor of Building 1A building began to design what would become one of the most significant innovations in industry and mechanical engineering.

Work on the automatic frame plant was postponed as the company devoted staff and technology to the war effort during World War I. As part of this effort, the A.O. Smith Corporation experimented with a superior welding method using electric arcs. A significant component of this welding technology was the weld rod itself. In 1917, one of Stanley Smith's interns, Orrin Andrus, realized that wrapping the weld rod with materials could create a mini-furnace that resulted in an ionized field, which would produce a high-quality, ductile weld with potential to be stronger than the metal itself. Andrus and Smith tested wrapping the weld rods in newspaper soaked in sodium silicate, a fire retardant, and

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[23] William Forney Hovis, *Herman Weltzien's Fifty Years and More with Smith's*, unpublished manuscript, Milwaukee County Historical Society, Mss-2396, Box 1 (1944), 33.
[24] "History Timeline," *AOSmith.com*, accessed April 20, 2021, https://www.aosmith.com/About/History/History-Timeline/
[25] A.O. Smith Corporation, *The A.O. Smith Corporation 1974-1950*, (Milwaukee: A.O. Smith, c. 1950), 1.
[26] Fehring, *The Magnificent Machines of Milwaukee,* 278.

presented their findings to Ray. He immediately hired thirty women to wrap rods in paper in the basement of Building 1A, while the engineers on the second floor worked with fabricators in the plant to incorporate the superior weld in bomb casings. This arc welding technology developed by Smith's engineers and scientists and patented in 1919 allowed the company to become the largest manufacturer of casings for aerial bombs and shells during the war, producing 6,500 casings a day by 1919. The welding division was retained after the war to continue to experiment and develop the technology, despite no longer having a specific use for it.[27, 28]

After the war, A.O. Smith redirected their attentions to the automatic frame plant design, but also continued to experiment with arc welding techniques. Smith purchased the baseball fields to the south, annexed and closed West Keefe Avenue, and commissioned a new building (Building 36, contributing) to allow them to build, engineer, and test the automatic frame plant without interrupting frame production in Building 1. The engineering department was also relocated to Building 36, which was referred to as the South Plant. Building 1 became the North Plant. Ray Smith, Stanley Smith, and company engineers also used their new laboratory and testing space in Building 36 to develop their weld techniques for industries where that technology could be transformative, and it became one of the company's most significant sources of expansion and diversification over the next several decades.

A.O. Smith finally received a patent for their automatic frame plant design in 1921. When the plant, which became known as the Mechanical Marvel, was first switched on in the South Plant (Building 36) later that year, it represented six years of labor, an eight-million-dollar gamble, and a level of automation that was unheard of for that era. It completed 522 separate operations within a ten-second cycle averaging well over 8,000 frames a day by performing four million operations. The automatic frame plant in Building 36 is shown in Figures G and H and the stacks of newly produced frames are shown in Figure I. The cost savings in time and labor over the existing A.O. Smith frame assembly plant represented a 3700% increase in productivity. The Mechanical Marvel allowed A.O. Smith to produce frames so inexpensively that they had no real competitors for several years. General Motors dropped their plans to develop their own in-house frame plant and contracted with A.O. Smith, a relationship that would last for decades.[29] At the time, *Fortune* magazine called it, "the most advanced single exhibit of automatic function in the world." The automatic plant was designated a National Historic Mechanical Engineering Landmark by the American Society of Mechanical Engineers in 1979.[30]

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[27] Wright and Smith, *Through Research a Better Way*, 27-28.
[28] A.O. Smith Corporation, *Remembering an Era, 1921-1958: 10,000 Automobile Frames a Day* (Milwaukee: A.O. Smith, 1958), 2.
[29] Fehring, *The Magnificent Machines of Milwaukee,* 280.
[30] Fehring, *Mechanical Engineering: A Century of Progress* (Milwaukee: Milwaukee Section of the American Society of Mechanical Engineers, 1980), n.p.

While the various machines and processes are no longer extant, the South Plant building that housed them is intact. It anchors the south end of the proposed district and retains its large open production space on the interior. The automatic frame plant was decommissioned in 1958, within the period of significance.

By 1927, the welding division that began during World War I with bomb casings had developed and perfected resistance flash welding. Through testing and experimentation in Building 36 and others on the campus that were purpose-built for welding, the company was able to manufacture longitudinal seams up to forty-foot lengths of large diameter pipe in as little as thirty seconds each. The petroleum industry, which was using an expensive, labor-intensive billeting system to manufacture piping, became a ready customer of A.O. Smith's new welded large-diameter pipe.[31] Smith's welding division finally had a highly lucrative use that was not related to bomb-making, and needed a new facility that was better-suited to testing and developing additional uses for the company's new welding technologies.

The success of the automatic frame plant and the growing sales of the piping division had strengthened Ray's belief in the importance of research, and the company began to use "Through research, a better way," as one of its taglines. In an article in the Magazine of Business in 1929, Ray Smith wrote proudly of the ratio of 500 engineers to eight salesmen, making light fun of critics who wondered how a company could afford so many "non-productive" workers. Smith listed the company's most significant accomplishments to date: 1) a robust engineering organization that could work in conjunction with technicians, fabricators, and testing facilities on site; and 2) a working knowledge of automated production that could be applied to subsequent products and technologies.[32]

In the late 1920s and early 1930s, research was growing increasingly important to industry throughout the United States, a trend that echoed other fields, including architecture, education, and medicine, that had begun to emphasize the collection and use of empirical data. Industrial and manufacturing companies began to tout their research activities to improve their image, whether research was a truly a key component of their business or not.[33] Flush with cash from the success of the inventions and products they formed to produce, companies were enticed by the German university model that had been successful at companies like Siemens. In this model, professors (or company engineers) were encouraged to pursue their interests in devising research and experiments without concern for commercial or economic interests.[34] Some companies like A.O. Smith turned this philosophy into part

31 Fehring, *The Magnificent Machines of Milwaukee*, 289.
32 A.O. Smith Corporation, *Remembering an Era*, 1.
33 Richard Guy Wilson, Dianne H. Pilgrim, and Dickran Tashjian, *The Machine Age in America*, (New York: Brooklyn Museum/Harry N. Abrams, 1986), 70.
34 Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1970* (Chicago: University of

of their identity. A few companies also commissioned prestigious architects to build dedicated research and development facilities in bold new styles to simultaneously house their R&D divisions and advertise their innovative spirit and engineering talents. The integration of research and development into the corporate campus was also a departure from use of university labs, which was the norm for development and testing at the time. The work done in corporate labs could be closely guarded, a valuable advantage in the race to bring new technologies to market. One of the earliest dedicated R&D facilities was the Ford Engineering Laboratory commissioned by Henry Ford and designed by Albert Kahn in 1925 as part of Ford's massive new plant.

The Mechanical Marvel garnered such a huge share of the automotive frame market that Ray Smith was financially free to experiment, and that experiment included the design of a flagship engineering building of his own. A.O. Smith's Research and Engineering Building was one of the most daring of these new research and development facilities, representing both engineering and architectural innovations.[35] The Research and Engineering building, placed into service in 1931, was a culmination of L.R. Smith's dedication to research and development, and his desire to showcase the results the company had already gained from that dedication. More on the unique design features of the Research and Engineering Building is included in the following sections.

A.O. Smith's existing contracts pulled them most of the way through the Great Depression, but by 1933 they were struggling like most other individuals and companies. Ray hired a new manager, William C. Heath, to help make cuts to salaries and staff without dirtying his own hands. Despite drastic cuts, the demand for A.O. Smith's most profitable product, the automobile frame, had dropped so low they could barely recoup the costs of running the plant. After a heart attack in 1934, Ray turned over day-to-day management of the company to Heath.

Ray Smith and William Heath continued to pursue new markets that might help keep the company afloat. Foreseeing the repeal of the 18th Amendment and an end to prohibition, A.O. Smith set out to develop a steel beer barrel that could be mass-produced using their patented welding technology and earlier work with coated weld rods. They experimented with vitreous enamel tank linings and determined the glass-like surface was impervious to the brewing process and had no effect on the flavor. The New Way steel beer barrel, introduced in 1933, was the first commercial use of the company's glass-fused-to-steel technique (Permaglas) which engineers had begun experimenting with in the 1920s without a dedicated use in mind. Permaglas was later incorporated into the development of other groundbreaking products, including A.O. Smith water heaters, boilers, and furnaces.[36]

Chicago Press, 2004)

[35] Gwendolyn Wright, *USA: Modern Architectures in History* (London: Reaktion Books Ltd., 2008), 93.

[36] "From the Anvil to the Atom, a history of the A.O. Smith Corporation," in *Creative Wisconsin,* Vol. VI, No. 2, edited by Neita O. Friend (Summer 1959), n.p.

As with all the company's innovations, Ray played an instrumental role in determining how A.O. Smith technologies might apply to various industries. The executive, marketing and sales departments in Building 1A were instrumental in breaking into these new industries and collaborating with engineers to address deficiencies in the products available from other manufacturers. The barrel solved a significant problem for the brewing industry's previous barrel-making materials: copper was prohibitively expense by the end of the Great Depression and wood affected the flavor, especially once it was exported to other cities and countries. Once other companies caught up with A.O. Smith at the end of Prohibition, the company had turned out 1.5 million barrels for a 3-million-dollar profit.[37] Having successfully entered and quickly transformed the resurgent brewing industry, Smith introduced new brewing products including glass-lined brewing tanks, producing over 11,000 units between 1933 and 1965.[38]

William Heath thought that the same glass-lined barrel technology that had transformed the brewing industry would solve a significant problem in water-heaters: corrosion of steel tanks. Corroding tanks required frequent replacement and could only be avoided by using stainless steel, which was especially cost-prohibitive for individual homeowners. A.O. Smith's glass-lined model was a dramatic improvement. It was developed in 1936, with a mass-production plant completed on the campus by 1939. World War II interrupted the sales and production of the new water heaters, but the glass-lined water-heaters, and subsequent improvements, became A.O. Smith's first mass consumer product and one of its most significant revenue streams in the latter half of the twentieth century (see Figure P). More is included on this later in this narrative.[39]

Recognizing their financial vulnerability as primarily a manufacturer of piping and automobile frames, A.O. Smith sought to diversify and expand through acquisitions. In 1937, they purchased Smith Meter Co. (based in Los Angeles), which produced measuring devices for petroleum lines, and then Sawyer Electrical Manufacturing Company (Los Angeles) and Whirl-A-Way Motors (Dayton, Ohio), both producers of electric motors. By the end of the 1950s, hermetically sealed electric motors had become the company's best-selling product.

During World War II, the welding technology and A.O. Smith's understanding of the petroleum industry again proved critical. Prior to the war, oil tankers transported oil from the Texas refineries to the northeast U.S.; this supply line was threatened by German U-boat submersibles. Between 1942 and 1944, and ironically despite the objections of the petroleum industry, two emergency war pipelines

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[37] A.O. Smith Corporation, *Remembering an Era*, 11.
[38] Fehring, *The Magnificent Machines of Milwaukee*, 279.
[39] "A.O. Smith Corporation," International Directory of Company Histories, *Encyclopedia.com,* accessed September 8, 2021, https://www.encyclopedia.com/books/politics-and-business-magazines/o-smith-corporation.

were constructed: the Big Inch (1,254 miles) and the Little Big Inch (1,475 miles). It was the longest pipeline project ever attempted in the U.S. (see Figures K, L, and M).[40] The pipelines were constructed using A.O. Smith's pipeline technology with 725,000 tons of materials for the pipeline manufactured into twenty to twenty-four-inch diameter pipe by A.O. Smith in Milwaukee. Earlier pipelines in use at the time maxed out at eight inches.[41]

The U.S. supplied six billion barrels of the seven billion total barrels used by the Allies during the war, a significant and necessary contribution that would not have been possible without the pipeline. Secretary of the Interior Harold L. Ickes called the pipeline one of the country's "most potent weapons of war." Nazi U-boats had become adept at identifying and sinking fuel tankers, sinking as many as twelve tankers a month. Oil companies switched to rail and barge to avoid U-boats, which cut in half the number of barrels that could be transported.[42] Oil was distilled into gasoline for trucks, jeeps, and planes, but also essential for the construction of runways, manufacture of synthetic rubber used in tires and other equipment, and for lubricating guns and machinery. The Big Inch carried petroleum, and the Little Big Inch line carried gasoline, heating oil, diesel oil, and kerosene.[43] The pipelines were sold after the war and still carry natural gas between Texas and the northeast United States. The Big and Little Big Inch supplied by A.O. Smith paved the way for rapid expansion of energy pipelines and made the company a go-to supplier of the required materials.

As in World War I, Smith also dedicated facilities to manufacturing bomb casings (see Figure N). William Knudsen, who oversaw the nation's manufacturing companies in providing materials for the war effort, contracted A.O. Smith to use their welding techniques in constructing ships. Using new technologies contributed by A.O. Smith engineers and scientists, the Allies produced Liberty and Victory ships in only forty-two days per ship, with over 3,200 built during the war.[44] By 1942, one hundred percent of A.O. Smith's facilities were converted from civilian to war production. Smith manufactured about eighty percent of the requirements for bomb casings, specializing in large capacity 500, 1000, and 2000 pound bombs which were tested in Building 65 just south of Building 1A. In 1940, engineers developed a new design for propeller blades that welded several pieces together for a propeller that was light, strong, and perfectly balanced. Other wartime innovations included a steel frame for B29 bomber noses that was twice as strong but two pounds lighter than existing technology, torpedo war flasks, compressed air containers, heavy bomber landing gear, and miscellaneous other

[40] B. A. Wells and K.L. Wells, "Big Inch Pipelines of WWII," American Oil and Gas Historical Society, updated August 2, 2021, https://aoghs.org/petroleum-in-war/oil-pipelines-big-inch/.
[41] Fehring, *The Magnificent Machines of Milwaukee*, 286-287.
[42] W. Bernard Carlson, "Energy pipelines are controversial now, but one of the first big ones helped win World War II," *The Conversation,* July 20, 2021, https://theconversation.com/energy-pipelines-are-controversial-now-but-one-of-the-first-big-ones-helped-win-world-war-ii-161729.
[43] Wells and Wells, "Big Inch Pipelines of WWII."
[44] Fehring, *The Magnificent Machines of Milwaukee*, 287-288.

products. By 1945, the company had built 4.5 million bombs, 16,750 sets of landing gear, and 46,700 propeller blades at their Milwaukee plant, all overseen from Building A1. A.O. Smith's wartime contributions caught the attention of Adolf Hitler, who included the company's Milwaukee production plant (including the subject district) in his unexecuted plans for the invasion of the United States.[45] [46] [47]

After World War II, Smith continued to innovate. They first resumed production and development of water heaters. They used their patented glass-laminated-steel technology (Permaglas) to develop new residential water heaters. Their glass- and zinc-lined tanks, patented in 1936, were ideal for home gas and electric operation, making hot water affordable for greater numbers of homeowners. They were the first company in the world to mass-produce glass-coated water heaters, a technology which transformed the industry and came to represent ninety-five percent of the market by the 1970s. Their infiltration into the residential water heater market was assisted by a line of private-label water heaters sold by Sears, Roebuck, & Co., and the company was producing as many as 48,000 residential water heaters per month by the end of the 1950s.[48] [49]

The Harvestore® silo (Figure O), brought to market in 1949, also made use of the glass-lined steel technology, and was far superior to other silos on the market. The Harvestore improved existing silos by distributing contents at the bottom with the push of a button, ensuring no new air or contaminants would enter through the top and threaten the feed inside, and significantly reducing the type and duration of work required at the top of the silo and subsequent related accidents. Traditional silos had to be filled and unloaded from the top and were notoriously dangerous; workers occasionally fell in and sustained major injuries or died either from sinking and suffocating or from the fall itself. Between 1949 and 2000, more than 70,000 Harvestores were installed on farms throughout North America. The signature dark blue Harvestore silos still dot the rural landscape today. By the 1960s, they were also sold in Germany and the United Kingdom. The Permaglass storage units were similar to the Harvestore but intended for industrial storage of dry goods, such as sawdust, woodchips, and other bulk products.[50] [51]

The automobile frame manufacturing business also fared well in the postwar economic boom. Smith retained the contract to manufacture all of the automobile frames for Chevrolet, which was at the time

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[45] Meg Jones, *World War II Milwaukee* (Charleston, S.C.: The History Press, 2015), 61-72.
[46] Fehring, *The Magnificent Machines of Milwaukee*, 279.
[47] "A.O. Smith Corporation," International Directory of Company Histories, *Encyclopedia.com.*
[48] A.O. Smith Corporation, *Remembering an Era*, 11.
[49] "A.O. Smith Corporation," *Encyclopedia.com*.
[50] Fehring, *The Magnificent Machines of Milwaukee*, 279.
[51] "From the Anvil to the Atom," n.p.

producing the best-selling cars in the United States. A.O. Smith was, as a result, once again the nation's largest independent supplier of automobile frames. In the latter part of the twentieth century, however, automakers expanded their car model offerings and switched to unibody construction. Unibody vehicle construction rapidly became fifty percent of the market and was ill-suited to Smith's frame-making methods, which struggled to adapt. General Motors, which retained the same riveted frame design longer than other manufacturers, was crucial to keeping Smith's frame product lines in business.[52]

The petroleum division also rebounded, leading Smith to a joint venture with ARMCO, a steelmaker in Texas, and later to develop fiberglass pipe and fittings suited to specific oil field uses. Once Smith had produced nearly all of the pipe for the U.S. Transcontinental Pipeline, demand for pipe was significantly reduced and Smith dropped their steel pipe business, selling most of their related assets to ARMCO in the 1960s.[53]

In 1967, L.B. (Ted) Smith became chairman of the company and Urban Kuechle president. The company divested their less profitable lines and expanded their Harvestore and Electrical Products divisions. They also sought increasing diversity and global markets through the acquisition of Layne & Bowler Pump Company (Los Angeles) and Bull Motors (United Kingdom), as well as a majority interest in Armor Elevator, which was at the time the sixth-largest manufacturer of elevators in the U.S. General Motors eventually converted its production and chassis style, eliminating the need for Smith frames. The company continued to produce frames for light trucks, vans, and sport utility vehicles into the 1990s.

A.O. Smith remains headquartered in Milwaukee on the far northwest side. They sold their automotive frame division along with the frame plants, Building 1A, and Research and Engineering Building (Building 65) to Tower Automotive in 1997. Tower Automotive continued to operate at the site into the 2000s. The buildings were acquired by the City of Milwaukee and most of the deteriorated and vacant factory buildings were razed. Today, A.O. Smith primarily specializes in commercial and residential water technology, including water heaters, softeners, and other treatment equipment, with several brands sold around the world.

Research and Engineering Building – Architecture and Engineering Significance

Holabird and Root

Holabird and Root was founded in 1880 as Holabird and Roche in Chicago by William Holabird Sr. and Martin Roche. Holabird passed away in 1923 and was succeeded by his son John, who in 1928

[52] "A.O. Smith Corporation," *Encyclopedia.com*.
[53] "A.O. Smith Corporation," *Encyclopedia.com*.

partnered with John Wellborn Root, Jr. (son of Burnham and Root partner John Wellborn Root). Holabird and Roche belonged to the Chicago School with other icons of architecture history William Le Baron Jenney, Burnham and Root, and Adler and Sullivan. The Chicago School used the void left by the fire of 1871 to experiment with new fireproof skyscraper design, exploring ways of structuring tall buildings as well as expressing new forms of frame structure and the freedom of non-load-bearing exterior walls. The Chicago School pioneered the Chicago window, involving a large center pane flanked by narrower double-hung sashes. The firm's designs tended to be straightforward, imposing towers in the Chicago School tradition until Roche's death in 1927.

When Root became a partner in 1928, the name changed, and the firm's style changed as well. Root was the firm's chief designer while Holabird specialized in engineering, and the partners presided over a staff of about 300 people. Holabird Jr. and Root had studied together at Ecole des Beaux Arts in Paris. Despite this training they decided that new buildings should look for a more modern aesthetic rather than adapting the motifs of earlier forms and extruding them upward. Their style became more streamlined and distinctly vertical while continuing to appreciate the structural advantages and aesthetics permitted by frame construction. The pair acknowledged that Eliel Saarinen's second place Chicago Tribune Tower competition entry had greatly influenced this thinking. Early examples of this transitional philosophy are 333 Michigan Avenue (1928), the Palmolive Building (1929), the Chicago Daily News Building (1929, winner of the Architectural League of New York gold medal in 1930), and the Chicago Board of Trade (1930), all located in Chicago. Their aesthetics were also influenced by changes in Chicago's building code requiring setbacks resulting in tiered designs. Holabird was also instrumental in bringing Mies van der Rohe to the Armour Institute (Illinois Institute of Technology); in a few years, Mies van der Rohe and his Bauhaus colleagues would usher in an even more structurally expressive skyscraper in Chicago with his "less is more" philosophy.[54]

On their interiors, Holabird and Root played with Art Deco eclecticism, using walnut, marble, glass, nickel, murals, sculpture, exotic motifs, and polychromatic schemes. One of their most expressive interiors was Diana Court in Chicago's Michigan Square Building (1930, demolished 1974). The Diana Court interior featured swirling terrazzo patterns, streamlined columns and pilasters, and a figure of the Roman goddess Diana atop an art deco fountain. For Holabird and Root, the interiors were considered comprehensive parts of the design. The firm employed in-house sculpture and interior design departments and collaborated with artists such as Carl Milles and John Norton to bring their

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54 Andrea Foggle Plotkin, "Holabird, William and John Wellborn Root," in *Encyclopeida of 20th Century Architecture*, edited by R. Stephen Sennott (New York: Fitzroy Dearborn, 2004), 630.

visions to life.[55] Holabird and Root firmly believed that all spaces should be first class spaces, since a second-class space cost nearly as much to build.[56]

In addition to skyscrapers, they built theaters, state capitol buildings, courthouses, railroad cars, hotels, public and private housing, exhibition buildings for the 1933-34 Century of Progress Exposition in Chicago, and research and laboratory buildings. Their work in the period around and following World War II is characterized by an emphasis on engineering innovation. A.O. Smith represents a transition between these two periods – the art deco tower complete with careful, comprehensive detailing and the engineering ingenuity represented in its ground-breaking aluminum and glass façade and free-span interiors. Regardless of style, the firm remained rooted in progressivism, adaptability, sound design principles, and engineering and construction competency.

Holabird and Root are considered master architects on a national scale. John Root won the AIA Gold medal in 1958, a recognition of a lifetime of architectural achievement.[57] Their greatest works were in the Midwest, but their style resonated around the country. Their contemporaries began to compare them to Louis Sullivan and Frank Lloyd Wright for the influence their vertically accentuated, carefully detailed art deco towers were having on national trends.[58] While they were great innovators seeking a modern vocabulary, they also hoped to establish a style with long-lasting universality. They sought to invoke the same architectural depth, rigor, and range of applications that had carried the styles of the past.[59] Their principles are on display at Building 65, from the innovative, folded exterior treatments to the highly decorative terrazzo and aluminum lobby.

The Research and Engineering Building as a Collaboration of Architecture and Engineering
(See Figures J through T)
Holabird and Root are rightfully given credit for the Research and Engineering Building's design, but A.O. Smith engineers collaborated directly with the architects, employing the company tradition of mock-ups, testing, and prefabrication to all aspects of the building's structural and mechanical systems. The A.O. Smith engineers were so intertwined in the process of design and construction, the building simply would not exist in its present form without their involvement.

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55 Plotkin, "Holabird, William and John Wellborn Root," 630.

56 Huxtable, *On Architecture*, 325.

57 *The AIA Historical Directory of American Architects*, s.v. "Root, John Wellborn," (ahd1038101), accessed January 18, 2018, http://public.aia.org/sites/hdoaa/wiki/Wiki%20Pages/1956%20American%20Architects%20Directory.aspx.

58 Plotkin, "Holabird, William and John Wellborn Root," 630.

59 William J.R. Curtis, *Modern Architecture Since 1900*, 3rd edition (New York City: Phaidon Press Inc., 1996), 31.

The design intent was to consolidate all research and experimental labs with the vast engineering staff under one roof, which required a new facility purpose-built for what were at times divergent and unforeseeable uses. As previously mentioned, Smith's earlier inventions had given the company great confidence in their engineering and research staff, and they wanted to provide the most up-to-date and flexible facilities for engineers to continue their innovative work. The program was to provide two floors for electrical and mechanical research at the base and two floors for chemical laboratories at the top. The attic and basement would provide tertiary space for the mechanical equipment to serve these testing and research spaces. In between, with easy access up or down depending on tasks, would be three floors of engineering and design. The only permanent partitions were to be in service areas in the building, including mechanical spaces, stairs, elevators, restrooms, and locker rooms. The design directive stated that all other partitions should be moveable.[60]

The building program produced a number of challenges. Natural light was critical, but the delicate instruments and machinery that were being utilized or tested could not be affected by changing temperatures and light quality. Flexibility of plan was also critical, demanding a free-span space that could be subdivided into offices or converted to an open lab by reconfiguring partitions like pieces of a stage set (Figure 65). Mechanical systems must carefully regulate interior temperatures to facilitate testing, while at the same time segregating chemical labs and other potentially hazardous spaces. Ideally, mechanical needs could be reconfigured without costly and time-intensive remodeling projects.

The solution to many of these issues was to integrate the structural and mechanical designs such that hollow columns and girders (doubling as wide chases) could provide infinite flexibility of plan as well as make running of new piping and conduit for evolving lab technology a simple and unobtrusive task (see Figure T). Hollow steel wall columns approximately three feet square were open from the basement to the attic, with six inches around the perimeter for pipe, conduit and exhaust ducts with a two-foot square in the center used as a ventilating duct and "manway" for inspection, alterations, and repairs. Hollow truss girders, utilizing much the same spatial divisions as the columns, supported the "battledeck" floor system, which is a precursor to many of the raised floor or dropped ceiling systems of today. Beams stretched between the girders and supported a welded plate subfloor. Both beams and plates were standardized sizes which could be prefabricated. All welding of the battledeck was done by A.O. Smith welders using their Smithwelding process. The large void resulting from the hollow girders (fully concealed by suspended plaster ceilings) created an infinitely flexible mechanical space that could be used to run piping to any point on the floor plan as laboratory needs changed. It was

60 A.O. Smith Corporation, "Research and Engineering Building of the A.O. Smith Corporation," 3.

sufficient size and with sufficient access to the column manways that an installer could complete the changes from within the ceiling to avoid cutting new access holes.[61]

The craneway exhibit space on the first floor, which was also designed to be used for experiments, featured a Smithsteel Floor Armoring system, a terrazzo surface reinforced with a two-inch grid of steel rings able to withstand the most significant live loads. These slabs were poured in sections and removable by the crane in the space, which allowed access for installing large equipment in the basement as well as room for displaying or testing anything taller than the two-story space would typically allow.[62]

The shallow V-shape curtainwall bays were based on a principle of refraction: two plates of glass occurring at different angles refract light differently than flat surfaces, thus diffusing the light to the interior more effectively. Glass was set in special cork and aluminum strips which were devised by Smith's engineers. The team estimated that faceted metal and glass curtainwall would provide up to thirty percent more daylighting than windows set into masonry. The curtainwall design criteria mandated that it must be simple enough that its parts could be subdivided to meet die requirements, and it must be interlocking to facilitate erection, weatherproofing, and expansion separation. Engineers executed several tests, including one with sheet iron, before selecting aluminum for its ability to be molded to meet the unique shape of the bays. Prior to fabrication, full-size models were erected to resolve joinery, welding, expansion, assembly, and erection. Like most Smith technologies, testing also established a process for assembly. A custom swing stage hung from the roof would allow for quick installation and later provide access for easy cleaning and maintenance (Figure L). The stage avoided the exorbitant cost of scaffolding the V-shape façade components. A custom vacuum cup frame was developed to facilitate the setting of large glazing sheets and retained to repair broken panes in the future.[63]

Smith engineers also collaborated with Holabird and Root to solve challenges of heat gain and ventilation which were critical to retaining a stable interior atmosphere for experiments. All windows were to be fixed so that total control of interior temperature and humidity could be attained. Air conditioning, not yet commonplace in mechanical design, was installed throughout. A model office was built representing a full structural bay in width and continuing eighteen feet in from the exterior windows to test ways of regulating interior temperatures based on exterior conditions. Engineers installed windows built of sheet iron and equipped with piping to spray hot water to simulate summer

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61 A.O. Smith Corporation, "Research and Engineering Building of the A.O. Smith Corporation," Bulletin No. 217-A, November 1936, with excerpt reprinted from *The Architectural Forum,vol. LV, no. 5*, 3-5.
62 A.O. Smith Corporation, "Research and Engineering Building of the A.O. Smith Corporation," 7.
63 A.O. Smith Corporation, "Research and Engineering Building of the A.O. Smith Corporation," 27-31.

and used large bins of cracked ice and salt to simulate winter. Several air circulation options were tested, resulting in different approaches to the HVAC design on each of the three curtainwalled elevations (north, south, and east) corresponding to their exposure and anticipated solar gain.

The model office experiments demonstrate how much attention A.O. Smith gave to the design and functionality of the building and how critical they felt the provision of proper research and engineering facilities was to the success of the company. This attention was typical in every aspect of the design. Engineers were even given the opportunity to test light fixtures, rating them according to glare, eye strain, ease of cleaning and relamping, risk of breakage, dust collection, and appropriateness to architectural treatment. Each piece of the building was carefully designed, tested, and detailed through a collaboration between client and architect that was unusual if not unprecedented at the time and remains unusual into the modern era.[64]

International and Art Deco Architectural Styles

The Research and A.O. Smith Building is most closely associated with the International Style. The International Style was defined in 1932 by the first ever architectural exhibition at the Museum of Modern Art in New York City. The show, titled simply "Modern Architecture" and organized by Alfred Barr, Henry-Russell Hitchcock, and Philip Johnson, used the term International Style to describe the new types of modern architecture on display, putting a name to architectural concepts that designers had been experimenting with in fifteen countries around the world (hence "International"). In the exposition catalog, Johnson and Hitchcock identified three key elements of the new style: first, an emphasis on volume rather than mass, second, designs ordered or regularity rather than axial symmetry, and third, avoidance of applied surface decoration. They also identified a dependence on the qualities of materials, technical perfection, and proportion as elements of the style.[65] Concrete, glass, and steel are the most common materials, with ribbon or corner windows expressing bands of horizontality. While the two styles are related, International Style is distinguished from Art Deco by a rejection of unnecessary ornament or decoration and an emphasis on horizontality rather than verticality.[66]

The New York exhibition identified many parallel trends in modern architecture of the era, but many of the most interesting and forward-thinking designs were occurring far from the East Coast opinion-makers. Frederick Keck, a Wisconsin-born Chicago-based architect, designed several International Style houses in Wisconsin. He maintained an interest in abstractionist painting and held an architectural engineering degree, which may have freed him from the traditional Neoclassical

64 A.O. Smith Corporation, "Research and Engineering Building of the A.O. Smith Corporation," 8-13.

65 Curtis, *Modern Architecture Since 1900,* 239.

66 John C. Poppeliers and S. Allen Chambers Jr., *What Style is It?: A Guide to American Architecture* (Hoboken, NJ: John Wiley & Sons, Inc., 2003), 127-128.

influences absorbed by his peers.[67] Rudolph Schindler, an Austrian who managed to leave Frank Lloyd Wright's tutelage with his own stylistic tendencies intact, experimented with concrete construction in California and the southwest. Richard Neutra, who left Wright shortly after Schindler and followed him to L.A., went on to execute several modern homes with multifunctional plans and open living spaces that were unique at the time and remain fine examples of early modernist homes.[68] Other architects to practice in the style in the early days include Raymond Hood and George Howe. Howe, in partnership with William Lescaze, designed one of the most important examples of the style applied to a taller structure, the Philadelphia Savings Fund Society (PSFS) Building (1932).[69] Other than isolated practitioners, the International Style was little-implemented in the United States until Mies van der Rohe, Walter Gropius, and Marcel Breuer arrived in America at the end of the 1930s.[70]

Regionally, the 1933 Century of Progress Exhibition in Chicago, which displayed technical innovations and modern stylistic forms and attracted architects from throughout the Midwest, did the most to further the International Style. Frederick Keck executed several buildings for exhibition in Chicago, including the House of Tomorrow. The A.O. Smith Building is one of the earliest examples of the style in Milwaukee. Another early example in Milwaukee is a house designed by Henry Phillip Plunkett, built on 55th Street in 1933. This metal-clad cubic form is broken by a stream-lined stair tower. In Wisconsin, one of the best examples of the International Style is a project by the Kecks. Their Edward Morehouse House in Madison (1937) features a basic white cube-like form, a flat roof, the sense of planes enclosing a volumetric space, and the absence of surface decoration. The Research and Engineering Building is one of very few large, commercial International Style buildings from the 1930s in Wisconsin. The International Style was most frequently used on small scale residential projects.[71]

The Research and Engineering Building also has some Art Deco elements and a thoroughly Art Deco lobby. Unlike the revival styles that were popular in the early twentieth century, almost to the point of exclusivity, Art Deco heavily stylized historical motifs or chose futuristic imagery instead. It was the first of the modern styles to take hold in the United States. Art Deco became wildly popular in select areas, such as Miami Beach, New York City, and Los Angeles. It was also popular among decorative artists and industrial designers.

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67 Wyatt, ed. *Cultural Resource Management in Wisconsin* (Madison, WI: State Historical Society of Wisconsin, 1986), Section 2-35.

68 Curtis, *Modern Architecture Since 1900, 232*-239.

69 Poppeliers and Chambers, *What Style is It?*, 130.

70 Curtis, *Modern Architecture Since 1900, 232*-239.

71 Wyatt, ed. *Cultural Resource Management in Wisconsin*, Section 2-35.

The term derives from the Exposition des Arts Decoratifs held in Paris in 1925. Promotional materials from the exhibition stated that "reproductions, imitations, and counterfeits of ancient styles will be strictly prohibited.[72] Instead, the style celebrates the possibilities of technology and industrialization, incorporating metal, hard machine edges, and an emphasis on verticality. Ornament includes low-relief geometry and fluted columns, stylized sculptures of modern inventions (trains, cars, appliances, etc.), sunbursts, chevrons, and polychromy (muted or otherwise). Ornament is often created using metal rather than traditional masonry materials, further emphasizing the futuristic ideal. Granite or terra cotta were also popular materials. In Wisconsin, the best examples of Art Deco other than the A.O. Smith lobby are the Wisconsin Gas Company Office Building in Milwaukee (1930, Eschweiler and Eschweiler) and the Wisconsin State Office Building at 1 West Wilson in Madison. The style is often associated with skyscrapers of the 1930s and '40s due to its emphasis on verticality and famous examples such as the Empire State Building, the Chrysler Building, and Rockefeller Center. Several smaller commercial buildings also used the style throughout the U.S.[73]

As an early example of International Style, the Research and Engineering Building represents a transition between that style and the earlier Art Deco influences of the architect. It utilizes the verticality, chevron elements (curtainwall in plan), interior, symmetricity, and small amounts of embellishment (at the cornice) from Art Deco; it's clarity of volume, purity of materials, flat roof, glass corners, and experimentation with curtainwall demonstrate its allegiance to International Style. It is not a dogmatic interpretation of either style (if such a thing were even possible at that early stage) but derives inspiration from the work of European modernists.[74]

Comparative Analysis
Architectural and Engineering Innovation – Curtainwalls and Aluminum Components
The Research and Engineering Building demonstrated several architectural innovations. It was the first true glass and aluminum curtainwall in the United States, and the first to clad entire sections in pressed, cast, and extruded aluminum.

Aluminum as a material was discovered through a series of experiments beginning in approximately 1825. Several scientists around the world worked to produce purer and more versatile forms of aluminum, culminating in the work of Charles Martin Hall and Paul T. Heroult, working independently but simultaneously in 1886. The Hall-Heroult process uses electrolytic means to produce metallic aluminum at sufficient quantities for a reasonable enough price to be worth exploring new uses. The Pittsburgh Reduction Company, later renamed the Aluminum Company of America

72 Poppeliers and Chambers, *What Style is It?,* 122.
73 Wyatt, ed. *Cultural Resource Management in Wisconsin*, Section 2-33.
74 Randy Garber, ed., *Built in Milwaukee: An Architectural View of the City* (Milwaukee: University of Wisconsin Press, 1984), 92.

(Alcoa) formed in 1888 and began to produce aluminum using the Hall-Heroult process, a method still in use today. Aluminum was first used in cast and wrought forms. The first industry to latch onto aluminum was aviation, where its weight-to-strength ratio was an instant improvement over existing materials. The hydraulic extrusion press first made extruded shapes widely available in 1900, gaining popularity into the 1920s. Anodization was developed in the early 1920s but did not become a common finish technique for aluminum until after World War II.[75]

The earliest buildings to use cast aluminum were all located in Chicago: the Venetian (1892, Holabird and Roche), Isabella (1892, Jenny and Mundie), and Monadnock (1893, Burnham and Root). All of these buildings used aluminum for interior applications such as elevator metalwork, stairs, and railings. Other early uses included the German Evangelical Church in Pittsburgh (1927), which featured a cast aluminum spire bolted to a steel frame that was reminiscent of the cast iron church spires of Europe. Cast and pressed-sheet aluminum were also notably used at the Cathedral of Learning in Pittsburgh (1925, Day and Klauder) and the Chrysler Building (1930, William Van Alen) and Empire State building (1931, Shreve, Lamb and Harmon) in New York City. In these examples, aluminum was affixed to masonry backup with concealed strap anchors and hooks using similar construction techniques as that used for face brick and veneer stone. The A.O. Smith Building was the first in the United States to push the unique properties of aluminum as a lightweight material that could be easily fabricated and erected.[76]

Curtainwall technology was first employed in an isolated way at large stained-glass windows in later Gothic-period cathedrals. Curtainwalls were not widely used in architecture until the development of metal-framed and reinforced concrete structures in approximately 1880. The necessity of increasing heights and decreasing construction times as cities grew denser made the curtainwall an ideal solution. The first examples of curtainwall mounted on frame construction consisted of columns/pilasters clad in stone, terra cotta, or brick with large windows set in the open bays.[77]

The earliest example of a true curtainwall (one continuing past the structure without interruption) was the Packard Motor Car Forge Shop in Detroit (1905, Albert Kahn), which used a curtain of glass in steel frames. Kahn used the same technology at the Brown-Lipe-Chapin gear factory (1908) and the T-model Ford assembly plant (1909), both in Michigan. The factory curtainwall, which provided more natural light to interior work spaces, drew the attention of European architects, especially those working in the Bauhaus tradition in Germany. Peter Behrens used curtainwall at the A.E.G. Turbine

75 Thomas C. Jester, Ed., *Twentieth-Century Building Materials, History and Conversation* (Los Angeles: Getty Conservation Institute, 2014), 14-15.
76 Jester, Ed., *Twentieth Century Building Materials*, 14-15.
77 Donald Langmead and Christine Garnaut. *Encyclopedia of Architectural Engineering Feats* (Santa Barbara, California: ABC-CLIO, Inc., 2001), 86.

Factory (1910) and Walter Gropius and Adolf Meyer used it at the Fagus Works in Alfred-an-der-Leine (1911). The first office block to use curtainwall in the United States was the eight-story Hallidie Building in San Francisco (1918, Willis Jefferson Polk).

The possibilities of the curtainwall were known, but no one had successfully employed a full curtainwall (all previous examples were single facades) until the A.O Smith Research and Engineering Building. Mies van der Rohe, Le Corbusier, and others in Europe had designed utopian curtainwalled towers in the 1920s, but these designs were not yet realized. The Research and Engineering Building was the only building to feature a full multi-story, multi-sided true curtainwall for nearly a decade. It would take post-World War II technology to make tall curtainwall buildings achievable on a large scale thanks to war-time advances in the extrusion, anodization, and availability of aluminum, improvements in synthetic rubber sealants, and more efficient sheet glass manufacture. The A.O. Smith building had an unusual advantage in a surrounding campus with thousands of square-feet of prefabrication and assembly expertise and equipment. The type of prefabrication methods used at A.O. Smith were not made widely available to the building industry until after World War II.[78]

The surplus of aluminum that had been stockpiled for World War II spurred the use of aluminum in towers and skyscrapers, with the earliest post-war aluminum curtainwalls constructed for the Equitable Building in Portland (1948, Pietro Bulleschi) and the Alcoa Building in Pittsburgh (1953, Harrison and Abramovitz). Aluminum did not become a standard material for glass and metal curtainwalls until the 1950s, twenty years after the A.O. Smith building was constructed.[79] Like so many of the products designed within the buildings at the A.O. Smith campus, the Smith engineers were well ahead of their contemporaries in pushing the boundaries of what metal could do.

Properties Related to the A.O. Smith Corporation
The proposed district includes most significant extant properties associated with the A.O. Smith Corporation's history. Another building closely associated with L.R. Smith's legacy is Sopre Mare, the home of L.R. Smith, his wife Agnes, and their children. Agnes commissioned architect David Adler to design their home in the style of an Italian Renaissance villa, completed in 1923 and listed in the National Register in 1974 (NRHP reference no. 74000107). The Smiths hosted lavish parties and family celebrations at the villa, including parties for other A.O. Smith executives. Ray Smith died at the family home in 1944. Agnes donated Sopre Mare to Milwaukee County in 1966 for use as a decorative arts museum to celebrate her love of design. It remains in operation today as the Villa Terrace museum.[80]

78 Langmead and Garnaut. *Encyclopedia of Architectural Engineering Feats*, 87.

79 Jester, Ed., *Twentieth Century Building Materials*, 15.

80 "Lloyd & Agnes Smith," *Villa Terrace Decorative Arts Museum*, accessed March 29, 2021, https://www.villaterrace.org/our_story/the_smiths/.

Most of the A.O. Smith factory in Milwaukee has been razed. A cluster of factory buildings at the southwest corner of the campus is also intact, and the exteriors retain good integrity. This cluster includes Buildings 101, 104, and 106, dating to the late 1920s and early 1930s. These buildings are significantly removed from the rest of the extant buildings, primarily focused with pipe-making and bomb-casing manufacturing, and removed from the administrative and engineering activity on the east end of the campus. A large area of brownfield separates the groups of buildings.

Properties in the 30th Street Industrial Corridor:
Several of the earliest industrial concerns in the 30th Street Industrial Corridor are still doing business at their historical locations. Harley Davidson continues their operations at 3700 West Juneau Avenue, and their historic plant is individually listed on the National Register (86003850). Master Lock Co. still retains a distribution center at 2600 North 32nd Street, but has relocated their headquarters to Oak Creek, Wisconsin.

The A.D. Meiselbach Company was acquired by the American Bicycle Company in 1899 and eventually ceased production at 5070 North 35th Street. It's North and South Plants are significant to Milwaukee's bicycle manufacturing activities and were determined potentially eligible for the National Register in the 2016 Milwaukee Industrial Properties Intensive Survey. These buildings are extant and in good condition, although modified on the exterior with infilled windows and entry canopies. Several additions have been removed.

Briggs and Stratton's west plant at 2748 North 32nd Street, designed by Milwaukee architect Alexander C. Eschweiler, was the site of gasoline-powered small engine manufacturing. Briggs and Stratton purchased it from the Westinghouse Lamp Company, who purchased it from the Romadka Brothers Company, manufacturers of trunks and luggage. The plant, which is now a National Register-listed historic district (100005095), is a collection of industrial buildings which were purchased, connected, modified, and added to.

A.O. Smith has similar integrity to these other listed and eligible properties, and had a similar or greater impact on Milwaukee's industrial development.

Properties Related to Automobile Manufacturing:
A number of Wisconsin companies impacted the development of the automobile industry. In Kenosha, the Rambler plant produced Nash automobiles, which, along with plants in Racine and Milwaukee, became one of the largest producers of trucks in the U.S. Racine's largest employer was the Mitchell-Lewis Motor Company (bought by Nash Motor Company in 1925). Clintonville's William Beserdich and Otto Zachow invented the four-wheel drive in 1906 and founded the Four Wheel Drive Company,

which produced trucks during World War I. General Motors bought the Samson Tractor Company plant in Janesville and produced Chevrolet cars starting in 1923.[81]

In Milwaukee, several established wagon manufacturers began producing automobiles, including the Herman Barkow Company (listed in the Historic Third Ward National Register District, 84003724), the Milwaukee Spoke and Bending Company (Wisconsin Architecture and History Inventory (AHI) No. 99995, extant, significant loss of integrity), and the Gustav Raetz Carriage Factory (Walker's Point Historic District, National Register no. 78000120). Ford Motor Company built a plant on Milwaukee's East Side at 1925 East Kenilworth Place (AHI 107185, extant, extensively remodeled in the 2000s) and Lafayette Motors Company built a plant in Bay View (AHI 232587, considered potentially eligible for the National Register pending further research).[82] Johnson Service Company manufactured custom automobiles between 1902 and the 1910s at their 507 East Michigan Street plant, including several custom-manufactured for the Milwaukee Fire Department and the first motor vehicles used for widespread delivery of U.S. mail.[83]

A.O. Smith was one of several automobile parts manufacturers in Milwaukee. Seaman Body was one of the most significant parts manufacturers other than Smith; the Seaman plant, which manufactured vehicle bodies for Nash Motors among others, is no longer extant. Seaman was among one of the city's largest employers. Both Seaman and Smith employed approximately 5,000 personnel each.

Of these auto and auto-parts manufacturers, A.O. Smith was the largest and had the greatest impact, with only Seaman Body operating a plant of comparable size. A.O. Smith is the largest company related to the manufacture of automobiles with extant buildings in the city and by far the most significant player in Milwaukee's contribution to the automotive industry.

Significant Research and Development Properties

A number of prestigious research and development laboratories were constructed at private companies and public institutions in the first half of the twentieth century. From 1900 until the 1940s and 50s when changes to university funding affected how American businesses sponsored innovative research, several significant corporate labs rose to prominence. One academic lab that signaled the shift away from corporate-sponsored research was Building 20 on the MIT campus in Cambridge, Massachusetts. Building 20 was the home of Radiation Laboratory, or "Rad Lab," made crucial developments in microwave and electronic technology during and after World War II. The building was intended to be

[81] "Automobile Culture, Wisconsin and the Invention of the Car" (historical essay), *Wisconsin Historical Society*, accessed September 8, 2021, https://www.wisconsinhistory.org/Records/Article/CS424.
[82] Mead & Hunt, "Milwaukee Industrial Properties Intensive Survey."
[83] "This Month in History: Johnson Postal Trucks," https://www.johnsoncontrols.com/insights/2021/history/this-month-in-history-february-2021

temporary but continued to serve as a development incubator until it was razed in 1998.[84] Changes in corporate stock structures and patent law in the latter half of the twentieth century have further impacted the corporate laboratory and development system and the buildings that housed them. Corporate research labs are beginning to see a resurgence in tech companies like Alphabet, Microsoft, and HP, but with dramatically different facilities from the industrial laboratories like A.O. Smith Building 65. As a result, an intact early twentieth-century research lab is a rare find, one that has often been remodeled, repurposed, or razed.

After Alexander Graham Bell invented the telephone, he took his earnings and founded a laboratory to continue his research into the analysis, recording, and transmission of sound. His laboratory Volta Bureau at 1537 35th Street NW in Washington, D.C. is a National Historic Landmark (NRHP #72001436). Later, Bell Telephone Laboratories would develop out of a shared partnership between Western Electric, which purchased and produced Bell's telephone system, and AT&T. Though it evolved into a separate research laboratory, it was founded as a division of Western Electric's engineering department at 463 West Street in New York City. For a time, Bell Labs was the largest industrial research center in the country. The company eventually relocated, but the original thirteen-building complex is listed on the National Register and designated a National Historic Landmark (NRHP #75001202). It has been converted to an artists' community. This building retains good integrity and is the home of several notable inventions and is similar in its connection to a manufacturing facility where potential new products could be fabricated and tested. It predates the A.O. Smith campus by a decade and the Research and Engineering building by forty years. It also predates the ethos of a glossy, purpose-built, cutting-edge research and development facility, an important distinction that places the A.O. Smith Research and Engineering building in a specific period of industrial development.

Established in 1900 by Thomas Edison, Willis R. Whitney, and Charles Steinmetz in Schenectady, New York, the General Electric Research Laboratory (NHRP #75001227) is widely credited with starting the trend of corporate-driven industrial research and development. Similar to Ray Smith, the General Electric leadership felt that research would not only improve existing applications of the company's products, but might find or create new applications and markets thus paying for experimentation that did not always have a clear product or use in mind.

Founded in 1903, DuPont's Experimental Station in Wilminton, Deleware, was another early corporate research laboratory, eventually expanding to a 150-acre campus and the location of notable materials and products including neoprene, nylon, Tyvek, Kevlar, and Corian. As an active research and development facility, the campus has been continuously modified and upgraded. Its most notable

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[84] Philip J. Hilts, "Last Rites for a 'Plywood Palace' That Was a Rock of Science," *New York Times*, March 31, 1998.

achievement is a commercially viable incandescent light bulb that resulted in GE holding nearly all o the market share for decades.

Albert Kahn designed Ford Motor Company's engineering laboratory in Deerborn, Michigan, constructed in 1930. Ford's Engineering Laboratory features a blend of Neoclassical and Art Deco motifs, but Kahn and Ford were not concerned with pioneering new building technologies alongside the stylistic expression. The facility also differs from the A.O. Smith Building 65 in that it originally had several purposes, including a newspaper office, dance studio, and accounting department. It remains in use by the Ford Motor Company as an engineering office and archive.

While the Research and Engineering Building lacks the scale and longevity of some of these examples, it represents a perfect merger of a company's business model, engineering expertise, and architectural innovation. It is an example of synergy between client and architect, between engineering and architecture, between systems and program, and between present and future, make it a significant example of architecture, invention, and engineering on a national scale.

Buildings Associated with Assembly Line Advancements
The first stationary assembly line was developed by Ransom E. Olds for the Olds Motor Works. Oldsmobile Model R "Curved Dash" cars stood in one place while workers moved from car to car performing a single task or sequence of tasks. The Olds Motor Vehicle Co.'s Lansing, Michigan, plant was demolished by General Motors in 2005.

Henry Ford, possibly inspired by Olds, developed the first moving assembly line at his Highland Park, Michigan, plant to produce the Ford Model T. Ford's plant used a conveyor system to move the cars from one assembly worker to another, allowing them to keep stationary workstations dedicated to specific tasks. The plant was designed by Albert Kahn and is listed on the National Register (NRHP #73000961). Unlike A.O. Smith Building 36, it is predominantly an industrial loft building type, whereas Building 36 has most of its processes concentrated in the large open industrial shed space.

A.O. Smith's automatic frame assembly plant was a dramatic shift from these approaches, which were still predominantly done by the hands of hundreds of line workers. Smith instead employed hundreds of engineers and tasked them with designing machines that could execute each individual task in rapid succession. In this way, the entire process could be overseen by a handful of workers who, instead of doing the actual assembly tasks, would simply supervise and shut down the line if anything got out of sync. Smith went from making 3,000 frames a day with 2,000 operators on its manual assembly line to making 10,000 frames a day with 200 operators. By 1920, it took about an hour and a half to build a Ford Model T on the assembly line. It took eight seconds to make a Smith automotive frame. It was such a dramatic step forward that manufacturing engineers came from around the world to see it for themselves.[85]

Not until robotics and computer-controlled equipment developments in the 1960s and 70s did another innovation so dramatically change the product assembly process. The first industrial robot, Unimate, was used for assembly line production was at the Inland Fisher Guide Plant, a General Motors plant in West Trenton, New Jersey. This plant has been demolished.

Conclusion

Ray Smith's unorthodox approach of jumping from industry to industry could have made the company a jack-of-all-trades and master-of-none. Instead, it allowed Smith to take one breakthrough and use it transform new industries. As Francis Walton remarked in *Miracle of World War II, How American Industry Made Victory Possible,* A.O. Smith's success in diversifying is due to its ability to "master its basic trade… the working of metal," and that the shape or use of the product to be created posed little hindrance thanks to this mastery of material.[86] The talent of the engineers and scientists, the commitment by company leadership to research and development, and prioritization of research and testing to adapt existing expertise to new products and industries, allowed A.O. Smith to continually reinvent itself while making significant contributions to industry and engineering. The company not only weathered some of the great challenges of the beginning of the twentieth century, it flourished.

A.O. Smith developed industry-creating and industry-transforming products for decades, all overseen initially from Building 1A and later from Building 65. The company not only invented products, they used testing and research to develop a start-to-finish process for fabrication that allowed them to outmatch their competitors in cost, efficiency, and capacity. They envisioned a new method of automated manufacturing that inspired subsequent manufacturing processes to reduce labor costs and improve output. A.O. Smith's commitment to research and willingness to pursue new technology without an apparent market allowed them to jump ahead of their contemporaries and make significant contributions to industry and engineering, as well as become a significant contributor the U.S. effort in both World Wars.

For the majority of the time that A.O. Smith has been in business, the A.O. Smith Corporation Headquarters Historic District at the 30th Street Industrial Corridor campus was the major decision-making and administrative home of the company, as well as the longtime hub of its automotive business from sales and engineering to its most significant achievement, the automatic frame plant. Within the walls of the district's buildings, company executives made the ultimate decisions about

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85 Austin Weber, "Then & Now: The Mechanical Marvel," *Assembly*, February 1, 2002, https://www.assemblymag.com/articles/82986-then-now-the-mechanical-marvel.

86 Fehring, *The Magnificent Machines of Milwaukee*, 279.

which technologies to pursue and which industries those technologies might be relevant to. They coalesced findings in research, engineering, and feedback from customers and industry experts to make A.O. Smith a leading inventor and producer of transformative products in several industries, including automobile frames, welded pipe, steel barrels, water heaters, farming storage equipment, bomb casings, and many other products. They developed industry-creating and industry-transforming products for decades and understood that one of their greatest products was engineering. They not only invented products, they used testing and research to develop a start-to-finish process for fabrication to outmatch their competitors in cost, efficiency, and capacity. They challenged one another to perfect and streamline the manufacturing process, and developed, tested, and operated a ground-breaking system for doing so.

Statement of Archaeological Potential
The area where the City of Milwaukee is now located has long been the home of American Indian populations. A documented seasonal trading post for indigenous populations was located in the immediate area. A camp was identified in the C. E. Brown Atlas at the northwest corner of the A.O. Smith campus, which is several acres from the proposed district's location at the southeast corner of the campus. Testing in 2021 only identified heavy disturbance at this location. The Brown Atlas may have inaccurately located the camp, or remnants may have been obliterated by subsequent industrial development. Despite significant subsequent development, pre-contact and early settlement archeological deposits undoubtably remain. Most of the site has not been excavated beyond that required for footings. Further exploration of archaeological potential was outside the scope of this nomination and remains unassessed.

Preservation Activity
Most district buildings remained in continuous use until 2006 when they were last vacated. As mentioned in the narrative, Building 1, Building 65A, and Building 38 which once connected to the subject buildings, as well as many of the infill structures and neighboring buildings, have been razed. Only essential life and safety repairs have been executed since 2006, resulting in hastening deterioration. Building 36 remains in use as an manufacturing facility. No preservation efforts have been undertaken at any of the other remaining A.O. Smith buildings outside the proposed district, though a few remain in use for manufacturing and warehouse space. For the last several years, the University of Milwaukee's Historic Preservation Institute has listed the campus as one of Milwaukee's most endangered industrial properties due to neglect and demolition. Initial planning is underway for a rehabilitation effort as part of the Rehabilitation Tax Credit program, which will be instrumental for saving the buildings due to their present levels of deterioration.

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Additional UTM References

5	16T	422605	4770275
	Zone	Easting	Northing
6	16T	422888	4770272
	Zone	Easting	Northing

Verbal Boundary Description:
Beginning at the west edge of the sidewalk where it turns at the intersection of North 27th Street and West Hopkins Street, the boundary continues south along the sidewalk edge for 733 feet to the sidewalk at the intersection of North 27th Street and West Townsend Street. It turns west and continues along the sidewalk edge and fence line for 891feet 351 feet until the edge of the paved area approximately encompassing the footprint of Building 38 (razed). It then turns north and continues 412 feet before turning east for 548 feet, following the edge of the paved drive. This is also colinear with the north edge of the parcel. The boundary turns north at the edge of the paved area behind Building 65 and the former east edge of Building 65A (razed). It turns and continues north for five hundred along the paved drive to a paved parking area before turning east along the parking area for 149 feet to the neighboring parcel boundary, about 55 feet off of West Hopkins Street. The boundary turns approximately 45 degrees and continues southeast for 124 feet to the corner of the neighboring parcel before turning 90 degrees and continuing 54 feet back to the sidewalk edge along W. Hopkins Street. It turns a final time, running along the sidewalk edge for 119 feet back to the point of origin.

Boundary Justification:
The original A.O. Smith property has been subdivided, resulting in many individually owned parcels, most of which are entirely or predominantly vacant land. Rather than encompass this entire area, which lacks integrity, the boundary encompasses the buildings and lawns outlined by the remaining paved drives. This preserves some sense of the space between buildings, which were typically built up to the paved edges, and makes a clear division point in what is otherwise mostly open fields. It also preserves the access points and auxiliary yard space associated with the extant buildings. At the north end of the district, the boundary is colinear with the parcel line. Since this boundary crosses the former land occupied by Building 1, there are no clear delineating features other than the narrow drive.

RESOURCE: A.O. Smith Corporation Headquarters Historic District, City of Milwaukee, Milwaukee County, Wisconsin

PHOTOGRAPHERS: Donna Weiss, Kate Bissen, and Hongyan Yang, Winter 2021-2022

LOCATION OF ORIGINAL DIGITAL FILES:
Wisconsin Historical Society, State Historic Preservation Office
816 State Street, Madison, WI 53706

LIST OF PHOTOGRAPHS:
Photograph 01 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0001)
Looking south at (left to right) Building 1A, Building 65, and the west end of Building 36 from West Hopkins Street

Photograph 02 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0002)
Looking southwest at the east facades of Buildings 1A, 65, and 36 (east addition) along North 27th Street.

Photograph 03 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0003)
Looking northwest at the east façade of Building 1A from North 27th Street.

Photograph 04 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0004)
Looking north at the south façade of Building 1A and the adjacent visitor parking area. The building at the right edge is Building 65.

Photograph 05 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0005)
Public lobby and reception area of Building 1A, remodeled in the 1950s.

Photograph 06 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0006)
Intact historic board room in the northeast corner of the first floor of Building 1A.

Photograph 07 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0007)
Intact historic main stair of Building 1A.

Photograph 08 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0008)
Corridor of Building 1A featuring ribbon windows and wood veneer from 1950s remodel.

Photograph 09 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0009)
Patio in front of Building 65 looking south dating to the 1960 canopy addition.

Photograph 10 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0010)
Main east façade of Building 65, non-contributing guard house, and adjacent drive to the south.

Photograph 11 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0011)
West façade of Building 65.

Photograph 12 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0012)
Looking east at the field where Building 1 was originally located. The west façade of Building 1A is in the distance, and the north façade of Building 65 is to the right.

Photograph 13 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0013)
Looking west down the drive between Building 65 and Building 36.

Photograph 14 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0014)
Historic art deco lobby of Building 65.

Photograph 15 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0015)
Decorative art deco terrazzo pattern in the lobby of Building 65.

Photograph 16 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0016)
The large demonstration and testing hall at the center of Building 65, including intact overhead crane.

Photograph 17 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0017)
Typical intact partitions at corridors on the second floor of Building 65.

Photograph 18 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0018)
Looking out one of the pleated windows toward the north façade of Building 36.

Photograph 19 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0019)
Looking south across the lawn in front of Building 65 toward Building 36. The east portion of Building 36 is a modern-era addition.

Photograph 20 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0020)
The historic east end of Building 36 which originally housed engineering offices and labs before the construction of Building 65.

Photograph 21 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0021)
1950s addition along the north side of the original Building 36; all of the additions and auxiliary buildings collectively make up the South Plant.

Photograph 22 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0022)
Looking east at the west façade of Building 36, which has been clad with modern-era metal panels.

Photograph 23 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0023)
Looking east down the drive that borders the north façade of Building 36. Building 65 is located in the middle of the photo; surrounded by brownfield.

Photograph 24 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0024)
Looking northwest at the southeast corner of the Building 36 addition, from the intersection of West Townsend Street and North 27th Street. The taller building behind the addition is the historic engineering wing of Building 36. The projecting blank brick façade beyond is Building 35, which has been modified several times over the history of the site.

Photograph 24 of 25: (WI_Milwaukee County_AO Smith Corporation Headquarters_0024)
Looking northeast down West Townsend Street at the west façade of Building 36 and the rail yard beyond.

LIST OF FIGURES:

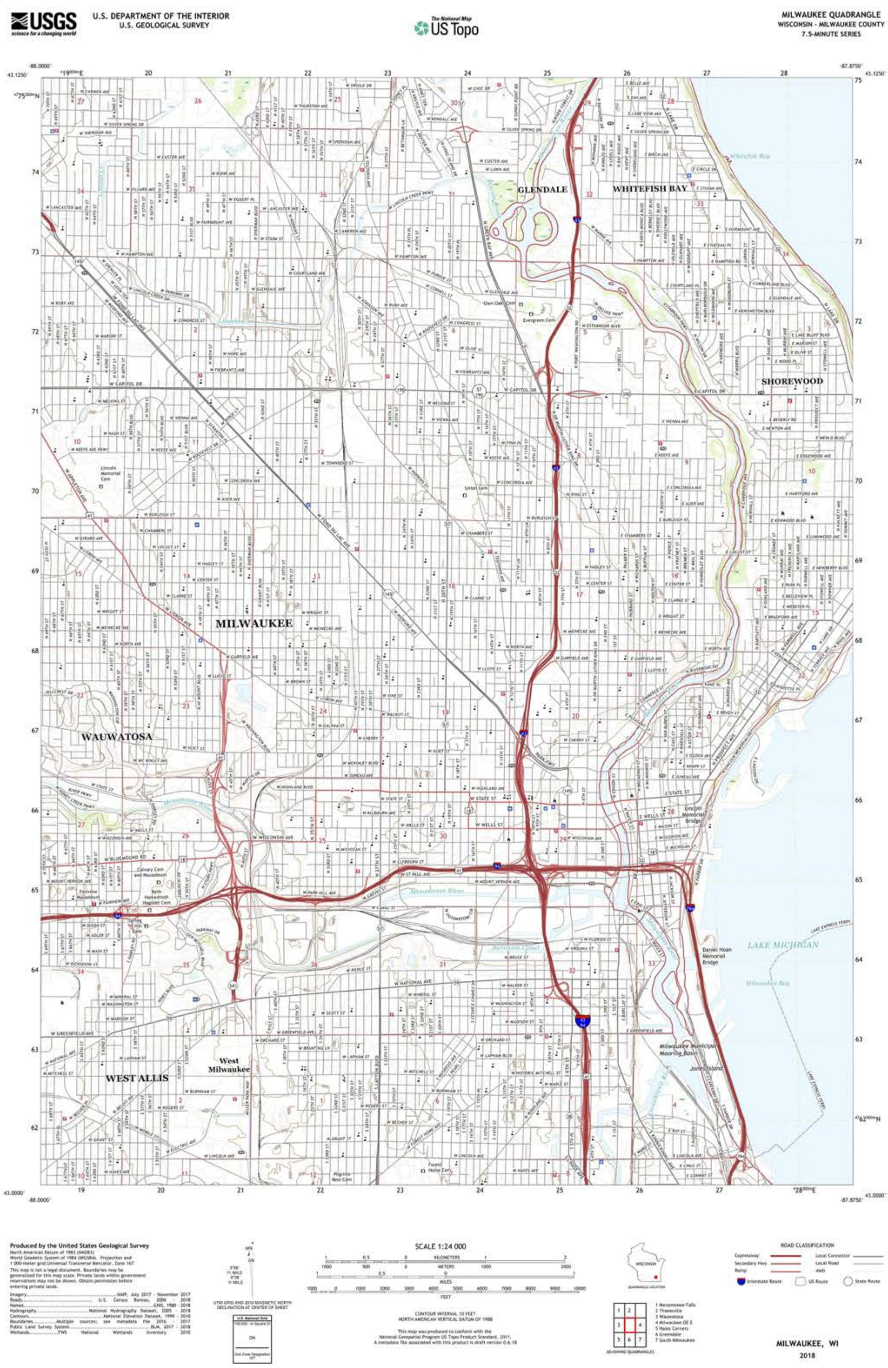


Figure A: USGS Map with UTM Coordinates.

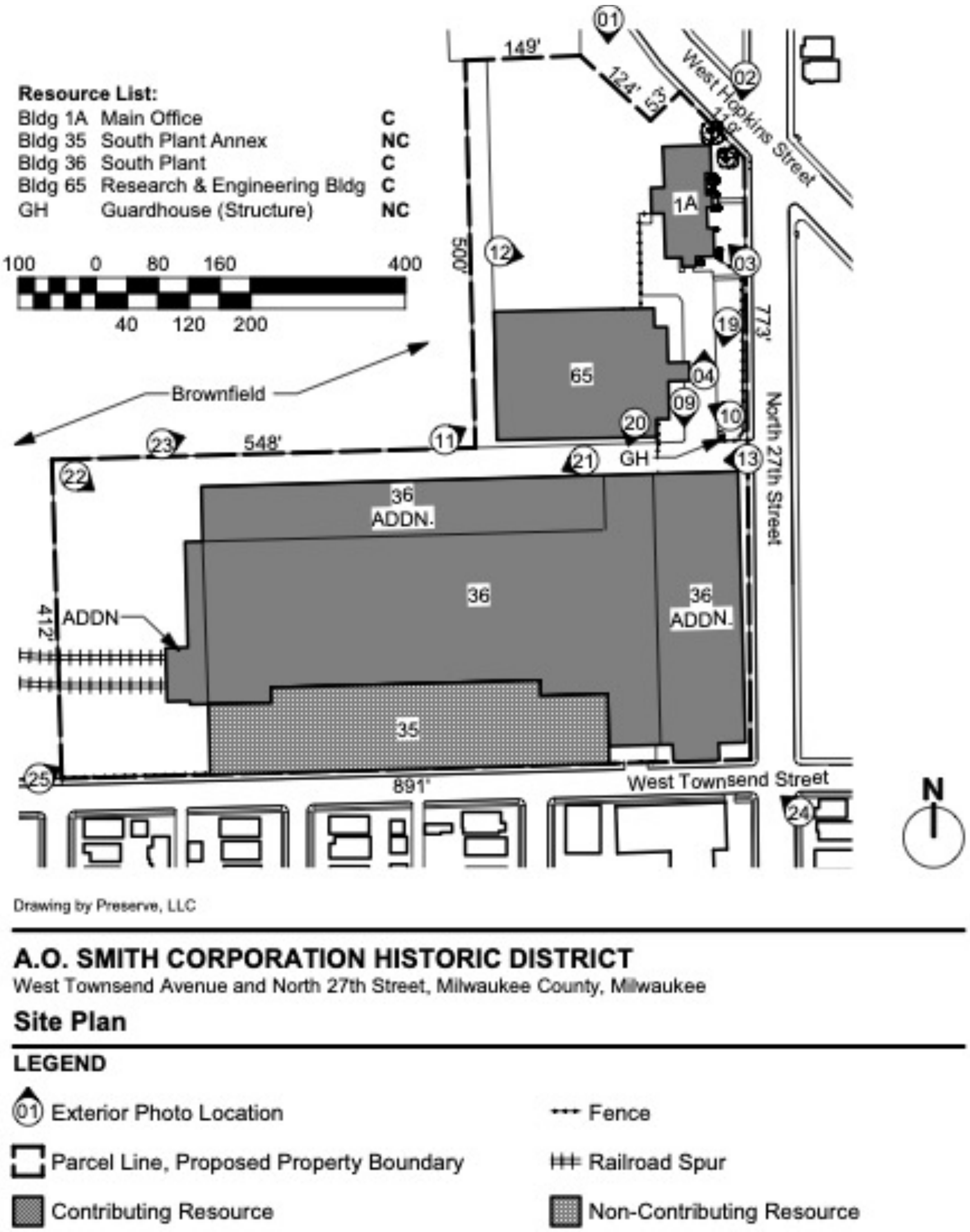


Figure B: District map.

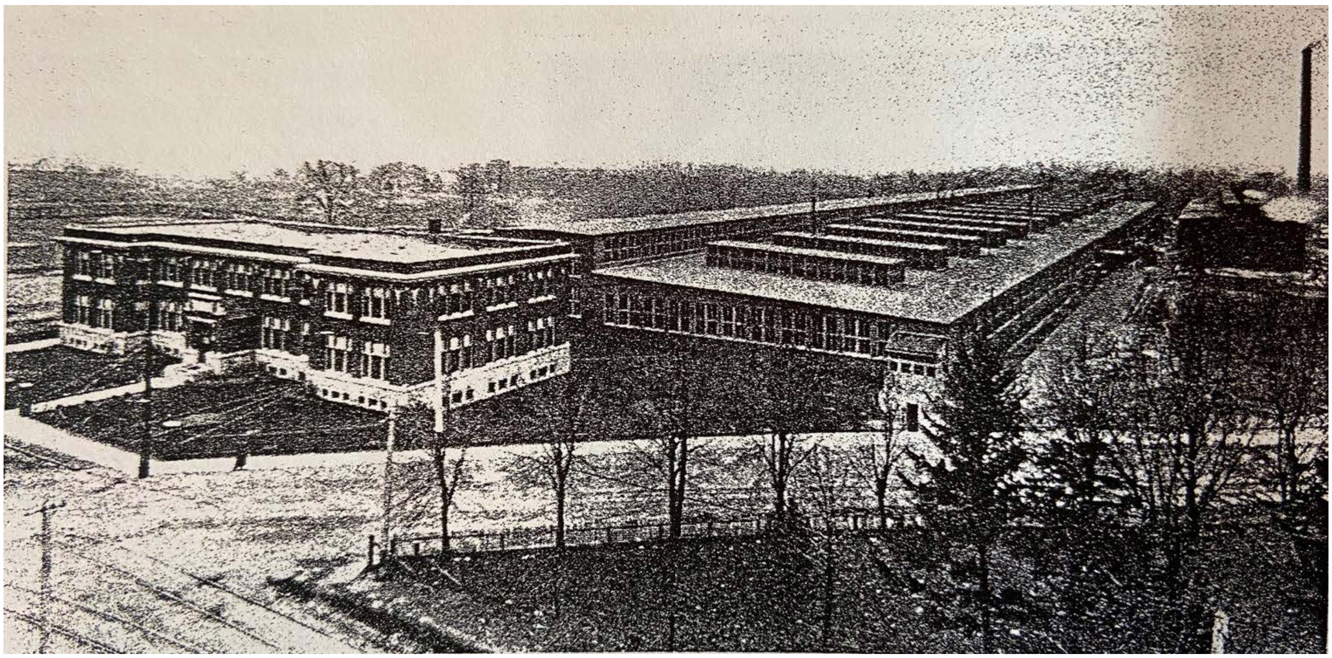


Figure C: Building 1A with Building 1, the first factory building on site, in the background (*Through Research, a Better Way*).

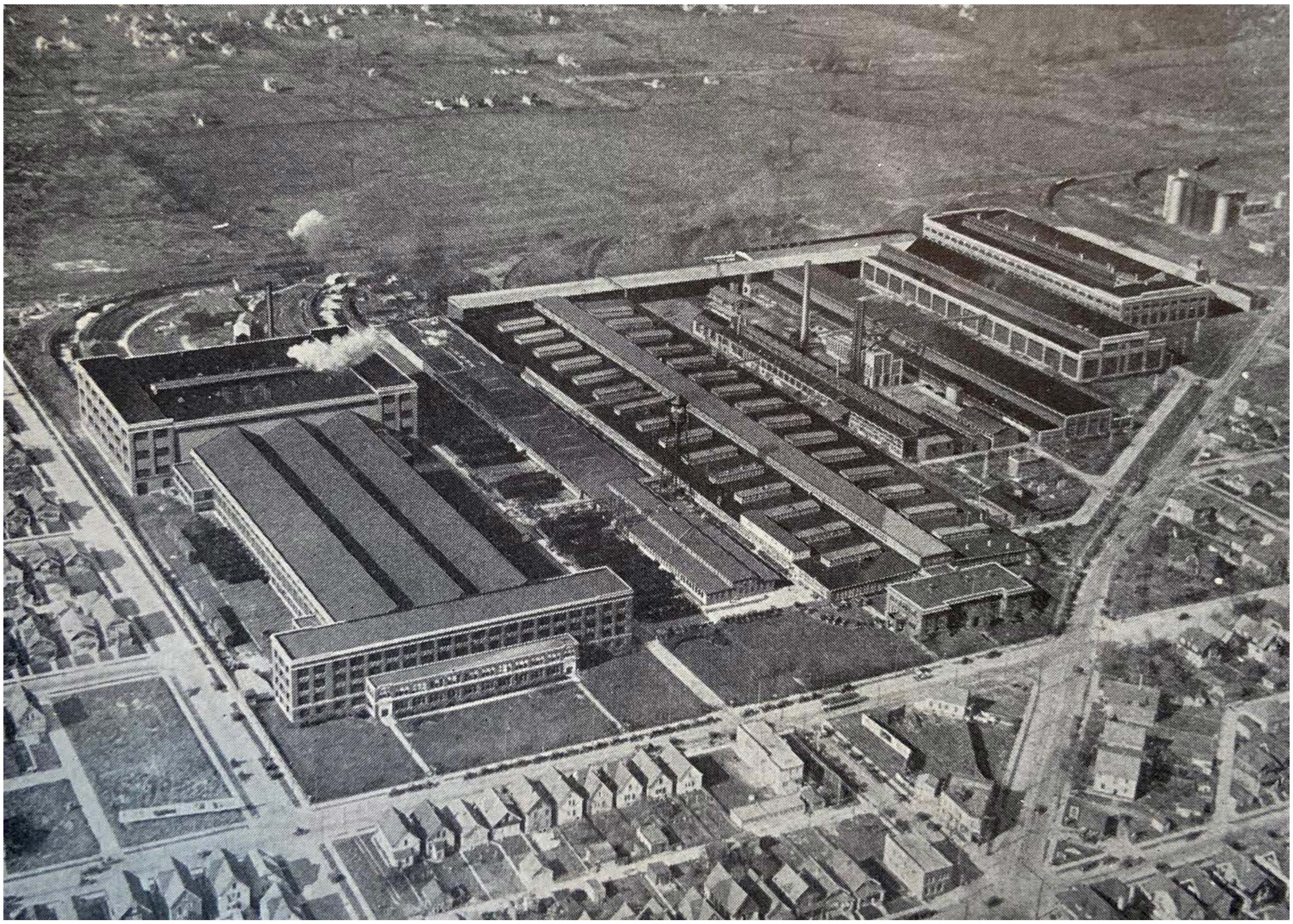
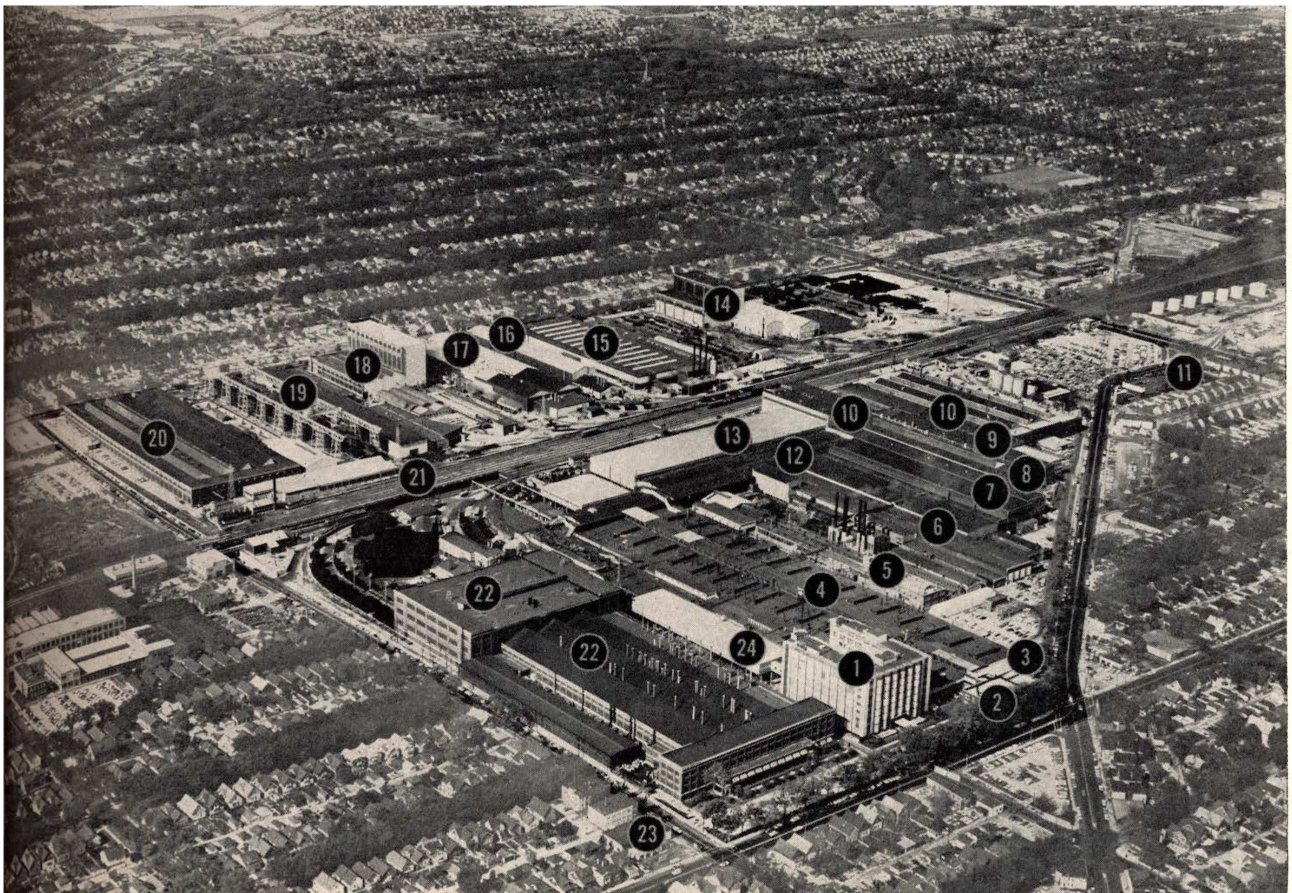


Figure D: Aerial photograph of A.O. Smith factory complex, 1929, just before the construction of Building 65. Building 36 is on the left (south) side of the complex, and Building 1A is at the end of the center factory building. (*Automatic Production of Automobile Frames*).



In 1874 Charles Jeremiah Smith opened a small machine shop on Humboldt Avenue in Milwaukee—the beginning of the A. O. Smith Corp. By 1908 the firm sought elbow room at the edge of town and purchased a 135 acre farm which became the Milwaukee Works. The first factory building was erected in 1910. Today the sprawling complex embraces 147 acres and over 3,500,000 square feet of floor space. (1) AOS headquarters, General Offices, R&D Div.; (2) Purchasing, Traffic, Visitor Reception, Telephone Center; (3) Data Systems Div.; (4) Automotive North Plant; (5) Weld rod production; (6) Parts Manufacturing; (7) Automotive parts-in-process; (8) Glass-lined Tank Div.; (9) Maintenance Div.; (10) Process Equipment operations; (11) Automotive Product Engineering; (12) Steel cleaning & Automotive Parts Mfg.; (13) Steel Storage; (14) Oil well casing (reducing and heat treating); (15) Special Products & Tool Mfg. Div.; (16) Railroad Products Div.; (17) Hess Div., casing finishing; (18) Government Research & Development Div.; (19) Control Arms Div.; (20) Tubular Products Div. (line pipe and casing); (21) Main line, Milwaukee Road; (22) Automotive South Plant; (23) AOS garage; (24) Automotive administrative offices, sales and engineering.

Figure E: Aerial photograph of A.O. Smith factory complex in 1964, showing expansion across the rail corridor to the west (top of image). The text from the article incudes the uses of the buildings in the early 1960s, near the end of the period of significance. Building 65 (#1) housed the Headquarters, General Offices, and Research and Development Division. Building 1A (#2) housed the purchasing department, traffic department, visitor reception, and service call center. Building 36 (#22) was still used by the automotive division to manufacture frames. (*A.O. Smith News*, Vol. 8, No. 1, January 1964).

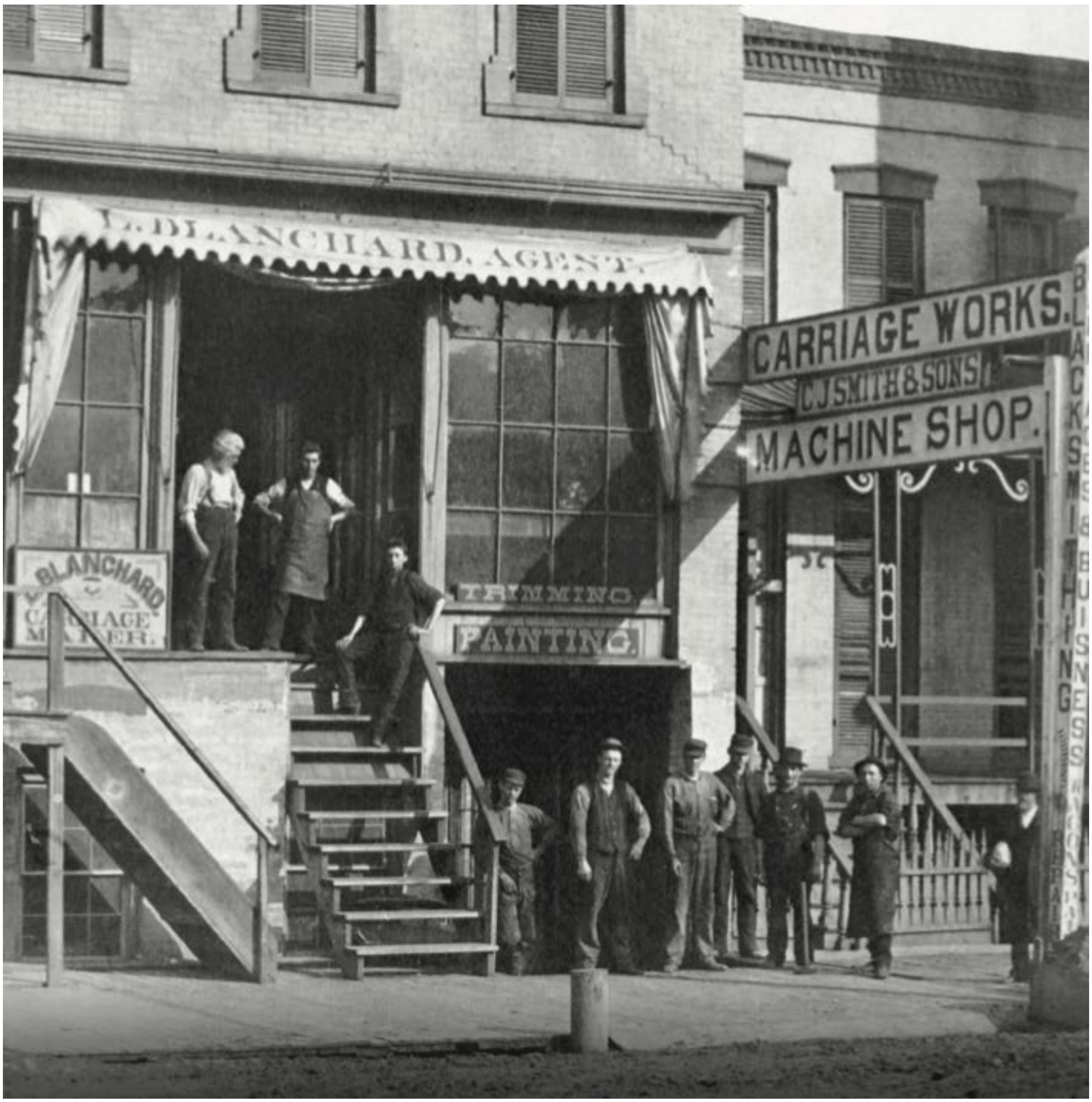


Figure F: Staff in front of C.J. Smith and Sons's carriage and machine shop in Walker's Point (AO Smith Corporation Archive).

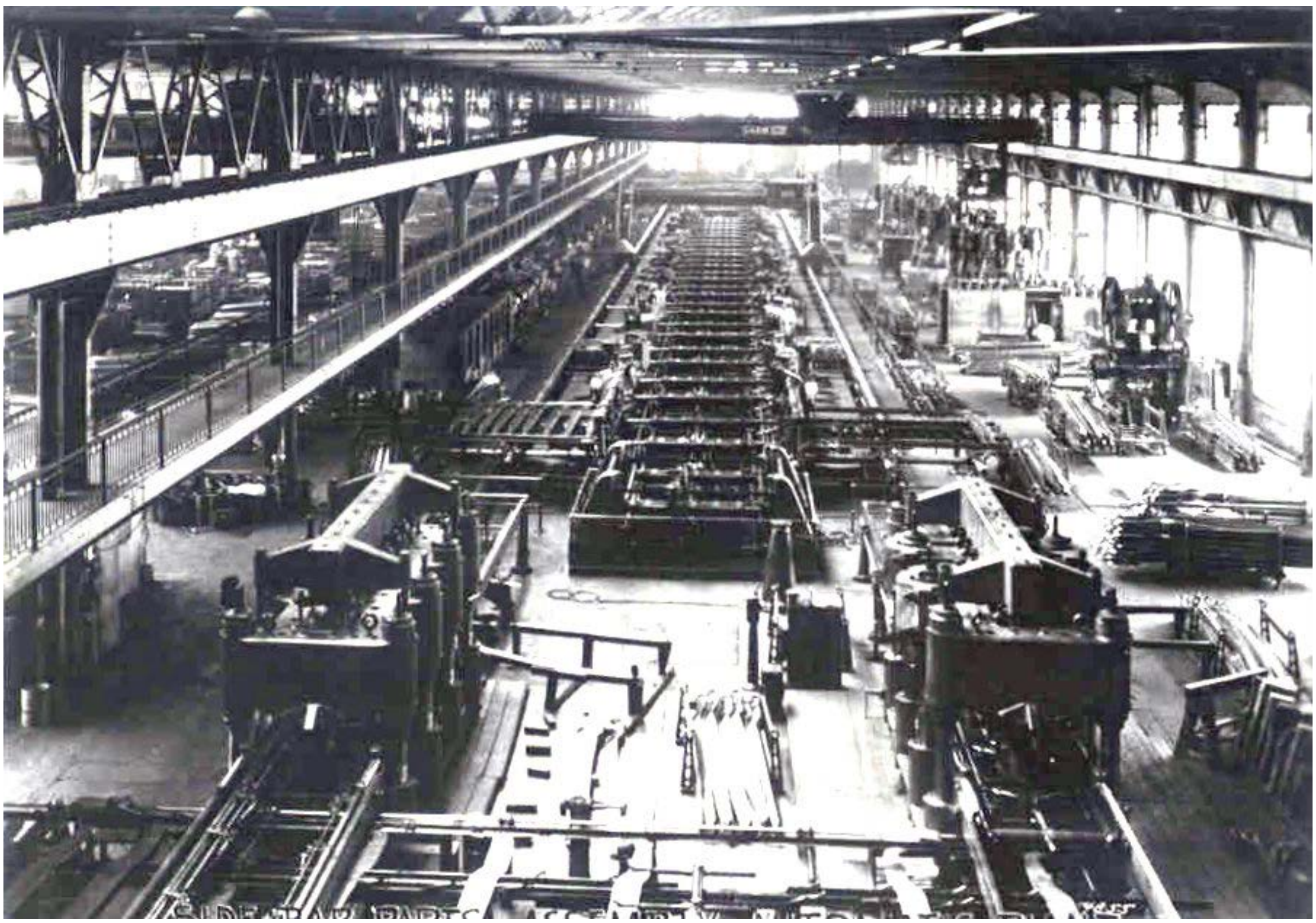


Figure G: 1920s photo of the automatic frame assembly plant in Building 36 (*Remembering an Era, 1921-1958: 10,000 Automobile Frames a Day*).

Figure H: The Mechanical Marvel at work in the South Plant in the 1920s. In the foreground, riveters work on frames. A nailing machine is visible in the background. (Milwaukee Public Library Historic Photo Collection)

Figure I: Outside frame storage in the yard around the curved rail line leaving Building 36, undated (*Remembering an Era, 1921-1958: 10,000 Automobile Frames a Day*).

Figure J: Exterior of Building 65, the Research and Engineering Building, looking northwest from North 27th Street, 1931 (Hedrich-Blessing Archive, Chicago Historical Society).

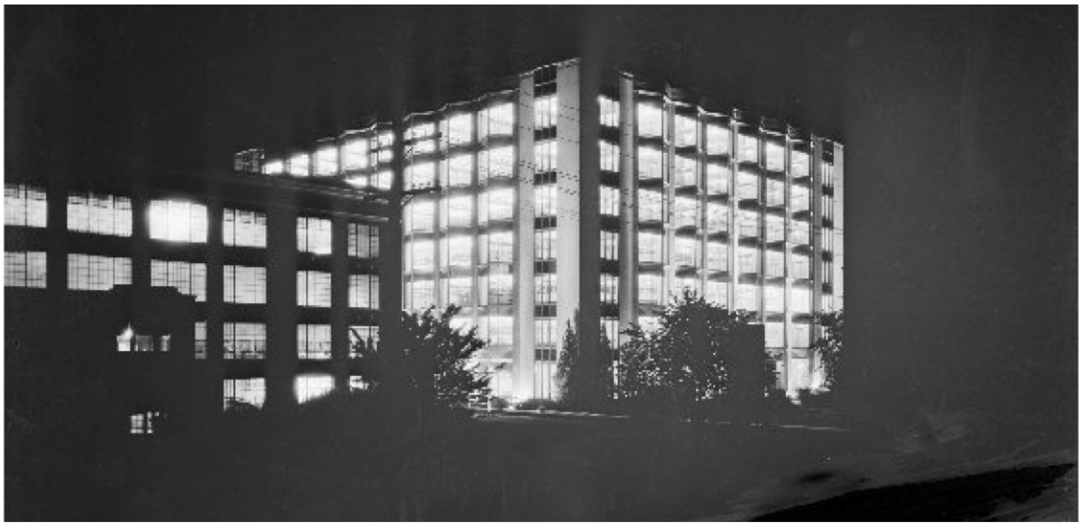


Figure K: Exterior of Building 65 and the north corner of Building 36 at night, 1931 (Hedrich-Blessing Archive, Chicago Historical Society).

Figure L: Custom-designed swing stage for Building 65 window installation and maintenance, 1931 (Hedrich-Blessing Archive, Chicago Historical Society).

Figure M: Building 65 Lobby with lighted floor feature, 1931. This feature remains intact (Hedrich-Blessing Archive, Chicago Historical Society).

Figure N: Building 65 elevator lobby, 1931. This feature remains intact. (Hedrich-Blessing Archive, Chicago Historical Society)

Figure O: Building 65 exhibit and demonstration hall, 1931. (Hedrich-Blessing Archive, Chicago Historical Society)

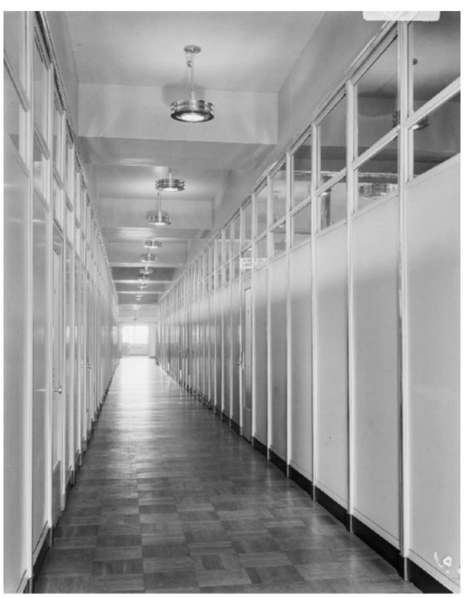


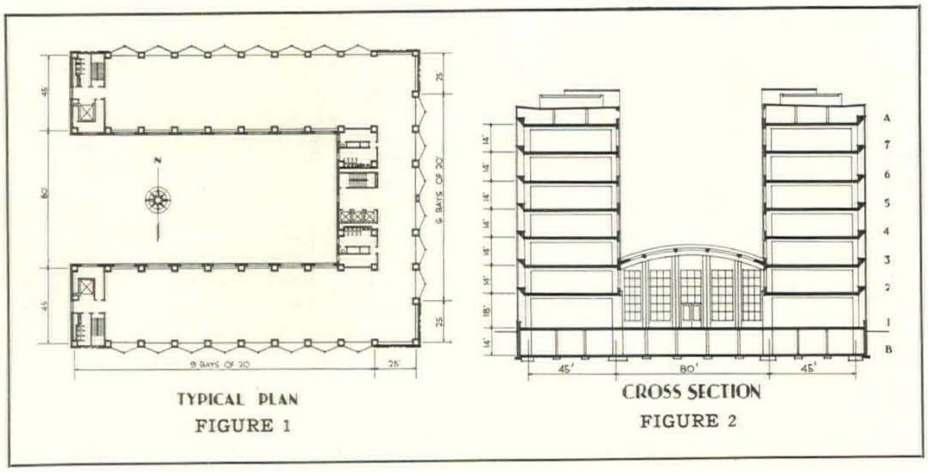
Figure P: Building 65 office corridor with moveable partitions meant to be reconfigured as needed, 1931. (Hedrich-Blessing Archive, Chicago Historical Society)

Figure Q: Building 65 open engineering floor with parquet flooring, 1930s. (Hedrich-Blessing Archive, Chicago Historical Society)

Figure R: Building 65 lab space surrounded by typical partitions, 1930s. (Hedrich-Blessing Archive, Chicago Historical Society)

Figure S: Building 65 lab space, 1930s. (Hedrich-Blessing Archive, Chicago Historical Society)

Figure T: (next page) Building 65 structural diagrams showing hollow column and girder configuration intended to allow piping, mechanicals, and any other necessary supply or waste lines to be concealed but easily relocated. (*The Architectural Forum*, Volume LV, Number 5, November 1931)

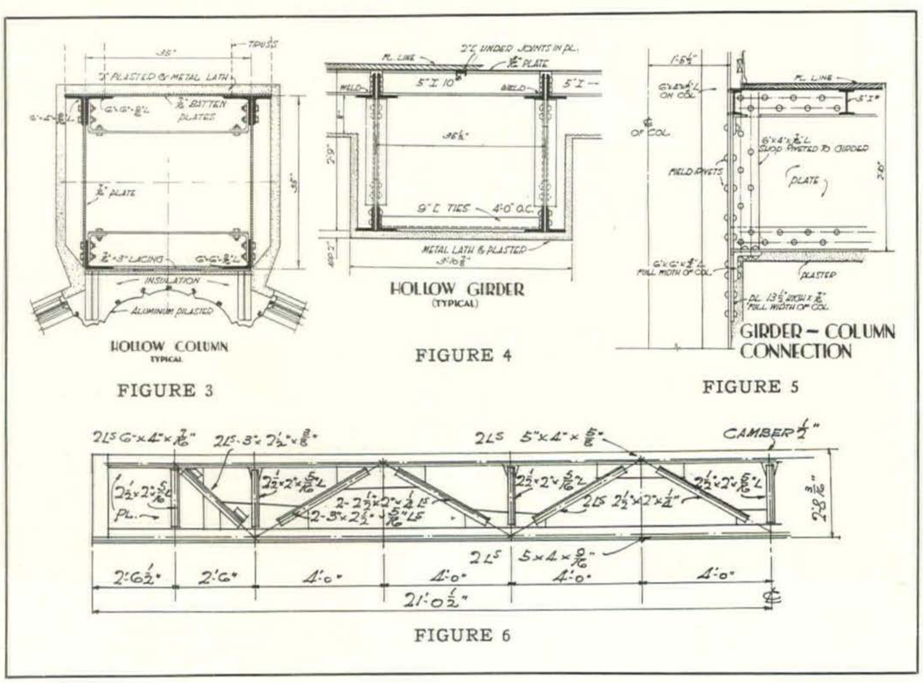


TYPICAL PLAN
FIGURE 1

CROSS SECTION
FIGURE 2

Structural Frame. It was determined at the outset to try to conceal all pipe lines, electrical conduits, and ventilating ducts, and yet keep these pipes and ducts accessible for inspection and repair. It was also recognized that reasonable provision must be made for economical installation of future pipe lines which might be required for the changing laboratory requirements.

To meet these conditions, a structural design was developed consisting of built-up hollow steel wall columns approximately three feet square, hollow truss type girders every twenty feet, and a "Battledeck" or steel plate and I-beam subfloor construction with suspended metal lath and plaster ceilings which would allow piping to any point in the building.



HOLLOW COLUMN
TYPICAL
FIGURE 3

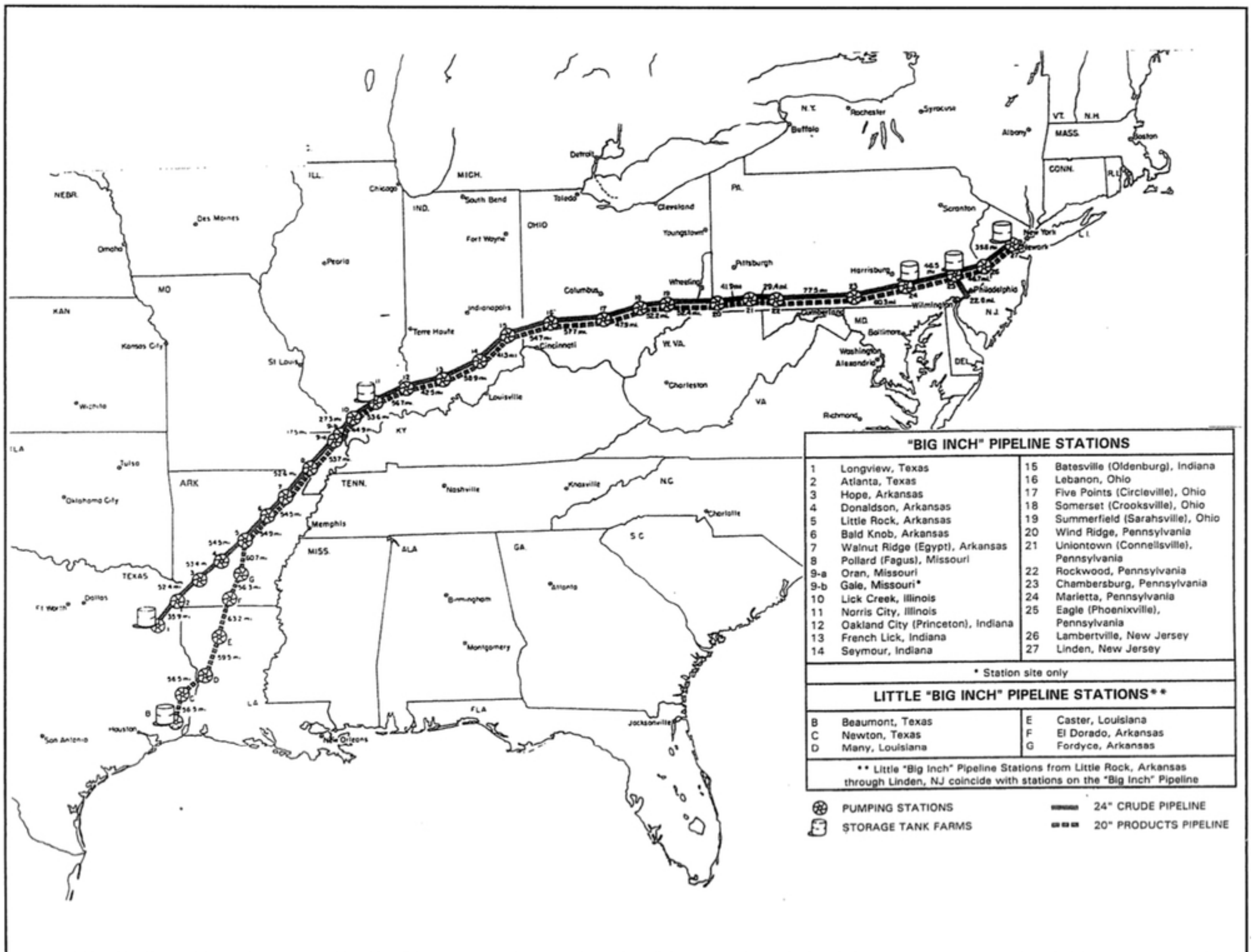
HOLLOW GIRDER
(TYPICAL)
FIGURE 4

GIRDER – COLUMN CONNECTION
FIGURE 5

FIGURE 6

Figure U: Glass-lined pipe under production at the Smith plant (exact building unknown), 1945 (Milwaukee Journal Sentinel).

Figure V: Big Inch pipeline installation in 1942-1943 (Library of Congress, Big Inch Pipeline Construction Photo Collection).



Station Location Map

Figure W: Map of Big and Little Inch pipelines installed during World War II; A.O. Smith developed the pipeline technology and manufactured most of the material for both pipelines (*The Conversation*).

Figure X: Factory worker standing next to bomb casings manufactured at A.O. Smith during World War II (Milwaukee Public Library Historic Photo Collection).

Figure Y: A.O. Smith Harvestore installed at a Wisconsin farm in the 1950s (Foxland Harvestore/Foxland Incorporated).

Figure Z: Sales literature for the Electra Permaglas-lined water heater, 1966 (A.O. Smith Archive).