Preservation Plan

for

THE FERRACUTE MACHINE COMPANY SITE

BRIDGETON,
CUMBERLAND COUNTY, NEW JERSEY

Owned by the
City of Bridgeton, New Jersey

Preservation Plan prepared for the
South Jersey Economic Development District
Millville, New Jersey

Funded in part with a grant from the
Garden State Preservation Trust Fund
Administered by the
New Jersey Historic Trust

Prepared by
WATSON & HENRY ASSOCIATES
Bridgeton, New Jersey
Project 04-009.1

OCTOBER 2007

Michael C. Henry, PE, AIA
Penelope S. Watson, AIA
NJ PE#25633  NJ RA#11115  NJ RA#10019
TABLE OF CONTENTS

COVER

TABLE OF CONTENTS

PROJECT DIRECTORY

PRECIS

BACKGROUND AND HISTORICAL ANALYSIS

- Introduction
- Historic Designation
- Legal Authority for Ownership and Stewardship
- Historic Name
- Location and Setting
- Architectural, Cultural and Historical Significance
- Architectural Description
- Historic Overview

CHRONOLOGY OF CONSTRUCTION

- Introduction
- Methodology
- Overview of Site Chronology
- Office Building
- Main Machine Shop

ANALYSIS OF EXISTING CONDITIONS

- Introduction
- Methodology
- Overview
- Climate Contest
- Site
- Exterior Masonry and Foundations
- Structure and Framing
- Roofing and Moisture Protection
- Windows and Doors
- Overview of Interior
- Building Systems

RECOMMENDATIONS

- Introduction
- Preservation/Restoration/Rehabilitation Philosophy and Guidelines
- Community Assessment of Adaptive Reuse Potential
- Architectural Assessment of Adaptive Reuse Strategies
- Life Safety and Code Requirements
- Barrier-Free Accessibility
- Technical Recommendations
- Main Machine Shop Recommendations
- Office Recommendations
- Project Phasing and Conceptual Costs
BIBLIOGRAPHY

PHOTOGRAPHS
- List of Illustrations and Photographs
- Figures 1 through 19

APPENDIX A
- Existing Arrangement Sketches:
  - Office: Plan
  - Machine Shop: Key Plan
  - Machine Shop: Partial Plan, Bays 8 through 15
  - Machine Shop: Partial Plan, Bays 1 through 7
  - Machine Shop: West End Wall Elevation
  - Machine Shop: Typical Bay Elevation
  - Machine Shop: Typical Section

APPENDIX B
- Concept Sketches for 25 July 2007 Workshop
  - Concept Sketch 1
  - Concept Sketch 2

APPENDIX C
- Secretary of the Interior’s Standards for the Treatment of Historic Properties, 1995

APPENDIX D
- Graphics for 25 July 2007 Workshop
  - Ferracute Then and Now
  - Site Arrangement
  - Machine Shop Plans
  - Site Maps

End of Table of Contents
PROJECT DIRECTORY

PROJECT

Preservation Plan for the Ferracute Machine Company Site
429 East Commerce Street
Bridgeton, New Jersey 08302

OWNER

City of Bridgeton
East Commerce Street
Bridgeton, New Jersey 08302
Phone (856) 455-3230

James Begley
Mayor
Sandi Zapolski
Director of Economic Development

CLIENT

South Jersey Economic Development District
226 High Street
Millville, New Jersey 08332
Phone (856) 765-970

Gordon K. Dahl
Executive Director
Judith Arnold, Esq.
General Counsel

FUNDING

The preparation of this Preservation Plan has been made possible, in part, by public funds from the Garden State Historic Preservation Trust Fund administered by the New Jersey Historic Trust.

INVESTIGATING TEAM

Watson & Henry Associates
Preservation Architects and Engineers
12 North Pearl Street
Bridgeton, New Jersey 08302
Phone (856) 451-1779 Fax (856) 451-0471

Penelope S. Watson, AIA
Principal Architect
Michael C. Henry, PE, AIA
Principal Engineer/Architect
Maria Cerda-Moreno
Associate Architect
Katherine Switala-Elmhurst
Senior Graduate Engineer
Carlos Fajardo
Graduate Engineer
Jaime Bustos
Intern
The statements and opinions contained herein are for the use and information of the South Jersey Economic Development District. The opinions reflect the judgment of a Professional Engineer and Registered Architect performing with the care and skill ordinarily used by other Professional Engineers and Registered Architects when dealing with existing structures at the same time and in the same or similar localities. Conclusions drawn in this report are based on those conditions and surfaces accessible to the unaided visual observation of the Architect/Engineer. No warranties or guarantees can be inferred from, or implied by, the statements or opinions contained in this report.

End of Project Directory
This *Preservation Plan* presents architectural and engineering findings and recommendations for the Ferracute Machine Company site in Bridgeton, New Jersey. Built in 1904 following a fire that destroyed an earlier complex, the Office and Main Machine Shop are the primary surviving structures of the press manufactory founded, owned and operated by Oberlin Smith, one of the country’s leading industrialists and inventors in the late nineteenth and early twentieth centuries. The company operated at the site until 1968; since then the buildings have been deteriorating through periods of vacancy and marginal use.

The South Jersey Economic Development District commissioned this *Preservation Plan* on behalf of the property owner, the City of Bridgeton, to provide the framework and guidance for development of this important resource, including identification of major stewardship issues, and potential adaptive reuses. This report, the first step in the preservation of the property:

- Reviews briefly the history and background of the Ferracute Machine Company, buildings and site;
- Identifies significant characteristics of the buildings and site;
- Documents the current state of the buildings’ architectural materials and overall structural condition;
- Recommends appropriate historic preservation treatments;
- Presents the outcome of a community workshop held to explore possible adaptive reuse strategies;
- Presents an architectural assessment of adaptive reuse strategies;
- Presents conceptual construction budgets for implementing the recommendations.

The *Background and Historical Analysis* presents the background and historical context of the buildings and site. It includes an architectural description of both the Office and the Main Machine Shop and discussion of the buildings’ significance. The section concludes that the buildings and site possess national significance for their association with Oberlin Smith, in addition to:

- Historical significance at the national level as the site of a company that perfected the operation of presses for cutting, punching, bending, drawing, stamping and coining of sheet metal, and that supplied the presses used in the industrialization of the United States in the late nineteenth and early twentieth centuries. Ferracute supplied presses to such manufacturing giants as Western Electric Company, General Electric, Eastman Kodak, McCormick Harvesting Machine Company, Winchester Repeating Arms Company, International Harvester, J.P. Morgan Company, Victor Talking Machine Company, Ford Motor Company, General Motors, Studebaker, Packard, Cadillac, and Chrysler, among many others;
- Historical significance for the part it played in the growing world dominance of American manufacturing in the late nineteenth and early twentieth centuries through its supplying of presses to countries throughout the world, including Australia, England, Holland, Hungary, Germany, Norway, Russia, Denmark, Sweden, Italy, Switzerland, India, Peru and Japan, and the supply and installation of entire minting operations in China and Bolivia;
- Historical significance for its contributions to the war effort for both the First and Second World Wars, including supplying the bulk of the presses shipped to England on an emergency basis for the replacement of ammunition abandoned at Dunkirk;
- Historical significance as the site of Oberlin Smith’s invention of the magnetic recording of sound;
- Cultural significance for its pioneering role in the development of “scientific management,” theories that called for the development of the efficiency of each individual worker, and thus the overall efficiency of the manufacturing operation;
- Architectural significance at a local level as an example of the architectural expression of a company of highly-skilled and experienced mechanical and manufacturing engineers.

The *Background and Historical Analysis* section traces the history of the firm and the site including:

- The firm’s founding in 1863 by a twenty-three-year-old Oberlin Smith;
- Its expansion and move to the present site in the 1870s;
- The exhibition at the Centennial Exposition in Philadelphia and Ferracute’s venture into the international market;
The firm’s growth during the bicycle fad of the 1890s;
Its growth in the area of coining presses, including setting up entire mints in China and Bolivia in the 1890s;
The loss of the physical plant through fire in 1903;
The construction of the extant facility in 1904;
The long and profitable relationship with the automobile industry starting in 1905;
The death of Oberlin Smith in 1926 and the restructuring of the firm;
The purchase of Ferracute by businessman George Bass in 1937;
Ferracute’s contribution to the war effort for both the First and Second World Wars;
The closing of the site after sale of the business to the Fulton Iron Works in St. Louis, Missouri, in 1968.

The Chronology of Construction section summarizes the results of research and field investigation of the changes to the Office and Main Machine Shop over the past century.

The Chronology of Construction section traces the development of the two buildings from their initial construction through the end of the twentieth century, and identifies several major builds for each. For the Office, it finds the:
- First Build: Initial construction, 1904;
- Second Build: Interior alterations, early twentieth century;
- Third Build: George Bass interior alterations, 1937.

For the Main Machine Shop, the chronology is as follows:
- First Build: Initial construction, 1904;
- Second Build: North addition, between 1908 and 1915;
- Third Build: South office, between 1915 and 1923;
- Fourth Build: Expanded north addition, between 1923 and 1930;
- Fifth Build: George Bass repairs, 1937.

The Analysis of Existing Conditions section summarizes the results of a survey-level assessment and analysis of conditions of the site and the structures, including architectural features and accessible structural components.

All of the above factors have contributed, in differing degree of importance, to the existing conditions found at the Ferracute Office and Main Machine Shop.

The Analysis of Existing Conditions reports that for the site:
- Potential environmental hazards exist, including Brownfield issues;
- The site has been invaded with vegetative growth which has contributed to building deterioration and poor site drainage;
- Exterior lighting and access control are poor for security purposes;
- Fire apparatus access is poor because of vegetation overgrowth and irregular site surface.

The Analysis of Existing Conditions reports that for the Main Machine Shop:
- The exterior masonry condition ranges from poor to good with notable brick and mortar loss in areas of moisture penetration and saturation;
- A portion of the building (bays one through five) has been heavily damaged by fire and is beyond repair;
- The structural steel embedded in the masonry side walls is exhibiting heavy corrosion;
- Certain base plates of the main structural columns show serious corrosion.

The Analysis of Existing Conditions reports that for the Office:
- The exterior masonry condition ranges from poor to good with areas of notable brick and mortar loss;
- The condition of wood roof and floor framing varies depending on its proximity to water entry.
The Analysis of Existing Conditions reports that for both the Main Machine Shop and the Office:
- The roofing systems are past their useful life and are allowing large quantities of water to penetrate the building envelopes and interior finishes;
- Window/roof glazing is either missing, broken or cracked;
- Doors are generally in poor condition with respect to operability;
- Interior finishes are deteriorated in varying degrees depending on proximity to water entry;
- Mechanical, electrical and plumbing systems are damaged, vandalized or deteriorated beyond repair or reuse.

The final section of the Preservation Plan, Recommendations, addresses issues and strategies for preservation of the Ferracute Machine Company site, and outlines conceptual budgets.

The Recommendations section finds that work on the buildings should meet the Secretary of the Interior’s Standards for the Treatment of Historic Properties, 1995 (Appendix C), with:
- The Standards for Restoration being applied to the exterior of the Office, and the most significant interior space, Oberlin Smith’s office;
- The Standards for Rehabilitation being applied to the remainder of the Office interior and the interior and exterior of the Main Machine Shop.

This section recommends that the Period of Significance be based on the active use of the existing buildings and site, between 1904 and 1968. The recommended Period of Interpretation, the time frame to which the Ferracute Machine Company site should be preserved and interpreted, should be circa 1926, the year of Oberlin Smith’s death.

The Recommendations section finds that the character-defining features include, for the Main Machine Shop:
- Long uninterrupted roof slopes;
- Glazed roofing, which affects the appearance and perception of the interior space;
- Roof appurtenances, such as ventilators and catwalks;
- Color, modularity, shape and rhythm of the roof tiles;
- Volume and openness of the interior;
- Exposed structural members in the interior;
- Overhead traveling cranes;
- Exterior masonry;
- Fenestration.

For the Office, the character-defining features include:
- Form and shape of the exterior including the front and side porte cochere and the turret;
- Brick masonry, fenestration and the slate roof;
- Certain interior spaces, notably the turret rooms;
- Extant interior trim, doors and hardware.

The Recommendations section presents the findings of an all-day workshop held on 25 July 2007 to consider the future reuse of the Main Machine Shop. The approximately thirty invited participants were asked to articulate the assets and liabilities of the building. Break-out groups then developed a wide array of potential new uses. Ideas were combined into related themes, and the participants voted on those considered the most appealing or the most viable. In order of preference, the uses were:
1. Mixed use: commercial/residential, cultural/residential, or light industrial/commercial/retail; restaurants were a favored addition to any use;
2. Education theme: vocational high school, Mesocosm, please touch museum;
3. Energy generating sustainable energy theme (combined with another base use);
4. Industrial theme;
5. Mixed use: residential/studio/performing arts/tourism;
6. Public attraction: museum, eco-tourism;
7. Recreational: mixed use gym and water related activities.

In the **Recommendations** section, three strategies are developed for adapting the potential uses to the existing Main Machine Shop. They are:

- The “Big Shed” Strategy, in which the Main Machine Shop would be restored/rehabilitated as a weather-tight and rain-tight shell with minimal heat, possible ventilation, and no air conditioning;
- The “Buildings under a Big Shed” Strategy, in which the Main Machine Shop would be restored/rehabilitated as a rain-tight shell which would be ventilated, but not heated or cooled, and would accommodate a combination of one-story and two-story, free-standing building, erected within the shop;
- The “Buildings under Skeletal Shed” Strategy, in which the Main Machine Shop would be stripped to its essential structure, with vestiges of roof tiles and glazing remaining; the unprotected, open-structure frame would span over a combination of one-story and two-story, free-standing buildings.

The **Recommendations** section provides technical recommendations for the site, the Office, and the Main Machine Shop, which include:

- For the site, suggestions for immediate stabilization, and minimum probable scope of work;
- For the Main Machine Shop, suggestions for immediate stabilization, further investigation, and minimum probable scope of work;
- For the Office, suggestions for immediate stabilization and more extensive recommendations for: Foundations and building envelope; Structure and framing; Roofing and moisture protection; Exterior trim; Exterior finishes; Windows and doors; Interior space; Building systems.

The **Recommendations** section presents conceptual costs for rehabilitation of the Office, and for immediate stabilization, investigation, and minimum shed rehabilitation for the Main Machine Shop.

**End of Precis**
BACKGROUND AND HISTORICAL ANALYSIS

INTRODUCTION

The Background and Historical Analysis of this Preservation Plan presents the physical and historical context of the Ferracute Machine Company site, as well as basic descriptions of the two extant buildings, the office and the main machine shop, and the site.

This section summarizes:
- Formal recognition of the historical integrity and significance of the resource;
- Legal ownership of the property;
- The location and setting;
- The architectural, cultural, and historical significance of the resource;
- A description of the site and buildings;
- The history of the company and founder Oberlin Smith.

HISTORIC DESIGNATION

The Ferracute Machine Company is included in the Bridgeton Historic District as a contributing property. The district was placed on the New Jersey Historic Register on 22 February 1982, and the National Historic Register on 29 October 1992.

LEGAL AUTHORITY FOR OWNERSHIP AND STEWARDSHIP

The City of Bridgeton is the owner of the property.

HISTORIC NAME

Ferracute Machine Company became the official name of the company on 1 January 1877 when it was organized as a New Jersey corporation, with Oberlin Smith as president and mechanical engineer, and his brother Fred F. Smith as secretary and treasurer. Oberlin Smith selected the name Ferracute, claiming it was Italian for “sharp iron,” as well as “the cognomen of a terrible giant reputed to have lived in the days of Charlemagne;”¹ he had started using it in the company name as early as 1872.

LOCATION AND SETTING

The Ferracute Machine Company site is located at 429 East Commerce Street in Bridgeton, Cumberland County, in the State of New Jersey (figures 1 and 2). The site is one block west from the intersection of Commerce Street and State Route 49. Bridgeton is approximately thirty miles southeast of the Delaware Memorial Bridge and Interstate 95 by way of Route 49. The site is approximately one mile east of the intersection of Commerce Street with State Route 77, which leads to Exit 2 of the New Jersey Turnpike, about thirty miles north.

The property occupies lots 64, 70 and 74 in block 103; the three lots together constitute 3.77 acres (figure 8). The site is on the north side of East Commerce Street, on the corner of North Elm Street. A residential property, formerly the home of Ferracute Machine Company founder and owner Oberlin Smith, separates the property on the west from the shore of East Lake, a manmade lake constructed for industrial power. The site is within a New Jersey Urban Enterprise Zone.
Bridgeton was founded in the seventeenth century, became the seat of newly-formed Cumberland County in 1748, and developed into a manufacturing center and the largest city in New Jersey south of Camden in the nineteenth century. The city retains much of its nineteenth-century built fabric. The immediate area surrounding the Ferracute site is rich in architectural and cultural history, and is characterized by a mix of residential and commercial uses, some of which occupy nineteenth-century industrial structures.

ARCHITECTURAL, CULTURAL AND HISTORICAL SIGNIFICANCE

In the professional opinion of Watson & Henry Associates, the Ferracute Machine Company site is of national significance for its association with Oberlin Smith, one of the country’s leading industrialists and inventors of the late nineteenth and early twentieth centuries, and as the site of Smith’s manufacturing operations and of his many inventions, including the magnetic recording of sound. The Ferracute Machine Company site possesses:

- Historical significance at the national level as the site of a company that perfected the operation of presses for cutting, punching, bending, drawing, stamping and coining of sheet metal, and that supplied the presses used in the industrialization of the United States in the late nineteenth and early twentieth centuries by selling to such firms as Western Electric Company, General Electric, Eastman Kodak, McCormick Harvesting Machine Company, Winchester Repeating Arms Company, International Harvester, J.P. Morgan Company, Victor Talking Machine Company, Ford Motor Company, General Motors, Studebaker, Packard, Cadillac, and Chrysler, among many others;
- Historical significance for the part it played in the growing world dominance of American manufacturing in the late nineteenth and early twentieth centuries through its supplying of presses to countries throughout the world, including Australia, England, Holland, Hungary, Germany, Norway, Russia, Denmark, Sweden, Italy, Switzerland, India, Peru and Japan, and the supply and installation of entire minting operations in China and Bolivia;
- Historical significance for its contributions to the war effort for both the First and Second World Wars, including the supply of the bulk of the presses shipped to England on an emergency basis for the replacement of ammunition abandoned at Dunkirk;
- Historical significance as the site of Oberlin Smith’s invention of the magnetic recording of sound;
- Cultural significance for its pioneering role in the development of “scientific management,” theories that called for the development of the efficiency of each individual worker, and thus the overall efficiency of the manufacturing operation;
- Architectural significance at a local level as an example of the architectural expression of a company of highly-skilled and experienced mechanical and manufacturing engineers.

ARCHITECTURAL DESCRIPTION

MAIN MACHINE SHOP

The original block of the main machine shop is a rectangular brick-masonry structure sheltering one large room. The four-bay by fifteen-bay structure has clay tile roofing on the south slope and two-thirds of the north slope. The top third of the north slope is glazed with glass imbedded with wire. Brick pilasters separate the bays in the brick masonry.

On the east and west ends, the gables are stuccoed above the level of the side eaves. On the west end, three terracotta plaques are inset: a plaque in the form of the logo, reading “Ferracute,” is located at the apex of the gable; an oval plaque reading “1863” is located to the lower left; and a plaque reading “1904” is located to the lower right.

Below the eave line, there is one window or door in each of the bays at the west end; along the south side, two windows are set in each bay. These windows have segmentally-arched heads. Large six-section windows are set in the east and west end gables above the line of the horizontal eaves. Later additions are attached along the north side in place of the original fenestration; a large roll-up door is located at the west end on the north elevation. A large opening is located in the east end.
On the interior, the space is divided into a center aisle and two side aisles, running east-west. The side aisles are separated from the center aisle by steel columns spaced at twenty feet on center; sidewall columns are embedded in the brick masonry. Columns support exposed steel trusses, with the center roof trusses being supported by the interior steel columns, and side aisle roof trusses being supported by the center columns and the sidewall columns. The floor is comprised of concrete slabs.

OFFICE
The brick-masonry, slate-roofed office building has a basic rectangular form with the addition of a circular tower intersecting the southwest corner. The foundation is field stone laid in a rubble pattern. The roof on the rectangular block is pyramidal, and on the tower, cone shaped. A brick chimney with a corbelled top pierces the southwest ridge of the roof behind the tower. The east, south and west slopes of the main roof are interrupted by hip-roofed slate-faced dormers; the north slope has a ventilator in place of a dormer. A wood-framed, slate-roofed porte cochere protects the primary entrance on the south façade.

On the south and east slopes of the main block, and on the tower, the roof displays a splay at the eave line. The wide overhang of the eaves is supported on decorative wood brackets; the brackets bear against a wood fascia at the top of the masonry wall.

The brick masonry has courses of Flemish bond alternating with three rows of stretchers; the masonry is without adornment except at the upper quarter of the tower. A corbelled string course surrounds the tower at the eave line of the main block. Above the string course, shallow pilasters at the plane of the string course separate recessed panels; the pilasters terminate in a corbeled entablature at the tower eave line. The fascia of the entablature is a wood band.

The main entrance has a wood entrance screen recessed behind a four-centered arch; the screen is currently boarded over, and its configuration cannot be seen. The gable-roofed porte cochere is supported on four wood posts bearing on stone pedestals. The pedestals adjacent to the building flank the entrance steps of four risers, and the two pedestals on the opposite side of the driveway are connected by a low stonewall. The posts support exposed beams, which, in turn, support exposed rafters with rounded tails. Decorative brackets embellish the connections between the posts and beams, and a decorative open truss fills the end of the gable.

A similar structure forms a portico at a secondary entrance at the north end of the east elevation. The posts rest on a brick base; metal windows and a door are set between the base and the gable roof. The north elevation exhibits remnants of a brick connector which at one time led to a now-demolished building north of the office.

Window openings have wood sills, and brick jack-arch lintels. Pairs of double-hung windows with transoms above are featured, with two pair on the west, one on the south, one on the east, and one on the east side of the north elevation. The tower has four similar double-hung windows with transoms, but with each set in a separate masonry opening: one in the southeast quadrant, two on the southwest quadrant, and one on the northwest quadrant. Above each of these four windows in the tower is a pivoting sash set in a recessed masonry panel in the upper section. The windows are boarded up, and the current configuration of sash and panes is not accessible; originally, the transoms in the tower held stained glass, and upper tower windows and upper sash of the double-hung windows held small panes. Small double-hung windows flank the front entrance; similar windows are located on the west elevation near its intersection with the tower and on the east elevation at the south end. Below each window and window pair, an original opening in the masonry to allow for ventilating air has been infilled with brick.

Basement window openings pierce the foundation below the two window pairs on the west façade, the windows flanking the primary entrance on the south façade, and the two window pairs on the east façade.
HISTORIC OVERVIEW

OBERLIN SMITH
Oberlin Smith (1840 – 1926) was the eldest son of George (1815 – c. 1856) and Salome (1813 - ?) Smith, both English immigrants who had settled in Cincinnati. George Smith, who was an early abolitionist, named his son for Johann Friedrich Oberlin, an Alsatian pastor who was widely known for his work in educating and raising the living standards of his parishioners, and for whom Oberlin, Ohio and Oberlin College were also named.

George Smith died when Oberlin was a teenager, and, in 1857, Salome Smith traveled with Oberlin and his younger brother and sister to Shiloh, New Jersey to visit relatives. The family settled in Bridgeton, and Oberlin went to work at the Cumberland Nail and Iron Works. He reportedly attended West Jersey Academy, and Polytechnic Institute in Philadelphia.

Oberlin Smith followed in his father’s footsteps, and was a community activist throughout his life. He was active in the temperance movement, founded and served as president of the Bridgeton YMCA, and was also active in the women’s suffrage movement.

EARLY YEARS OF THE FIRM
By the age of twenty-three, Smith became an entrepreneur. He started a machine and repair shop at 21 N. Laurel Street in Bridgeton, and went into partnership with J. Burkitt Webb, his cousin, in 1863 as Smith & Webb. The partnership lasted for five years, and made iron fences and porch railings, as well as iron church furniture. They also installed plumbing and gas piping, an activity that continued at least to the end of the decade; when the South Jersey Institute was built in Bridgeton in 1870, Oberlin Smith received $3,367 for “plumbing and gas-fitting and furnishing steam-pumping apparatus.”

By the mid 1860s the firm was making all kinds of machinery, but started specializing in presses. The first seven presses went to local food canneries; by 1872 the company had shipped presses to San Francisco, California; Franklin, Tennessee; Portland, Maine; and Cathlamet, Washington Territory.

Smith worked on his own from 1869 until 1873, when he formed a partnership with his brother Fred F. Smith; the firm was then called Ferracute Machine Works – Oberlin Smith & Bro. It was in 1873 that Smith sold the shop on North Laurel Street along with business interests not associated with presses, and purchased a former brickyard on the east side of East Lake. He built his new shop along the shore of the lake, close to East Commerce Street. Further north along the lake, Fred Smith designed an Eastlake-style house for the family, Oberlin, Fred and their mother Salome, to live in.

EXPANSION
The Smiths took advantage of the opportunity to advertise their wares by entering an exhibit of nine presses in the Centennial Exposition in Philadelphia in 1876. The presses included the foot presses that the company had sold since the mid 1860s, as well as power presses that had been introduced in 1875.

Though no presses were sold off the floor at the Centennial, the public exposure appears to have paid off. Sales “jumped from twenty seven presses in 1876 to sixty six in 1877, sixty five in 1878 and ninety two in 1879. Press shipments reached one hundred forty six in 1880.”

The die business was also expanding during this period, with custom designs being fabricated for individual customers who wanted to produce such items as frying pans, and toy plates, spoons knives and forks.

The company expanded physically thanks to the Centennial when Smith purchased the New York Tribune’s Centennial Exposition building and added it to the complex on the shore of East Lake.

The Centennial year also marked the company’s first venture into the international market, when, in July, a foot press was shipped to the Pope Knitting Machine Company, Georgetown, Ontario, Canada, and, later in the year, presses were shipped to Adelaide, Australia and to Sweden. Ferracute shipped its first press to Japan in 1878.
and six more the following year.¹⁴ Eighteen hundred and seventy-eight also marked the first shipment to Europe: two foot presses sent to Paris. The first shipment to South America was sent to Bolivia in 1890.

In the United States, Ferracute marketed presses by watching patents issued by the United States Patent Office, and sending recipients a card reading “We notice that you have taken out a patent for an article that may require PRESSES AND DIES for its manufacture. We make a full line of these and many other kinds of sheet-and bar-metal machinery. Please let us know whether you wish our illustrated price lists and estimate for tools required.”¹⁵

By 1881, the plant covered twelve thousand square feet, and employed sixty workers.

**BICYCLE FAD**

The bicycle fad of the 1890s produced another outlet for Ferracute presses. The company took advantage of the growing opportunity, and three years after the large-scale production of bicycles began with the machined-parts Columbia safety bicycle in Hartford, Connecticut, Ferracute was selling presses to competing manufacturers in the mid-west that had developed a more efficient manufacturing method using stamped parts. Clients in the first two years included the Cycle Fitting Company of Indianapolis; Columbus Cycle Company of Columbus, Ohio; Snell Cycle Fitting Company of Toledo, Ohio; and the Western Union Cycle Company of Chicago, which was making bicycles for its own messengers. By 1895, the stamped-parts manufacturing technique had moved east, and Ferracute was shipping to Moore Cycle Fitting Company in Harrison, New Jersey; Eclipse Cycle in Elmira, New York; Liberty Cycle Company in Rockaway, New Jersey; and Premier Cycle Company in Bridgeport, Connecticut.¹⁶ That same year, Ferracute exhibited at the National Bicycle Exhibition at Madison Square Garden in New York City.¹⁷

By 1896, at the peak of the bicycle fad, over a million bicycles were produced a year.¹⁸ The next year, the fad began a precipitous decline, though Ferracute continued shipping presses to bicycle manufacturers until 1909.¹⁹

**ADDITIONAL CLIENTS**

Ferracute began dealing with another new industry in 1890 when Eastman Kodak bought its first press, beginning a long-term relationship. The next year, General Camera in Philadelphia bought its first press.²⁰

The American Meter Company, a gas meter manufacturer, purchased a press and several dies in 1889. Other clients purchasing power presses included National Typewriter Company of Philadelphia, McCormick Harvesting Machine Company of Chicago, Brown & Sharpe Manufacturing Company (a machine tool builder in Providence, Rhode Island), and the Winchester Repeating Arms Company of New Haven, Connecticut.²¹

**MINTS**

Ferracute entered a new segment of the market in August, 1892 when a press was shipped to the United States Mint in Philadelphia; it was followed by another in September.²² This coining press immediately established Ferracute as a leader in the field, and, by 1896, the firm was the successful bidder for three entire mints to be fabricated, shipped, and set up in China. Ferracute was expected to provide not just the presses, but everything required for the complete operation: melting furnaces, annealing furnaces, casting equipment, rolling mills, boilers and the rest of the apparatus for driving the machinery, and a machine shop for maintenance. Henry A. Janvier, a Ferracute engineer, accompanied the machinery to China and spent about nine months in the country setting up the mints.²³

Based on the successful outcome of these mints in Hopeh Province and Szechuen Province, Ferracute went on to set up complete mints in Potosi, Bolivia, and in Honan Province, China, and to sell coining presses to the governments of Italy, Japan, India, and Peru.

**FIRE**

By the beginning of the twentieth century, Ferracute was producing from three hundred to four hundred presses a year. The plant itself had grown into a series of buildings rimming the shore of East Lake. On Sunday 27 September 1903, a fire started in the boiler room, and was out of control before the alarm was sounded. The entire complex burned to the ground.²⁴
Oberlin Smith, though sixty-three years old, decided to rebuild the plant and reorganize the company. Operations resumed in temporary quarters across Commerce Street and in an abandoned factory nearby, and the company was able to meet its obligations.25

On 30 November 1903, partners Fred Smith and Dr. J. C. Street, vice-president, retired, and Oberlin Smith bought Smith’s and Street’s shares. Percival Smith, Oberlin’s son, became the new vice-president. J. Burkitt Webb, Smith’s first partner, who was then a professor at Stevens Institute in Hoboken, became a member of the board.

Oberlin Smith did not let Bridgeton take for granted that Ferracute would remain in the city. Though the Bridgeton Evening News announced in December 1903 that the firm would rebuild in the city, in the same article it noted that “there had been vague rumors even before the fire, that the subject of removing to some other location was being considered” and that “Bridgeton would lose the vast advantages that a concern of this kind furnishes a town.”26 In February of 1904, Oberlin Smith wrote in a letter to the editor of the Bridgeton Evening News:

As is generally known, we have continued our manufacturing operations in temporary shops which we have built and rented, so that we are now employing about two-thirds of our former force, one of the shops running by night as well as day, with plenty of orders to fill...

We have had numerous invitations from places, scattering all the way from Boston to Chicago, to locate our plant in their respective vicinities. We have, however, considered carefully only a few of these which were in the neighborhood of New York, a vicinity which, for many reasons, especially in connection with the selling part of our business, would be much better than Bridgeton. We desire, however, to stay here, if possible, for the sake of long-time associations, and for the sake of our many valued and trusty employees...

We finally decided, therefore, that with a certain proviso, we would establish our works here permanently, putting up much larger and better buildings than ever before, among them being offices, power-house, pattern-storage, pattern, carpenter and blacksmith-shops, etc. (all of which contain combustible materials) of slow burning construction, with brick walls. From these the machine shop would be entirely isolated, and would be an absolutely fire-proof building about 100 ft. x 200 ft. in size, equipped with all the most modern devices for electrical driving and hoisting, the use of the new high-speed steels for cutting tools, etc., etc...

The proviso above mentioned therefore involves the question, can the necessary money be raised in this vicinity or must we go to some of the other towns who are anxious to provide us with sites and assist with the necessary capital...

That the building plans may be pushed forward so as to break ground next month, it is necessary to raise several thousand dollars additional funds by the sale of Preferred Stock.27

The people of Bridgeton came through; Smith announced in March that sufficient stock purchases had been made, and Ferracute would stay in the city:

Our last communication regarding the establishment of our works in Bridgeton was somewhat uncertain, but it now gives us pleasure to announce that the matter has been definitely decided, and that we shall proceed at once to erect our plant here.

We are able thus to act on account of the success of our financing operations, we having subscriptions to our Preferred Stock of such amount as, in connection with other financial arrangements, will warrant us in going ahead with work—which was commenced yesterday.28

THE NEW PLANT
Oberlin Smith took the opportunity the fire provided to resituate and redesign his factory for optimum efficiency. The new buildings were constructed east of the Pennsylvania Railroad tracks that bisected the property, providing room for immediate expansion and future growth. The office building was designed as the point of public contact on Commerce Street, and the manufacturing plant extended to the north and east.

No record of an architect for the new buildings has been discovered, and presumably Smith and his engineers designed them in-house. Fred Smith had produced a credible, and fashionable, design for the family cottage thirty years earlier, and Oberlin undoubtedly considered the complexity of designing the buildings to be relatively insignificant compared to his other design, manufacturing and business accomplishments.

The office was designed as a one-story, brick version of the four-square residential design in vogue at the time, with the addition of the corner tower, to house Smith’s office, and a simple porte-cochere protecting the front...
architectural embellishments were limited to a splay in the eave line, and stained-glass transoms above the windows in the tower. Smith devised a weather-vane for the peak of the tower that could be read by a pointer in his office.

The main plant embodied a machine for manufacturing: a machine that was as up-to-date as Smith could make it. It was intended to be fireproof, being built of brick, concrete, steel and tile. "Power for running the machinery and electric lights came from steam turbines connected to dynamos, and the exhaust steam was used to heat the building." A skylight forming one-third of the north slope of the roof supplied natural light. The company proclaimed "every machine upon the premises is driven by one or more individual electric motors, there being no line-shafting or belting and no ceiling countershafts." The absence of belting allowed for the installation of overhead cranes. This installation of motor-driven machinery made Oberlin Smith a pioneer in its use.

Local contractor H. H. Hankins & Bro. constructed the plant in their third year of operation.

**Scientific Management**

In the early years of the twentieth century, a new approach to management was developed that emphasized studying and timing the movements of each worker to determine the most efficient procedures. It also emphasized "seeking harmony in the workplace instead of discord, for cooperation in place of individualism." The system was called "scientific management," and one of its leading proponents was Frederick W. Taylor, a Philadelphia manufacturer who was a friend and colleague of Oberlin Smith through the American Society of Mechanical Engineers, of which they were both active members.

Smith was enthusiastic about the possibilities of scientific management, and retained as a consultant a disciple of Taylor, Frederick Parkhurst, to study operations at the Ferracute. The result of the study was a three-hundred-page case history, *Applied Methods of Scientific Management*. Parkhurst’s method of speeding up production emphasized the carrot over the stick, recommending assigning a standard time for each job and offering the worker a bonus for finishing it in less time. He also supported the worker by recommending that proper tools be supplied by management, and that machine maintenance be performed by a specialist and not the machine operator.

Oberlin Smith was pleased with the results of the study, and guided the operation of Ferracute by its recommendations from then on. One of the company’s supervisors, Philip Meyers, wrote “…we have just recently had a number of large frames to machine that used to average from thirty five to forty hours a piece. But they are now being machined (under the same conditions except Bonus and Instructions) in sixteen to eighteen hours apiece…The operator in the above job makes a bonus equal to 25% to 30% of his wages, and would complain very much if the job were transferred to another man." Added to the Ferracute letterhead was the statement “Our system of scientific management since Jan. 1st 1912 has given us an efficiency in ‘deliveries’ of 103 per cent. Thus the average time for all shipments has been shorter than promised.”

**Automobile Industry**

At the end of the first year in the new plant, Ferracute made a shipment that presaged a long and profitable relationship with the automobile industry. The first press went to the Lozier Motor Company in Plattsburg, New York, in December 1905. It had taken a while for the automobile industry to move away from the nineteenth-century carriage form of manufacturing and adopt stamped metal parts, as had the bicycle industry a decade earlier. By 1907, John R. Keim Company of Buffalo, New York, had switched from bicycle parts to automobile parts, and was selling a substantial amount to Ford Motor Company. Ferracute provided a small number of presses to Keim, later purchased by Ford, in the early years; around the same time, Ferracute started selling presses to Weston-Mott, a parts subsidiary of General Motors. Sales to the automobile industry began to increase in 1910, when Ferracute supplied presses to early manufacturers Cartecar of Pontiac, Michigan; Stevens Duryea of Chicopee Falls, Massachusetts, and the Metzger-Flanders Company, which was later purchased by Studebaker.

Other automobile manufacturers who purchased Ferracute presses were Pierce Motor Company in Racine, Wisconsin, which made the Pierce-Arrow; Packard and Cadillac became customers in 1910. The Maxwell-
Briscoe Company, manufacturer of the Maxwell in New Castle, Indiana, remained a client until the 1920s, when it was acquired by Chrysler.

Ford Motor Company made its first purchase directly from Ferracute in 1909, another in 1910, and a third in 1911. It was in 1912 that Ford became a major customer, when it bought a total of 63 presses. In 1913, Ferracute shipped Ford 65 presses, and 110 in 1914. From that period until after Oberlin Smith’s death in 1926, Ford was Ferracute’s primary client. From 1914 to 1917, Ford bought 500 presses from Ferracute for their Detroit operations, and another 115 presses for their manufacturing plant at Walkerville, Ontario. Sales to Ford continued to rise, and in 1924, Ford purchased 450 presses, seventy-three percent of Ferracute’s total production.

**INTERNATIONAL HARVESTER**

Some years after the rebuilding of the Ferracute plant, International Harvester Corporation, which then incorporated 1888 purchaser McCormick Harvesting Machine Company, became a major client. From 1909 until 1914, International Harvester purchased many presses for its manufacturing plants in Chicago, Illinois; Milwaukee, Wisconsin; and abroad: Canada, Sweden, Russia, France and Germany.

**LATER YEARS**

Oberlin Smith died of a heart attack 18 July 1926, in his eighty-seventh year; he was still the active president of the company at the time of his death. Percival Smith, Oberlin’s son and vice president, took over management of the firm after his father’s death.

The company continued to prosper throughout the 1920s, with fourteen hundred presses shipped between May 1925 and May 1926; over one thousand of these went to Ford. Ford orders continued through the end of the decade as the company retooled for the Model A, but never again reached the level of orders in 1925 and 1926.

Orders from other companies rose to offset the drop in Ford orders, with Chevrolet becoming a major client. Between 1928 and 1930, Victor Talking Machine Company, which was in the process of being acquired by Radio Corporation of America, purchased over one hundred presses.

The stock market crash and ensuing Great Depression devastated Ferracute’s business. Total orders dropped from 237 presses in 1930, to 112 in 1931, to 52 in 1932. By 1934, the company was in receivership, with orders unfilled because Ferracute could not borrow enough money to meet operating costs.

Operation of Ferracute was taken over by Barton F. Sharp, a Bridgeton real estate and insurance broker and director of the Cumberland National Bank who was a well-respected businessman, though, in his own words, “not knowing the difference between a wheelbarrow and an express wagon.” Sharp was able to keep the plant operating at a minimal level for several months until production began to rise again, to 56 presses in 1934, 83 in 1935, and 132 in 1936. Receivership ended in 1937 when the Ferracute was auctioned at a court sale in Atlantic City. The high bidder at $180,000 was George Bass of Berwyn, Pennsylvania.

**GEORGE BASS**

George E. Bass was a businessman and employee of Commonwealth Steel Company, later General Steel Casting Company. Bass had represented the company in France from 1928 until the impending war instigated his return in 1934; he continued working for the company in Eddystone, Pennsylvania, south of Philadelphia, until he decided to venture into business for himself in 1937 by purchasing Ferracute.

George Bass became president of Ferracute Machine Company, and the board of directors included Bass’s wife Medora, and Barton F. Sharp. Henry Janvier, who at that time had worked for Ferracute for sixty years, stayed on as vice-president.

George Bass’s experiences in Europe had convinced him that a second world war was imminent, and he set out to update and strengthen Ferracute so it would be ready to supply the military’s needs when the war began. He needed to bring in a younger work force to supplement the long-time workers, many of whom had worked for the company for fifty years and more, who had kept the factory going through the depression.
Bass also had to rehabilitate the buildings, which had fallen into disrepair during the lean years. He gave up the generation of electricity to purchase power from the public utility at half the cost. At the machine shop, he repaired the roof and fixed broken windows. He installed a new boiler and piping to the blowers to heat more efficiently, and devised a system of dumping coal from railroad cars directly into a bin to be automatically fed to the boiler. He remodeled the interior of the office building, installing fluorescent lighting and linoleum on the floors.  

The transition was not easy, and before the economy began to turn around, at one point Bass was forced to put his personal car up for collateral to borrow money for payroll. The company, along with the rest of the country, gradually pulled itself out of the depression, with sales of presses slowly increasing: 155 in 1937, back down to 50 in 1938, 88 in 1939, and, finally, 223 in 1940, almost back to the level of production in 1930.

The plant equipment was also slowly replaced with more modern machinery during Bass’s first years of ownership. In 1939, Ferracute began to manufacture high-speed punching presses for Super Speed Press Corporation, presses that could produce parts at a rate five times that of a conventional press. George Bass eventually acquired the Super Speed Press Corporation, and both manufactured and sold the presses from the Bridgeton plant.

**WAR EFFORTS**

During World War I, one of Ferracute’s largest presses, weighing more than fifty-eight tons, had been used for producing ammunition. In addition, many smaller presses had been sold to international munitions manufacturers such as Fenwick Frères, Canadian Montreal Ammunition Company; American munitions companies with international contracts such as Remington Arms Manufacturing Company, Winchester Repeating Arms Company, Western Cartridge Company and Maxim Munitions, and civilian companies doing war production work, such as Gramophone Company, Ltd., Baldwin Locomotive Works, and Neverslip Manufacturing Company, a firm that before the war had manufactured horseshoes.

Ferracute entered production for World War II through a phone call in 1940. H. E. Clive, a US citizen, had been sent by Imperial Chemical Industries to buy as many small-arms ammunition presses as possible to replace the entire English supply of ammunition that had been abandoned at Dunkirk. He invited representatives of five press building companies to meet him in New York. George Bass recalled that Clive told them “that the future of England depended on us; the future of the United States depended on us; the future of Western Civilization depended on us; the future of the world depended on us, and we had to come through. He was exaggerating, but he was impressive.” Ferracute ended up supplying the bulk of the presses that were shipped overseas.

George Bass’s modernization of Ferracute was close to completion at this point, putting it again in a position as a leader in the metalworking press building industry, and allowing it to take full advantage of the opportunities for business brought by the war. Ferracute had become the most completely equipped and modern shop in South Jersey. In 1941, press shipments reached 424, almost double the figure for the year before.

Employment increased during the war from fewer than one hundred in December 1941 to more than seven hundred a couple of years later. In order to train new employees under the demands of deadlines, Ferracute developed a method of breaking jobs down into segments that could be learned quickly, still building on the Parkhurst program from early in the century. Women began to be employed by Ferracute in significant numbers for the first time.

Ferracute had so much work during the war that about one sixth was subcontracted to small machine shops.

War work extended to building and shipping 147 presses to the Soviet Union in 1943 and 1944. Eight of these were the largest presses ever built by Ferracute: 2500-ton toggle embossing presses. The shop floor had to have ten-foot-deep pits excavated in which to build them, as the ceiling of the main machine shop was not high enough otherwise.

By 1943, the war-focused work load began to decline, and George Bass began to look towards the country’s peacetime needs.
**DISOLUTION**

Orders began to climb again in 1945 as deferred peacetime manufacturing began to get under way. Ferracute no longer functioned as the paternalistic company of the early years, and a work stoppage over personnel assignments closed the plant for several days in May 1947. The first authorized strike took place over wages in 1953.

After 1956, annual orders began to decrease, and never again reached one hundred. Over the next decade, orders ranged from a low of 19 to a high of 48. The hundredth anniversary of the firm in 1963 was celebrated quietly, because business was so poor that meeting the weekly payroll was a concern.

In 1961, Ferracute purchased the A. B. Farquhar Division of the Oliver Corporation, a line of hydraulic presses, and moved the operation to the Bridgeton plant. Over the next seven years, about thirty Farquhar hydraulic presses were manufactured.

By the mid 1960s, George Bass was ready to retire, and started looking for a buyer for the firm. Ford Motor Company suggested that the firm be moved to Detroit to be closer to major clients, but Bass did not want to break the century of ties to Bridgeton.

The two-year search for a buyer failed, and on 3 May 1968, the Ferracute and Farquhar lines were sold to Fulton Iron Works Company of St. Louis, Missouri. The sale included the names, trademarks, drawings and some inventory, but did not include the plant or equipment: “After one hundred five years, Ferracute ended its Bridgeton, New Jersey, operations with the shipment on May 27, 1968, of press number 24853, a fifty-ton P 4 punching press, to Utica Tool Company in Utica, New York, which had bought its first Ferracute presses fifty years earlier, during World War I.”

The site was abandoned as far as manufacturing was concerned after the 1968 sale. In the 1970s, it was sold by Fulton, and over the years, it passed through ownership by a series of marginal business enterprises. The site was used primarily for storage in the Main Machine Shop. On 02 November 1993, 970 tons of illegally-stored recycled paper products in the Main Machine Shop was set on fire by arsonists, the fire severely damaged the five easternmost bays. In 2000, Preservation New Jersey included the Ferracute Machine Company site on its annual list of the state’s ten most endangered historic sites. After the fire and the bankruptcy of the owner, the site remained in legal limbo until the City of Bridgeton assumed ownership through tax foreclosure in early 2007.

Fulton continued to manufacture Ferracute presses at least through 1985. In February 2000, Fulton became a wholly-owned subsidiary of South Side Machine Works, Inc., also located in St. Louis, Missouri.

Industrial presses such as those made by Ferracute are not disposable items. An untold number of the hundreds of presses sold during a century of operations are still contributing to the manufacturing industry in the United States and abroad. A recent cursory search on the internet turned up dozens of operational Ferracute presses currently listed for sale, and numerous metal-working companies advertising the possession of Ferracute presses as part of their equipment inventory.

**End of Background and Historical Analysis**
Endnotes

Background and Historical Analysis

1 Arthur Cox and Thomas Malin, *Ferracute: The history of an American enterprise*, Cowan Printing, Bridgeton, New Jersey, 1985: p.18. This work presents the most definitive history available of Oberlin Smith and the Ferracute.

2 Ibid. p. 8.

3 Ibid. pp. 8 – 9.

4 According to the federal census, in 1850, the family was living in Euclid, Ohio, where George was farming; the family then included three children. In addition to Oberlin, there was Frederick (1849 - ??) and Emily (1842 - ??).

5 Cox and Malin, *Ferracute*: p. 9.

6 J. Burkitt Webb left the partnership in 1869 to study civil engineering at the University of Michigan. He went on to teach at the University of Illinois, then to Europe for advanced study. He returned to teach at Cornell, where he was a professor of mathematics, and Stevens Institute of Technology in Hoboken, NJ. He, too, was an inventor, and invented “a floating dynamometer for measuring the power delivered by dynamos and…a dynamophone, which measured the twist of a transmission shaft carrying power.” Ibid. p. 16.


8 Cox and Malin, *Ferracute*: 25.

9 Ibid. 16.


12 Ibid. p. 29.

13 Ibid. p. 25.

14 Ibid. p. 32.

15 Ibid. p. 34.

16 Ibid. p. 47.

17 Ibid. p. 47.

18 Ibid. p. 45.

19 Ibid. p. 48.

20 Ibid. p. 42.
21 Ibid. p. 43.
22 Ibid. p. 49. This relationship lasted until the 1960s.
23 Janvier wrote letters home, as well as an article for Cassier’s Magazine, relating his travels; he was also the subject of articles in Harper’s Weekly and the Philadelphia Inquirer. His story is told in Chapter 5, “Ferracute Goes to China,” in Ferracute: The history of an American enterprise.
29 Cox and Malin, Ferracute: p. 76.
30 Ibid. p. 77.
31 Ibid. p. 77.
32 Conversation with Arthur Cox, 29 January 2006.
33 Cox and Malin, Ferracute: p. 79.
34 Ibid. p. 80.
35 Ibid. p. 81.
36 Ibid. p. 81.
37 Ibid. p. 86.
38 Ibid. p. 86.
39 Ibid. p. 89.
40 Ibid. p. 95.
41 Ibid. p. 99.
42 Ibid. p. 103.
43 Ibid. p. 119.
44 Ibid. p. 121.
46 Ibid. p. 133.
48 Ibid. p. 135.
49 Ibid. p. 134.
50 Ibid. p. 142.
51 Ibid. p. 142.
52 Ibid. p. 49.
53 Ibid. p. 91.
54 Ibid. p. 147.
55 Ibid. p. 149.
56 Ibid. p. 158.
57 Ibid. p. 154.
58 Ibid. p. 156.
59 Ibid. p. 160.
60 Ibid. p. 162.
61 Ibid. p. 167.
62 Ibid. p. 169.
63 Ibid. p. 179.
64 Ibid. p. 180.
65 Ibid. p. 177.
66 Ibid. p. 181.
67 Ibid. p. 182.
68 Ibid. p. 182.
69 Ibid. p. 183.
70 www.fultoniron.net/About_us.html retrieved on 5 April 2006.
INTRODUCTION

The Chronology of Construction section of this Preservation Plan presents a brief overview of the sequence of significant changes to the buildings and the site of the Ferracute Machine Company. This Chronology of Construction is based on documentary research and field investigations.

The Chronology of Construction addresses the:
- Methodology of investigation;
- Overview of site chronology;
- Office building: First Build: Initial construction, 1904;
- Office building: Second Build: Interior alterations, early twentieth century;
- Office building: Third Build: Bass interior alterations, 1937;
- Machine Shop: First Build: Initial construction, 1904;
- Machine Shop: Second Build: North addition, between 1908 and 1915;
- Machine Shop: Third Build: South office, between 1915 and 1923;
- Machine Shop: Fourth Build: Expanded north addition, between 1923 and 1930;

A correct understanding of the construction chronology of a historic building is essential to the rehabilitation, preventive conservation and interpretation of the building to its appropriate period of significance. This Chronology of Construction section provides the information and basis for that understanding.

METHODOLOGY

The chronology of construction for the Ferracute Machine Company was researched and established through the following steps:
- Assembly and review of documentation, including historic narratives, Sanborn Maps, and photographs;
- On-site observations of the structure;
- Comparative study of significant construction details;
- Comparative analysis of evidence yielded from the above investigations.

OVERVIEW OF SITE CHRONOLOGY

The first Ferracute Machine Company buildings on the site were located to the west of the railroad tracks, between the tracks and the east shore of East Lake (figure 3). The conglomeration of buildings had grown in a haphazard fashion between 1873, when the firm moved from North Laurel Street, and 1903. The individual buildings, constructed contiguous to one another to form one large structure, included:
- Offices;
- A building with a machine shop on the first floor and a die shop on the second that also contained the box shop;
- A tool and jig room;
- The forge shop;
- A building with tool storage on the first floor and the pattern shop on the second;
- An erecting shop with square footage comprising over a third of the entire footprint;
- A two-story area of the erecting shop with casting on the first floor and a store room on the second;
- A platform adjacent to a spur of the rail line.
This extended structure burned to the ground on 27 September 1903. Oberlin Smith decided to rebuild almost immediately, but construction did not begin until 1904. The entire plant was relocated to the east side of the rail line, on property already owned by Oberlin Smith.

The new plant constructed in 1904 consisted of two of the buildings that are extant, the Office and the Machine Shop (figures 4 and 9). In addition, structures included a long, narrow building running north behind the Office that contained, at the south end, the pattern shop, pattern storage, and a carpentry shop; the north end housed the dynamo and steam turbines that ran the whole operation. The smoke stack was located in the northwest corner of the building.

A triangular building with rounded corners occupied the space between the Machine Shop and the pattern/dynamo building, and housed lockers for the employees. A blacksmith shop was constructed north of the Machine Shop on the west side, and, just east of the blacksmith shop, was an oil storage house. Three bicycle sheds were located along the fence, east of the Office and south of the Machine Shop.

**OFFICE BUILDING**

**First Build: Initial Construction, 1904**

The Office was probably designed in-house by the Ferracute Machine Company. In form, it is a one-story, brick version of the four-square building, reminiscent of residential design of the period. The brick with narrow joints probably had mortar blackened with a coloring agent to minimize the appearance of the joints. The slate roof splays at the eave line. The windows in the tower (Smith’s office) were surmounted with stained-glass transoms.

The porte-cochere on the south façade provides entrance into a small lobby, with offices to the right and left. To the left is the circular room in the southwest corner that was planned as Oberlin Smith’s office; a weather vane on the peak of the conical roof connected to an indicator on his desk; the office was further enhanced by a fireplace with a carved brick surround. Other spaces on the first floor were comprised of two large rooms east and west, separated by a vault on the north side. A small rectangular room in the southeast corner balanced Smith’s office.

**Second Build: Interior Alterations, Early Twentieth Century**

Partitions in the center of the Office, in the vicinity of the entrance lobby, appear to have been altered after the original construction of the building. The extent of alteration has not been determined. Investigation of the alterations should be undertaken when a more extensive study of the building is prepared.

**Third Build: George Bass Interior Alterations, 1937**

George Bass remodeled the interior of the Office after he bought the company in 1937. The wood floors were covered with linoleum, and the plaster ceilings, with acoustic tile. Fluorescent lights replaced the glass-shaded electric ceiling fixtures. The natural-finished woodwork was painted a light color.

**MACHINE SHOP**

**First Build: Initial Construction, 1904**

The Machine Shop as constructed in 1904 was ten bays long, just two-thirds as long as the current building (figures 4 and 9). The Machine Shop had a rectangular footprint, with no wings, when originally constructed.

The brick, concrete, steel and tile building was intended to be fireproof. Steam turbines connected to dynamos powered the machinery, and the building was heated by the exhaust steam. The skylight that formed one third of the north roof slope lighted the shop floor. The use of individual electric motors was a pioneering approach to powering the machinery, and allowed the installation of overhead cranes because of the absence of power belting.1

**Second Build: North Addition, Between 1908 and 1915**

Between 1908 and 1915, when Ferracute was experiencing growth through sales to the automobile industry, the main Machine Shop was lengthened by five bays, increasing its size by fifty percent (figure 5). The construction was the same as that of the original building.
During the same period, and probably as part of the same building campaign, a masonry and steel wing was added on the north side of the Machine Shop, centered on the long north elevation of the expanded fifteen-bay building. The wing had a sawtooth design, with glass in the north sides, to allow natural light into the factory floor.²

**THIRD BUILD: SOUTH OFFICE, BETWEEN 1915 AND 1923**
A small brick building was constructed to house the office of the production department (figure 6). It was located south of the Machine Shop, and was separated from it by just a few feet. The separation was probably designed as a fire separation, to protect records in the office.³

**FOURTH BUILD: EXPANDED NORTH ADDITION, BETWEEN 1923 AND 1930**
The second major expansion of the Machine Shop occurred between 1923 and 1930, corresponding with a prosperous period for the company, with large annual sales to Ford Motor Company and Chevrolet. To the north of the north sawtooth-roofed wing of the Machine Shop, a frame addition was constructed for steel storage (figure 7). North of the main Machine Shop Building and to the east of the north wing, a brick addition was built to expand the function of the Machine Shop, and, to the north of that, a frame addition was built to house a storage and inspection room.⁴

**FIFTH BUILD: GEORGE BASS REPAIRS, 1937**
George Bass was required to rehabilitate all the buildings when he bought the company in 1937, because of lack of upkeep during the financially difficult years of the Depression. The electric generator was removed, and, at the Machine Shop, the roof was repaired and broken windows were reglazed. A new boiler and more efficient piping to the blowers were installed. A new system of dumping coal directly into a bin that automatically fed coal to the boiler was devised and constructed.⁵

End of Chronology of Construction
End Notes
Chronology of Construction


2 Sanborn Maps, Bridgeton, New Jersey, 1908 and 1915.

3 Sanborn Maps, Bridgeton, New Jersey, 1915 and 1923.

4 Sanborn Maps, Bridgeton, New Jersey, 1923 and 1930.

5 Cox and Malin, *Ferracute*: p. 135.
ANALYSIS OF EXISTING CONDITIONS

INTRODUCTION

The Analysis of Existing Conditions section of this Preservation Plan summarizes the results and methodology of an assessment and analysis of the exterior and interior existing conditions of the Ferracute Machine Company Office and Main Machine Shop buildings. This Analysis of Existing Conditions is based on field investigation, which was limited to observation of exposed surfaces.

The Analysis of Existing Conditions addresses the:

- Methodology of investigation;
- Overview of existing conditions;
- Climate context;
- Site;
- Exterior masonry and foundations;
- Structure and framing;
- Roofing and moisture protection;
- Windows and doors;
- Overview of the interior;
- Building systems.

Observation and analysis of existing conditions provide a basis of understanding the processes of deterioration that act on the historic structure, and the conditions or factors that cause or facilitate these processes. Understanding the condition of a historic structure and the processes of deterioration that result in these conditions is a prerequisite for further research or future repair and restoration.

METHODOLOGY

The existing conditions of the Office and Main Machine Shop buildings were established through qualitative analysis consisting of the following:

- Observation of accessible surfaces;
- Analysis of existing room arrangements and materials;
- Review of the evidence yielded by the above investigation to identify existing conditions, their extent, and the probable factors which caused or contributed to the conditions.

An on-site investigation of the Ferracute Office and Main Machine Shop was conducted on 20 February 2007 by Penelope S. Watson, AIA, Michael C. Henry, PE, AIA, Katherine Switala Elmhurst and Carlos Fajardo. The weather was clear and the temperature ranged from 40 °F to 45 °F.

The on-site assessment consisted of:

- Visual examination of the exterior and interior from grade/finished floor;
- Visual examination of surfaces and materials accessible for observation;
- Narrative and photographic recording of critical conditions.

Please note that bays one through five of the Main Machine Shop have been severely damaged by fire and have been generally assessed as damaged beyond repair. Details of this portion of the building therefore are not reported.

Roofing samples, including tiles and glass, were taken from the Main Machine Shop. There were no samples collected in the Office, nor were areas of the building disturbed for examination of hidden conditions. Additional investigation will be necessary to confirm the extent of the observed conditions.
The information yielded by the above steps was then reviewed in the whole, and the overall condition of the structure was established, along with the processes that caused the conditions.

For each topic, the Analysis of Existing Conditions presents the following information:

- Description of the systems, materials and/or arrangement;
- Description of conditions observed;
- Summary qualitative rating of the conditions, for example: excellent, very good, good, fair, poor, very poor, inadequate or hazardous.

OVERVIEW

The existing conditions that are encountered at any given time in a historic structure are a function of the following:

- Materials of construction;
- Quality of the workmanship;
- Durability of the design and detailing;
- Environmental factors;
- Age and type of service of the structure;
- Subsequent repairs and alterations;
- Quality of maintenance over the life of the structure.

All of the above factors have contributed, in differing degree of importance, to the existing conditions found at the Ferracute Office and Main Machine Shop.

The Analysis of Existing Conditions reports that for the site:

- Potential environmental hazards exist, including Brownfield issues;
- The site has been invaded with vegetative growth which has contributed to building deterioration and poor site drainage;
- Exterior lighting and access control are poor for security purposes;
- Fire apparatus access is poor because of vegetation overgrowth and irregular site surface.

The Analysis of Existing Conditions reports that for the Main Machine Shop:

- The exterior masonry condition ranges from poor to good with notable brick and mortar loss in areas of moisture penetration and saturation;
- A portion of the building (bays one through five) has been heavily damaged by fire and is beyond repair;
- The structural steel embedded in the masonry side walls is exhibiting heavy corrosion;
- Certain base plates of the main structural columns show serious corrosion.

The Analysis of Existing Conditions reports that for the Office:

- The exterior masonry condition ranges from poor to good with areas of notable brick and mortar loss;
- The condition of wood roof and floor framing varies depending on its proximity to water entry.

The Analysis of Existing Conditions reports that for both the Main Machine Shop and the Office:

- The roofing systems are past their useful life and are allowing large quantities of water to penetrate the building envelope and interior finishes;
- Window/roof glazing is either missing, broken or cracked;
- Doors are generally in poor condition with respect to operability;
- Interior finishes are deteriorated in varying degrees depending on proximity to water entry;
- Mechanical, electrical and plumbing systems are damaged, vandalized or deteriorated beyond repair or reuse.

Sketches of the existing building arrangements are included in Appendix A.
CLIMATE CONTEXT

The Ferracute Machine Company is located in the mid-Atlantic region of the United States within the city limits of Bridgeton, New Jersey. The National Climate Data Center (NCDC) published weather data is available for Philadelphia, Pennsylvania, which is approximately 45 miles north of Bridgeton, New Jersey.

Based on NCDC data for 1973 to 1996, Bridgeton’s climate can be characterized by the following conditions:

- Summer median extreme high temperature: 97°F (dry bulb), 78°F (wet bulb), 43% RH;
- Summer median high wet bulb temperature: 93°F (dry bulb), 82°F (wet bulb), 64% RH;
- Winter median extreme low temperature: 6°F (dry bulb), 4°F (wet bulb), 50% RH;
- Median daily dry bulb temperature range: 17°F;
- Mean precipitation:
  - >4.0 inches per month: July;
  - >3.0 and <4.0 inches per month: January, March through June, August, September, November, December;
  - >2.0 and <3.0 inches per month: February and October;
- Freeze-thaw cycles, annual average: 52;
- Ground water temperature: 57.6°F.

The climate may be qualitatively characterized as hot summers with occasional periods of moderately high relative humidity and cold winters with periods of very low relative humidity. On a daily basis, high relative humidity is likely in the morning and evening, especially in spring, summer and fall. Precipitation is relatively consistent throughout the year.

SITE

This report and the accompanying drawings, unless otherwise noted, orient the structures and site of the Ferracute Machine Company by “project” compass orientations. For example, building elevations facing the Commerce Street side are referred to as the south elevations.

The Ferracute Machine Company site is located at 429 East Commerce Street in Bridgeton, New Jersey within the Bridgeton Historic District. The site is located at the intersection of East Commerce Street and North Elm Street. The site occupies 3.77 acres and consists of the following surviving buildings (figure 5):

- Office (1904) 2,000± square feet;
- Main Machine Shop (1904) 30,000± square feet;
- Saw-tooth Roof Machine Shop (c. 1904-17) 5,000± square feet;
- Secondary Machine Shop (c. 1917-30) 5,000± square feet;
- Staging Machine Shop (c. 1917-30) 2,500± square feet;
- Pattern Storage Building (various dates) Near ruin;
- Miscellaneous small structures (various dates) Near ruin.

The site is set on a nearly level lot in a residential section of Bridgeton and is partially enclosed by a wire fabric fence which has been breached at numerous locations. The Office (figure 6) is located on the southwest corner of the site, outside the perimeter fence. An asphalt and concrete path leads to the front of the Office from Commerce Street. A deteriorated asphalt parking lot is located to the east of the Office. The main personnel and vehicular entrance to the site abuts the back of the Office. The Main Machine Shop (figure 7) is located to the northeast of the Office within the perimeter fence; the east side of the building abuts North Elm Street. The site is overgrown with vegetation.

Due to the industrial nature of the property, the site has been identified by other studies as a “Brownfield” site. Hazardous and toxic materials in the buildings or on the site are not addressed by this report.
Electrical service enters the Office above ground from Commerce Street. Locations of other utilities are unknown. There is currently no exterior lighting for security purposes. The site cannot be easily accessed by fire apparatus because of the overgrowth of vegetation and the irregular site surface.

The condition of the site is considered:
- Poor with respect to vegetation and surface drainage;
- Poor with respect to site lighting and access control for security purposes;
- Poor with respect to fire apparatus access;
- Potentially hazardous with respect to environmental issues;
- Indeterminate with respect to utility and subsurface structure locations.

**EXTERIOR MASONRY AND FOUNDATIONS**

**MAIN MACHINE SHOP**
The Main Machine Shop has a concrete slab floor constructed directly on grade, although service pits or utility chases may exist. The floor is presumed to be reinforced concrete and probably has a high live load capability due to the nature of the industrial work. The foundations, presumed to be reinforced concrete, are not exposed and their condition is unknown. The exterior walls are load bearing and consist of brick masonry up to the roof line and steel framing at the gable ends. The exterior masonry is generally in fair condition; sections of the south wall, particularly areas without adjoining buildings, display heavy mortar loss and brick deterioration due to moisture penetration. The stucco finish on the gable ends shows signs of atmospheric and rust staining, but generally appears to be in good condition.

The condition of the Main Machine Shop exterior masonry and foundations is considered:
- Poor to good with respect to exterior brick masonry condition;
- Indeterminate with respect to foundation condition.

**OFFICE**
The Office has a field stone masonry foundation laid in a rubble pattern. From the exterior, the foundation appears to be in good condition. Areas of repointing were noted, particularly along the south elevation. The stone foundation wall is parged on the interior; the parging is deteriorated in many places. Due to the amount of debris in the basement, the condition of the foundation wall from the interior was not assessed.

The exterior walls of the Office consist of brick masonry. Overall, the brick masonry appears to be in fair to good condition with areas of poor condition. There is a substantial amount of brick and mortar loss right above the stone foundation, particularly along the west elevation. Ventilation openings under the windows have been infilled with brick.

The condition of the Office exterior masonry and foundations is considered:
- Good with respect to the stone masonry foundation;
- Poor to good with respect exterior brick masonry condition.

**STRUCTURE AND FRAMING**

**MAIN MACHINE SHOP**
The Main Machine Shop is structurally symmetrical about the longitudinal axis (figure 8). The Main Machine Shop framing includes steel roof trusses, beams and columns, built-up sections which typically have been fabricated from plates and angle sections, joined by rivets and/or bolts. The Main Machine Shop is three structural bays wide and fifteen bays in length. The main columns are located approximately at the quarter span of the transverse section and sidewall columns are partially embedded in the brick masonry sidewalls.

The building suffered fire damage in 1993, which structurally destroyed bays one through bay five (figure 9).
Concrete Floor Slabs
The Main Machine Shop floor is constructed of concrete slabs which appear to be several inches thick. In most locations, the floor is exposed to outdoor conditions due to inadequate roofing and moisture protection. The concrete floor slabs show signs of cracking and deterioration, and the emergence of vegetation.

Main Columns
The main columns are spaced at 20 feet on-center along the length of the Main Machine Shop and support the center roof trusses as well as the rails and longitudinal beams of the center overhead traveling cranes. The main columns consist of four angles fastened via bolts to a steel plate, essentially forming a cross section similar to a rolled W-shape in contemporary structural steel (figure 10). They are in relatively good functional condition. There are four columns, however, that are deformed from impact. Further investigation will be required to determine if the damage has compromised the load capacity of these columns.

All of the main columns have suffered from general corrosion, which is indicated by the presence of uniform rust on unprotected surfaces. The bottom portion of the columns has been coated with yellow paint. Heavy moisture exposure had led to paint deterioration.

The main column base connection consists of four steel angles that secure the main column to the base plate. The base plate is secured to a footing by anchor bolts. The base plate connections show signs of local corrosion. More than half of the base connections display signs of crevice corrosion in the interface between joined plates and sections and facilitated by the presence of moisture retaining deposits such as soil or trash. In these cases, the rust has deteriorated a substantial mass of the anchor bolts, base plates and/or the angles. The rest of the base connections suffer only minor corrosion and are in fair condition.

Sidewall Columns
Sidewall columns are embedded within the brick sidewalls and support the side bay roof trusses and are on grid with the main columns. As a result of embedment in the moisture-retaining masonry sidewalls without protective coating, the sidewall columns have lost significant section, including perforation, due to corrosion. The sidewall columns are considered to be in very poor condition and are probably structurally inadequate in section. In these instances, the masonry may be transferring some of the vertical loads. There are exceptions; a few sidewall columns are in fair condition, exhibiting only surface rust without substantial section loss.

Roof Trusses and Framing
The roof framing was observed from the floor, so more intensive, closer observation is needed.

The roofing system consists of steel trusses fabricated from small angle sections. The center roof truss is supported by the main columns. The side bay trusses are supported by both the main and sidewall columns.

The roof trusses have suffered from general corrosion due to exposure to rain and atmospheric moisture, which is indicated by the presence of uniform surface corrosion. The trusses are laterally braced by channel sections spanning between the panel points of the trusses; these were installed with the flanges upslope, which results in retention of moisture as well as retention of avian guano on the flanges. Between each truss set, three small-section rafters span the roof slope, supported by the side wall and the lateral bracing. On top of the top chord of the trusses and the rafters are set small section purlins, which support the tile roofing system. As described elsewhere, the purlins are partially encased in tile-setting mortar.

The roof framing assembly is likely to have crevice corrosion at the interfaces of joined sections. Impacted crevice corrosion may overstress joint fasteners due to corrosion jacking.

The load capacity of the roof framing system must be checked, especially with respect to the heavy dead load of the roofing system.

The condition of the Main Machine Shop structure and framing is considered:
- Very poor with respect to structure and framing in bays one through five;
- Fair with respect to the concrete floor slabs;
Analysis of Existing Conditions

- Fair to good with respect to the main columns, bays six through fifteen;
- Poor with respect to the sidewall columns, bays six through fifteen;
- Indeterminate with respect to the condition of joints in the roof framing, bays six through fifteen;
- Indeterminate with respect to load capacity, bays six through fifteen.

OFFICE
Direct observation of the structural framing was primarily limited to accessible spaces on the first floor. Due to debris and moisture damage, analysis of structure and framing visible from the basement and attic was not performed.

The first floor ceiling framing typically consists of wood joists at approximately 10" to 12" on center, spanning east-west between load-bearing partitions and exterior masonry walls. The load-bearing walls and partitions are in fair condition despite water damage at specific locations. The majority of the structural framing of the ceiling and partitions has maintained original mass and appear to be in working condition; however, ceiling joists have been notched for plumbing and fire protection piping in various locations throughout the building.

The ceiling framing in Room 100 is not visible due to the ceiling plaster; however, the south walls exhibit signs of extended exposure to moisture, which suggests water damage to adjacent joists. The west wall in Room 103 and the northeast corner of Room 108 exhibits heavy moisture damage which also suggests damage to adjacent joists.

A section of the ceiling joists along the east wall in Room 106 have disengaged from the wall due to extensive water damage, causing the ceiling to partially collapse (figure 11). The rest of the joists appear to be in functional condition. The bearing walls seem to be in fair condition with minor water damage. Joists in the northwest corner of the room are presumed to have water damage based on heavy flaking of paint on the walls and discoloration.

The condition of the Office structure and framing is considered:
- Fair with respect to observable structural framing.

ROOFING AND MOISTURE PROTECTION

MAIN MACHINE SHOP
An exterior roof-mounted stair and catwalk originally provided access to the south slope and ridge of the roof; At present, these are in precarious condition. For this report, observations of the roof were made from exterior grade and from the interior floor level, where the roofing is exposed on the underside.

The roofing consists of two cladding systems:
- An interlocking terra cotta tile system. Typical of the period, the interlocking tiles appear to be engaged with the purlins and secured with copper tie wire. The tiles overlap at the purlins and the joints are squeeze-set with mortar to prevent water entry. A sample terra cotta tile collected from ground level is approximately 16" in length, 8" in width, 1-1/2" thick and weighs 7 pounds.
- Roof glazing panels utilizing several types of glass, based on fragments and spare stock on the Main Machine Shop floor. The roof glazing panels are approximately 19-1/2" wide by 48" long and are roughly 1/4" thick, although some of the glazing types may be thicker. Some glazing panels have embedded safety wire, others do not; some panels appear to be slightly corrugated, others appear to be flat. The glass panels are set on the purlins and the method of fastening is presumed to be metal straps at the base of the panels, but this could not be confirmed. Wire mesh netting has been suspended below the roof glazing, to catch broken glass.

The gable roof has an east-west ridge and long single slopes on the north and south side. The south slope is clad with terra cotta roofing tiles with a small section of roof glazing at the ridge. The north slope is clad with terra cotta roofing tiles over the side trusses and roof glazing over the center truss. The ridge is pierced by one sheet metal ventilator in each of the fifteen bays.
A substantial number of roofing tiles are missing from the north slope. Judging from the color of the underside of the tiles on the south slope, it appears that a campaign of tile replacement was undertaken at some point.

A large percentage of the roof glazing panels are cracked, broken or missing; lack of continuity in the glazing system undermines the stability of the individual panels.

Apart from the obvious losses in the roofing system, a key condition issue is the integrity of the tile fasteners and the safety of the roof glazing. The tile fasteners and glass installation details were not accessible for observation.

Water from the Main Machine Shop roof drains directly to grade; there is no evidence of a previous roof drainage system. The eaves are shallow, and the large volume of roof water runoff saturates the soil and masonry sidewall below the eave.

The condition of the Main Machine Shop roofing systems is considered:
- Good with respect to the integrity of the surviving tiles;
- Very poor with respect to roof drainage;
- Dangerous with respect to roof access system;
- Dangerous with respect to the roof glazing system;
- Indeterminate with respect to the competency of the tile fastening system;
- Indeterminate with respect to the competency of the fastening system for the roof glazing.

**OFFICE**

The Office roof consists of slate roofing on a wood deck. The main roof is pyramidal, and the tower is conical. A brick chimney pierces the southwest ridge of the roof behind the tower. The east, south and west slopes of the main roof are interrupted by hip-roofed slate-faced dormers; the north slope has a ventilator in place of a dormer. A wood-framed, slate-roofed porte-cochere protects the primary entrance on the south façade.

There is a considerable amount of missing slates, particularly near the eave. The roof under the east dormer has started to collapse (figure 12) due to water entry from broken slates. The roofing system is past its useful life and is allowing a large quantity of water to penetrate the building.

Water from the roof drains directly to grade; there is evidence of gutter brackets along the eave, but the gutters are not extant.

The condition of the Office roofing systems is considered:
- Poor with respect to roofing materials;
- Poor with roof drainage.

**WINDOWS AND DOORS**

**MAIN MACHINE SHOP**

*Windows*

Most windows in the Main Machine Shop have metal sash and frames in a four-over-four configuration. The bottom sash opens by pivoting at its center rail. It appears that the top sash is fixed. Some original window openings have been infilled and replaced by metal doors or by arched openings as other buildings were constructed adjacent to the Main Machine Shop. A number of the windows have been covered over by plywood. Much of the glazing is cracked or missing.

The gable ends each have six windows. The center two windows have an eight-over-eight configuration and the flanking two windows have a six-over-six configuration. It appears that the bottom sash opens by pivoting at its center rails and that the top sash is fixed. The majority of glazing is cracked or missing. The metal window frames show signs of corrosion but have retained their integrity and do not exhibit bowing or crushing.
Doors
The location of the original main entrance is unclear. There are double metal doors located on the west elevation that appear to be original. There is a large roll-up door located on the north elevation in bay 15. While the door is modern, the opening may be original due to its proximity to the train tracks. There is also a large opening along the east elevation, which appears to be original to the construction of the five easternmost bays. It appears that the doors may be large sliding doors; however, the doors are located in the damaged portion of the building and were not accessible.

Other doors in the building appear to have been added over time as new wings were constructed. All doors are metal.

The condition of the Main Machine Shop windows and doors is considered:
- Poor to fair with respect to windows;
- Poor to fair with respect to doors.

Office
Windows
The first floor windows in the Office consist primarily of wood double hung sash in a one over one configuration; most double-hung windows feature a transom window above. The upper section of the tower consist of pivoting sash windows set in recessed masonry panels. All windows are currently boarded up. The configuration and condition of the basement and attic windows is unknown as they were not accessible for observation.

The first floor window frames and sash exhibit deterioration and minor water damage. Further investigation is necessary to determine operability. Most of the window glazing is either cracked or missing.

Doors
The main entrance consists of wood double doors, with one glass light each, that open into the building. The doors are operable; however, opening hardware is missing. The doors are currently held closed with lengths of chain secured with a padlock. The bottom portions of both doors show heavy water damage.

Other exterior doors consist of one door at the north end in Room 103 and double doors along the northeast wall of Room 106. The exterior door in Room 103 is a single-leaf wood door that leads to a concrete stoop and stairs. The door has one glass light; however, it appears that the glass is no longer extant. The door is boarded up from the inside with plywood. The exterior doors in Room 106 are wood double doors each with one glass light. It appears that the glass is missing and the openings have been boarded up with plywood. One door is fitted with an automatic closer. The operability of these doors is unknown.

Interior doors are wood laminate which appear to be replacements of earlier doors. Many doors show signs of water damage on the lower portion that impedes their operability. Extant door hardware appears to be original.

There appears to have been a sliding pocket door between rooms 106 and 108. The door is not extant, though part of the track is.

The vault doors are made of heavy gauge steel. Most of the doors’ exteriors are covered with surface rust. The doors are generally operable, though fully closing the doors is impeded by the corroded hinges.

The condition of the Office windows and doors is considered:
- Poor to fair with respect to the windows;
- Poor with respect to doors;
- Fair with respect to the front entrance doors.
OVERVIEW OF INTERIOR

MAIN MACHINE SHOP
The Main Machine Shop has an open plan consisting of fifteen bays, each of which is three structural bays deep. Bays one through five have been destroyed by fire. There are two large traveling cranes, manufactured by Pawling & Harnischfeger Co. in Milwaukee, Wisconsin, that are mounted on steel beams in the central bay. The large cranes travel along the entire length of the building. Smaller traveling cranes are located in the side bays.

OFFICE
The Office was remodeled during the Bass ownership: ceilings were lowered, doors were replaced, linoleum flooring was added and the front entrance hall appears to have been rearranged. The newer ceiling finishes have been removed, but the furring strips are extant. There is more than one generation of wood trim. A previous owner has stripped some of the historic woodwork, such as baseboards, from the building and stored it in Room 106.

The building is currently unoccupied and is filled with trash and debris. Due to debris and moisture damage, an overview of the basement and second floor interior was not performed.

Room 100 and 100A
The main entrance to the Office is located in the center of the south façade on the first floor. The front doors lead into the front hall, Room 100, and alcove, Room 100A. The room consists of painted plaster finishes. The finishes are generally in fair condition with the exception of the south wall which exhibits evidence of moisture penetration.

Room 101
The west side of Room 100 leads into the distinctive tower, Room 101. The room features painted plaster finishes. The finishes are generally in fair condition with minor cracking, patches and staining. There is evidence of moisture penetration on the north wall.

A fireplace is located in the northeast quadrant of the room (figure 13). The condition of the chimney is unknown and may require reconstruction upon further investigation. The firebox and carved masonry surround are in good condition, but the mantel is missing.

Room 102
The door on the north side of Room 101 leads into a small stair vestibule. The stair leads to the second floor.

Room 103
Room 103 is a large room located in the northwest corner of the first floor. The room is accessible through rooms 100, 102, and 105. Room 103 gives access to the north exit and the vault. The finishes consist of painted plaster; however, a substantial amount of plaster is missing at the southeast corner of the room. Also, a large portion of ceiling plaster is missing. The floors contain penetrations near the south wall, which appear to have been used for ductwork.

Rooms 104 and 107
Vaults were constructed at the rear portion of the building and are accessed through Room 103 and Room 106. Rooms 104 and 107 are protected vaults that are secured with reinforced concrete floors, ceiling, and walls. Room 107 is located in the middle of the north wall façade and appears to have been developed after the initial construction of the building. The ceiling and walls appear to have been previously plastered, but the plaster has almost completely peeled away, exposing bare concrete and brick masonry. The entrance to these vaults features heavy gauge steel doors which are covered with surface rust. There is a set of metal cabinets in Room 107 that has lost its function due to extensive corrosion.
**Room 105**
A small hallway, Room 105, connects Room 103 and 106. The hallway is missing large portions of plaster on the south wall and ceiling. The plaster appears to have been removed by a previous owner. The south wall contains a recessed alcove and may at one time have contained a drinking fountain.

**Room 106**
Room 106 is a large room located in the northeast corner of the building. The finishes consist of painted plaster; however, there is a substantial amount of moisture damage along the east wall due to the collapsing roof. The areas in the vicinity of the failed joists are considered unstable and pose a life safety risk. There is also notable moisture damage at the north wall above the vault door.

**Room 108**
To the east of Room 100 is Room 108 which provides a route to Room 106. The ceiling plaster is absent in this room, exposing the ceiling lath. The floor is littered with plaster, trash and other debris. The top of the northwest wall exhibits heavy water damage. The entrance that leads to Room 107 is missing a door and door trim.

**Room 103A and 106A**
Rooms 103A and 106A are in generally good condition with respect to the plaster finishes. There is an electrical panel in Room 106A which seems relatively new and shows no sign of corrosion.

**BUILDING SYSTEMS**

**HEATING AND VENTILATING SYSTEMS**

**Main Machine Shop**
The heating system serving the Main Machine Shop is not extant. Originally, power was provided by electric dynamos driven by steam turbines; the building was heated by waste thermal energy from power generation and fabrication processes. There is evidence of sheet metal ductwork overhead; this may have been for ventilation supply or exhaust purposes rather than delivery of warm air for heating.

The building is equipped with fifteen gravity ventilators, one for each bay. The ventilators are located at the roof peak and are constructed of sheet metal. All ventilators are extant; however, some are missing top caps.

The condition of the heating and ventilating system is considered:
- Inoperable in its current configuration;
- Inadequate due to lack of heating system;
- Indeterminate with respect to ventilation system operability.

**Office**
The original heating system serving the Office is not extant. The original heating system appears to have been a hydronic system consisting of radiators; rectangular patches below the windows show where radiators were once installed. The existing system consists of a forced-air system delivering air through sheet metal ductwork and grilles. The existing system is not operational.

The condition of the heating and ventilating system is considered:
- Inoperable in its current condition and configuration.

**PLUMBING SYSTEM**

**Main Machine Shop**
In its current configuration, the plumbing system at the Main Machine Shop served one restroom located along the south elevation off bay nine. It appears that this restroom was added after the original construction. The restroom fixtures are in very poor condition.

The condition of the Main Machine Shop plumbing system is considered:
• Inoperable in its current condition and configuration.

**Office**
In its current configuration, the plumbing system at the Office served two restrooms, located in the basement, and an automatic sprinkler system. The restroom fixtures are in very poor condition. Sprinkler piping visible from the basement is corroded. The plumbing system is not functional.

The condition of the Office plumbing system is considered:
• Inoperable in its current condition and configuration.

**Electrical System**
Electrical power to the Office is supplied overhead from Commerce Street to the southeast corner of the building. The operability of the existing system is unknown as power has been shut off to the building. Panels visible in the basement are corroded due to moisture. A newer panel was added to the first floor, but final connections were not made.

The condition of the electrical system is considered:
• Inoperable in its current condition and configuration;
• Potentially hazardous.

**End of Analysis of Existing Conditions**
Endnotes
Analysis of Existing Conditions

1 http://en.wikipedia.org/wiki/Electrical_generator, retrieved 09 October 2007: “The Dynamo was the first electrical generator capable of delivering power for industry. The dynamo uses electromagnetic principles to convert mechanical rotation into a pulsing direct electric current through the use of a commutator. A dynamo machine consists of a stationary structure, which provides a constant magnetic field, and a set of rotating windings which turn within that field.” At Ferracute, the energy for the mechanical rotation was derived from steam turbines, fueled with coal.
RECOMMENDATIONS

INTRODUCTION

The three preceding sections have summarized the background, documented history, significance, chronology and existing conditions of the Ferracute Machine Company site. This section, Recommendations, provides recommended strategies for preservation, restoration, or rehabilitation of the building components and systems, as appropriate.

The recommendations are derived from review of the concerns, issues and needs of the City of Bridgeton, as well as of the site’s documented history, the extant architectural fabric, and the existing conditions encountered. The resultant recommendations are intended to satisfy the objectives for a Preservation Plan that:

- Provides good stewardship of the Ferracute Machine Company Office, Main Machine Shop and site as a historic resource;
- Conforms with sound preservation practice and principles;
- Can be implemented through logical phasing.

PRESERVATION/RESTORATION/REHABILITATION PHILOSOPHY AND GUIDELINES

The objectives for preservation of a historic resource should be consistent with the architectural, historical, and cultural significance of the resource. The Background and Historical Analysis concludes that the Ferracute Machine Company site and surviving buildings possess:

- Historical significance at the national level as the site of a company that supplied the presses used in the industrialization of the United States in the late nineteenth and early twentieth centuries, for the part it played in the growing world dominance of American manufacturing in the late nineteenth and early twentieth centuries, and for its contributions to the war effort for both the First and Second World Wars;
- Historical significance at the national level as the site of Oberlin Smith’s invention of the magnetic recording of sound;
- Cultural significance for its pioneering role in the development of “scientific management,” theories that called for the development of the efficiency of each individual worker, and thus the overall efficiency of the manufacturing operation;
- Architectural significance at a local level as an example of the architectural expression of a company of highly-skilled and experienced mechanical engineers.

In the United States, the widely accepted bases for stewardship of historic properties are the Secretary of the Interior’s Standards for the Treatment of Historic Properties, 1995. Conformance with the Secretary of the Interior’s Standards is required for a publicly-owned building on the New Jersey Register under the New Jersey Register of Historic Places Act of 1970, and subsequent regulations, and conformance will help assure the eligibility of the Ferracute Machine Company site for potential grant funding from the New Jersey Historic Trust’s Garden State Historic Preservation Trust Fund program, and for the twenty percent federal Rehabilitation Tax Credit for historic structures.

The Secretary of the Interior’s Standards for the Treatment of Historic Properties, 1995, include (Appendix C):

- Standards for Preservation, which apply to singularly important structures or features which retain significant form, integrity, and materials, and will be interpreted in their historic context;
- Standards for Rehabilitation, which apply to less critical work, such as adaptation of an undistinguished or already altered component to a new use, or possibly for a secondary space within a significant resource;
- Standards for Restoration, which apply to important structures or features which have lost form, integrity, or materials through alterations and are to be depicted as they appeared at a particular period.
of time through the removal of later features and the reconstruction of missing features from the restoration period;

- *Standards for Reconstruction*, which apply when it is necessary to create a contemporary depiction of a missing building to understand and interpret a property’s historic value.

The *Standards* reflect the governing objective that any action to be taken on the building or site should conserve and preserve the extant historic fabric to the greatest extent possible and should provide accurate interpretation to the public. The tendency to make surfaces and finishes "good as new" should be recognized as incompatible with the objective for preservation, as is conjectural reconstruction, even when such sentiments are well intended.

The recommendations contained in this *Preservation Plan* have been developed with the intention of satisfying the Secretary of the Interior's *Standards for the Treatment of Historic Properties, 1995*. Implementation of the recommendations should be performed with the guidance and involvement of an experienced historic preservation professional. Work on the Ferracute Machine Company buildings should be performed by contractors and craftsmen with demonstrated successful experience in historic preservation projects; qualification requirements will vary depending on the type and scope of work to be performed. So that expectations of craft and workmanship are clearly established, “mock-ups” should be utilized to demonstrate proper construction means and methods, and end quality of the constructed work. Implementation of the recommendations should be well documented. When historic fabric must be replaced, removals should be documented, and samples should be catalogued and retained.

Over the long term, a preservation professional should periodically review the recommendations of this *Preservation Plan* against any historical documentation or physical evidence that may come to light and subsequently improve the understanding of the history of the Ferracute Machine Company site.

**APPLICATION OF THE STANDARDS**
The two major extant buildings at the Ferracute Machine Company site were both constructed in 1904. The exterior of the Office has had no major changes since, and interior remodeling has been relatively minor. The 1904 Machine Shop was expanded to its current primary footprint by 1915; subsequent additions were frame instead of masonry, and of secondary quality and importance. Both buildings have suffered significant deterioration through neglect since Ferracute Machine Company was sold out of state in 1968.

The following specific *Standards* should govern for work at Ferracute Machine Company site:

- The *Standards for Restoration* should be applied to the exterior of the Office, and the most significant interior space, Oberlin Smith’s office. The *Standards for Restoration* are applicable to the exterior and Smith’s office because of the high level of integrity of historic fabric and of historic significance they possess;

- The *Standards for Rehabilitation* should be applied to the remainder of the Office interior and the interior and exterior of the Main Machine Shop. The *Standards for Rehabilitation* are applicable to the remainder of the Office building interior because of the alterations these spaces have undergone since their association with Smith ended at the time of his death in 1926; the *Standards for Rehabilitation* are applicable to the interior and exterior of the Main Machine Shop because the features of the structure that convey its historical, cultural and architectural values can be preserved while adapting the large, undifferentiated space for a new, compatible use that will ensure the building’s survival.

**PERIOD OF SIGNIFICANCE**
The determination of the Period of Significance is the pivotal decision in planning for the preservation and restoration of a historic site or structure. The Period of Significance is based on a number of factors, including the cultural importance of the resource and the historical events associated with it, the architectural importance of a structure and its features, the extant architectural fabric and site context, and the availability of information which accurately documents the configuration and changes of the site and building over time. The Period of Significance may be a specific date or a range of dates.
When the history of the Ferracute Machine Company is viewed in the whole, the active use of the property while the company was operating at the present site in the extant buildings between 1904 and 1968 appears as a determining factor for identification of a General Period of Significance. However, the overarching significance of Oberlin Smith’s association with the site indicates a Primary Period of Significance between 1904 and 1926, when Smith died.

**PERIOD OF INTERPRETATION**
The Period of Interpretation is the time frame to which the Ferracute Machine Company site should be preserved and interpreted. The Period of Interpretation should fall within the Period of Significance.

The objective in establishing a Period of Interpretation is to find a date, or dates, that:
- Results in a minimum disturbance and maximum retention of extant historic fabric;
- Can be substantiated by historical or physical evidence in terms of details to be preserved, reconstructed, or restored;
- Avoids conjectural restoration or reconstruction;
- Results in an historic resource that permits accurate public interpretation with respect to its cultural importance and the associated historic events.

The objectives in establishing the Period of Interpretation must be carefully weighed against the existing building, its condition, and the historical and physical evidence.

Based on the above, a Period of Interpretation falling within the Period of Significance should be:
- Circa 1926, the year of Oberlin Smith’s death.

The two primary extant buildings, the Office and the Main Machine Shop, date from 1904, with the sawtoothed addition and five easternmost bays of the Main Machine Shop dating from between 1908 and 1915. The small brick office of the Production Department was constructed between 1915 and 1923. Frame additions to the north side of the Main Machine Shop were constructed between 1923 and 1930.

The proposed 1926 Period of Interpretation would allow the restoration/rehabilitation of the Office to the period of its occupation by Oberlin Smith. For the Main Machine Shop, the 1926 date would allow the removal of deteriorated frame additions on the north side, which were constructed near the time of or after Smith’s death. The 1904 building, and the sawtooth-roofed addition to the north, constructed before 1915, would be rehabilitated. Ideally, the five bays added on the east end of the Main Machine Shop before 1915 would be rehabilitated with the rest of the building, but a fire in 1993 severely damaged the steel framing of these bays; economic expediency may require the demolition of these five bays, which date to within the Period of Interpretation but are not part of the original 1904 construction (figure 15).

**CHARACTER-DEFINING FEATURES**
Conformance with the Secretary of the Interior’s *Standards* requires that the character-defining features of a building be identified and retained to the greatest extent possible.

For the Main Machine Shop, the character-defining features include the following:
- Long uninterrupted roof slopes;
- Glazed roofing, which affects the appearance and perception of the interior space;
- Roof appurtenances, such as ventilators and catwalks;
- Color, modularity, shape and rhythm of the roof tiles;
- Volume and openness of the interior;
- Exposed structural members in the interior;
- Overhead traveling cranes;
- Exterior masonry;
- Fenestration.
For the Office, the character-defining features include the following:
- Form and shape of the exterior including the front and side the *porte cochere* and the turret;
- Brick masonry, fenestration and the slate roof;
- Certain interior spaces, notably the turret rooms;
- Extant interior trim, doors and hardware.

COMMUNITY ASSESSMENT OF ADAPTIVE REUSE POTENTIAL

The Ferracute Machine Company site and surviving buildings have been vacant or underutilized for several decades.

The size and configuration of the Office are well-suited to continued use in its original capacity as an office building, once it has been restored/rehabilitated. It could serve as an office for a public or private entity, either related or unrelated to the adaptive reuse of the Main Machine Shop.

The best adaptive reuse of the Main Machine Shop is more problematic to determine, and this *Preservation Plan* is intended to inform that assessment. As part of the preparation of this *Preservation Plan*, an all-day workshop was held on 25 July 2007 to consider the future reuse of the Main Machine Shop. The approximately thirty invited participants included elected government officials; state, county and city government employees; local historians and preservationists; consultants with various areas of expertise; and interested members of the community. The attendees were asked first to articulate the assets and liabilities of the building. The participants were then divided into four smaller groups, and each group was asked to identify potential new uses.

All ideas were shared with the group as a whole, and participants voted for which ideas they preferred. Finally, the participants were asked what they considered the necessary next steps for the city to move forward with developing the adaptive reuse.

The identified assets fell into six general categories:
- Historic significance;
- Features integral to the site;
- Site location;
- Surrounding infrastructure;
- Potential for economic development in the region;
- Economic opportunities.

Under historic significance, participants mentioned:
- The status as community icon of the building and the site because of association with Oberlin Smith;
- The status of the buildings as a contributing resource in the Bridgeton Historic District.

Contributing features integral to the building and site were:
- Building’s size, and barrier-free accessibility through being single story;
- The building’s high, open interior, with room for insertion of a second story;
- The presence of existing utilities;
- Room for onsite parking;
- The overall size of the site;
- The large south-facing roof, and its potential for the capture and conversion of solar energy.

Site location assets were:
- The accessibility of the site, with frontage on two streets;
- The walkable distance to downtown Bridgeton;
Recommendations

- Location within a county seat;
- Location at a gateway to downtown;
- Location in a residential neighborhood;
- Proximity to bus routes on Rt. 49;
- The potential for other properties in the immediate vicinity to become available for purchase.

Assets provided by infrastructure in the vicinity included:
- Railroad access;
- Connection to the port on the Cohansey River by means of the railroad;
- Location on a state highway;
- The benefit of the East Lake dam having recently been renovated.

The potential for economic development in the region provided further assets:
- The construction of the Motorsports Park in Millville;
- The possibility of light rail coming to the area;
- The potential for the area on the opposite side of Commerce Street, now in the floodplain, becoming green space;
- The presence of Rutgers University in the city, and the construction of the incubator for new food processing businesses;
- The potential for industrial expansion in Bridgeton;
- The current momentum for growth in the county;
- The potential for helping the community with the ripple effect of a tourist-oriented or multipurpose use.

Economic benefits for the development of the site could be provided by:
- Presence in an Urban Enterprise Zone;
- The Smart Growth fit of a historic site in an urban community;
- Possibility of grants from the New Jersey Historic Trust for rehabilitation;
- The involvement of the South Jersey Economic Development District, which can start dealing with obstacles as soon as they are identified;
- The potential for a good employment pool with hiring tax benefits, based on Bridgeton’s demographics;
- The potential for Brownfields funding;
- Current zoning as mid-density residential, and location in a Hope VI Redevelopment Area in which developers can be selected without bids;
- The commitment of the city, the county, and the community in general to seeing the site adaptively reused.

Perceived liabilities fell into the same general categories. Under historic significance were listed:
- Listing as a contributing building on the New Jersey Register of Historic Buildings, which limits what can be done with the building without permission from the Historic Sites Council, including demolition;

Features integral to the site that were seen as liabilities included the:
- Condition of the building, which is on a downward slope and needs immediate stabilization;
- Lack of parking for some potential uses;
- Time that will be required to develop the site and building;
- Potential cost of maintenance and utilities in the long term;
- Overall size of the building;
- Liability of the site for tours in its present state;
- Fact that the site is currently not secured;
- Number of obstacles to development that would have to be overcome in the near future.

A possible liability due to location was:
• The residential neighborhood surrounding the site.

Liabilities perceived due to the surrounding infrastructure included:
• The lack of public transportation and highway access to Bridgeton.

A liability caused by the potential for economic development in the region was that:
• The port on the Cohansey River will not return to industrial use.

Liabilities presented regarding economic opportunities included:
• Necessity of funding for Brownfields remediation;
• The lack of funding advantages of being in a Hope VI Redevelopment Area.

The break-out groups developed a wide array of potential new uses, including:

• Multipurpose uses, such as:
  A theater and shops;
  An office building and restaurant;
  Athletic facility with a pool, gym, tennis courts, roller skating, skate boarding, indoor soccer, play areas, and water related sports on the lake, possibly operated by a gym chain;
  A mixed use including condos;
  A multi-use carrying out the industrial theme;
  A transit village: mixed use including access by light rail, a terminal, parking, and residential use around site;
  Light industrial and rail;
  A public/private mixed use providing amenities that capitalize on other activities in the county such as the Motorsports Park;
  Artists center providing living space, studio space and retail space;
  Commercial use on the ground floor with apartments at a second level.

• Single purpose uses, such as:
  Event and exhibition space;
  Industrial incubator space;
  Rail hub;
  A park area tied into geo-thermal and solar energy generation, selling excess electricity;
  Interior commercial strip mall;
  Minor league baseball stadium;
  Expansion space for Rutgers’ Food Innovation Center.

• Uses with an education theme:
  Culinary school;
  Ecotourism Mesocosm, which would attract tourists and school groups;
  Hands-on science center with an industrial theme for children.

Several ideas revolved around a green theme that would be combined with other uses, including the possibility of self-generation of energy by locating windmills on the property and developing solar energy.

The ideas were combined into related themes, and participants voted on those that were preferred or considered the most viable. The themes, in order of preference, were:
1. Mixed use: commercial/residential, cultural/residential, or light industrial/commercial/retail; restaurants were a favored addition to any use;
2. Education theme: vocational high school, Mesocosm, Please Touch museum;
3. Energy generating sustainable energy theme (combined with another base use);
4. Industrial theme;
5. Mixed use: residential/studio/performing arts/tourism;
6. Public attraction: museum, eco-tourism;
7. Recreational: mixed use gym and water related activities.
Finally, the participants discussed what is needed to move forward with the project. Suggestions for the short-term included:

- Stabilization and securing site to allow time for thoughtful development;
- Short term solutions: better signage, signature tourist signage;
- Looking for base hits, not grand slams, in the short term.

Longer-term issues included:

- Understanding title issues;
- Identification of hazardous material, to determine restricted or unrestricted use;
- Market research on preferred uses;
- Buy-in from stake holders – city, county, state, federal, residents;
- Understanding land use permitting issues;
- Brownfields Task Force;
- Historic status: New Jersey Register Act – needs state review for any activity (use or resale);
- Historic status: opens funding sources: Federal tax credit (20%);
- Structural evaluation;
- Transit village: improving transportation access;
- Link to existing sites;
- Develop interpretive signage soon;
- Need a champion (locally);
- Need a partner (with $$);
- Partner such as Smithsonian, Franklin Institute.

ARCHITECTURAL ASSESSMENT OF ADAPTIVE REUSE STRATEGIES

The uses preferred by the participants of the Workshop were analyzed for the means by which they would best be accommodated by the structure of the Main Machine Shop. All the uses were based on the asset provided by the large, open volume of the building; individual uses would either make use of the whole space as is, or require construction within the shelter of the roof.

Because of the configuration of the building as an overarching shelter with proposed new construction inside, none of the suggested uses was found, in theory, to be incompatible with the historic structure. Specific appropriateness and compatibility will depend on the actual design for the use that is ultimately determined.

The only caveat at this point is for the seventh use, the recreational mixed use with water related activities. The site as it is now configured does not have water access, and an analysis has not been performed on the potential for the city acquiring water access contiguous to the existing site.

From an architectural and engineering standpoint, the adaptive reuse of the Main Machine Shop can be approached under the use/design strategies discussed below. These strategies assume the removal of bays one through five, leaving the intact portion the building at roughly 98 feet wide by 200 feet long with a footprint of approximately 19,600 square feet.

- The “Big Shed” Strategy
  The Main Machine Shop would be restored/rehabilitated as a weather-tight and rain-tight shell and would be minimally heated, possibly ventilated, but not air conditioned.

“Big Shed” uses would be similar to the original use, characterized as follows:

- Uses that require shelter from weather, but do not require interior environmental management for sedentary comfort of occupants;
- Uses that require high overhead clearances, and a flat floor minimally interrupted by columns;
- Uses that require diffuse natural light;
• Uses that require overhead lifting capability.

Such uses might include:
• Metal fabrication;
• Industrial education;
• Vehicle, heavy transportation or agricultural equipment storage, sales and servicing;
• Outdoor or quasi-outdoor fitness or sports centers;
• Outdoor or quasi-outdoor recreational and entertainment activities;
• Headhouse for light rail or bus/rail transit station.

**The “Buildings under a Big Shed” Strategy**

The Main Machine Shop would be restored/rehabilitated as a rain-tight shell which would be ventilated, but not heated or cooled. The Main Machine Shop would accommodate a combination of one-story and two-story, free-standing buildings, erected within the shop, possibly with open areas such as mezzanines and courtyards that would be protected by the “Big Shed.” As a design concept, it is important that the free-standing buildings allow the interior spatial and volumetric qualities of the Main Machine Shop to be perceived and enjoyed by those using the buildings.

The free-standing buildings would be insulated, heated and cooled as needed for occupant comfort; the exteriors would be protected from the weather by the “Big Shed,” reducing some of the construction and maintenance costs for the roofs and walls of the free-standing structures.

With “Buildings under a Big Shed,” the potential uses would be only be limited by the available footprint of space under the “Big Shed.” Thus, potential uses within these free-standing buildings might include:
• Offices;
• Retail;
• Food services;
• Residential, including hotels;
• Indoor entertainment and recreation.

Concept sketches of this approach are included in Appendix B.

There are ample precedents for the “Buildings under a Big Shed” approach in the rehabilitation of large industrial buildings for new uses. Several structures at Charlestown Naval Shipyard in Boston, Massachusetts are examples.

**The “Buildings under Skeletal Shed” Strategy**

The Main Machine Shop would be stripped to its essential structure, with vestiges of the roof tiles and roof glazing left on the frame. The frame, unprotected from the atmosphere and weather by the removal of the roof, would be painted to resist corrosion. The open-structure frame would span over a combination of one-story and two-story, free-standing buildings.

The free-standing buildings would be complete, conventionally-constructed free-standing buildings. They would be weather-tight and rain-tight, since they would not be protected from the weather by the roof of the Main Machine Shop. They would also be insulated, heated and cooled as needed for occupant comfort. The disadvantage of the “Skeletal Shed” compared to the “Buildings Under a Big Shed” is the lack of roof protection for the buildings and the pedestrian areas between the buildings.

With “Buildings under Skeletal Shed” strategy, the potential uses would be similar to those of the “Buildings Under a Big Shed” strategy. Thus, potential uses within these free-standing buildings might include:
• Offices;
• Retail;
• Food services;
• Residential, including hotels;
• Indoor entertainment and recreation.
• **Preservation Considerations**

From the standpoint of conformance with the *Secretary of the Interior’s Standards for Rehabilitation*, and eligibility for funding and tax credits, the above strategies would be ranked as follows:

- “Big Shed;”
- “Buildings Under a Big Shed;”
- “Buildings Under a Skeletal Shed.”

The last strategy, “Buildings Under a Skeletal Shed” was successfully employed under a major historic rehabilitation tax credit project in 1984 at St. Louis, Missouri, Union Station. However, it may not be acceptable under current National Park Service interpretation of the *Standards*. Therefore, this approach, if used, would require careful coordination with the New Jersey Historic Preservation Office and the National Park Service.

To help visualize the potential for adapting the industrial space for a new, public-oriented use, photographs are included of the Erie Maritime Museum, a State of Pennsylvania museum in a former steam-powered electricity generating station (figures 20 and 21).

**LIFE SAFETY AND CODE REQUIREMENTS**

Preservation and rehabilitation of the Ferracute Machine Company buildings must conform to the requirements of the *Rehabilitation Subcode* (New Jersey Administrative Code, Title 5 Chapter 23 Subchapter 6, of the *New Jersey Uniform Construction Code*), which references the *2006 International Building Code*. Because the Office and Machine Shop are contributing buildings in the Bridgeton Historic District, they are eligible for exceptions to the *Rehabilitation* code under 5:23 – 6.33 Historic Buildings.

Under the New Jersey Rehabilitation Subcode, it is not necessary to bring an existing building into compliance with the building code for new construction, though new or replacement work must conform to the *Rehabilitation Subcode* or other codes for new work. However, meeting certain life-safety requirements is recommended. When compliance with specific requirements of the Rehabilitation Code is difficult, it is necessary to develop code conformance strategies that satisfy the life safety intent of the code through alternative means. Building codes represent the minimum requirements for life safety of the occupants; each building, historic or non-historic, must be evaluated to address its specific risks, based on factors such as the characteristics of the building, its occupancy and its use.

The Office was last used as an office building, and will probably maintain that use in the future. The Main Machine Shop was last used as an industrial building; a new use has yet to be determined. A detailed code review cannot be performed for either building until the future uses are decided.

**BARRIER-FREE ACCESSIBILITY**

The Office’s design and construction predate concerns for barrier-free access. The primary entrance is about five steps above grade, or thirty-five to forty inches. Because of the original use of the Main Machine Shop, which involved movement in and out of heavy materials and equipment, the floor is at grade.

The Americans with Disabilities Act allows exemptions for a historic building eligible for national, state, or local register listing, in areas where full compliance with the guidelines would threaten or destroy the historic significance of the building or features of the building. If these exemptions are not enough to negate the threat to or destruction of historic significance, then there is a possibility of further exemption from the requirements. The State Historic Preservation Officer is charged with making the determination as to what will threaten or endanger historic significance.
In addition, the New Jersey Uniform Construction Code, Barrier-Free Subcode, requires compliance with ICC/ANSI A117.1-1998 in alterations or new construction.

Reasonably convenient access could be provided to the first floor of the Office by construction of:

- A barrier-free parking space on the east side of the Office;
- Construction of a ramp to the door on the east side, and barrier-free circulation within the first floor. If the full rise above grade is achieved with a ramp, the ramp will have to be thirty-five to forty feet long, not counting landings. Careful site planning can manipulate the exterior grade so some of that rise can be achieved through a sloped sidewalk, at a ratio of 1:20 or less, to minimize the length of a ramp.

Whatever the new use is chosen for the Main Machine Shop, if the existing floor level is retained, barrier-free access will be easily achieved at an entrance from any side.

TECHNICAL RECOMMENDATIONS

The following are general technical recommendations for the preservation/restoration/rehabilitation of the Office and Machine Shop of the Ferracute Machine Company.

SITE

- **Immediate Stabilization**
  The City of Bridgeton has been making an effort to control the vegetation since taking over ownership of the site earlier this year. This effort should continue, with an ongoing program of site clearing to open and maintain clear access for fire apparatus, and to prevent vegetation growing up to and on the building; vines attached to the building that have previously been cut off at their roots should not be pulled off the building, as this may pull off bricks along with the vegetation.

- **Minimum Probable Scope of Work for the Site**
  Recommendations for site improvements will need to be addressed once new uses for the buildings have been determined, and are beyond the scope of the Preservation Plan. General improvements that should be anticipated include: lighting; vehicular circulation; parking; pedestrian circulation, including barrier-free paths of travel to the buildings; signage; and drainage.

MAIN MACHINE SHOP

- **Immediate Stabilization**
  The Main Machine Shop requires immediate stabilization to protect it from further deterioration, regardless of future use strategy.

  Stabilization should include the following actions, all of which will require review and approval of the New Jersey Historic Preservation Office:
  - Careful disassembly of the fire-damaged framing and the masonry walls;
  - Erection of a temporary end wall at the point where the fire-damaged bays have been removed;
  - Careful disassembly of the remaining roof glazing and installation of temporary roof cover in the open areas of the roof;
  - Surface grading to carry roof water run-off away from the building;
  - Removal of debris and trash from the interior;
  - Securing at-grade windows and openings from entry.
• **Further Investigation**
  There are a number of questions about the condition of the building that cannot be addressed under this *Preservation Plan*. These issues may substantially impact construction costs, and therefore solutions are required to advance the definition of the project.

Further investigation is required and includes, at a minimum:
- Survey and assessment of the structural frame using a high-reach personnel lift to determine the extent of corrosion and its impact, if any, on load capacity;
- Survey and assessment of the terra cotta tile roof from the underside to determine the condition of the tie wires and fastening system, which are key to retention or replacement of the roof;
- Survey and assessment of the roof glazing system to determine the method of support, fastening and weatherproofing;
- Survey and assessment of the structural framing embedded in the masonry walls;
- Testing for presence of lead paint on the frame and asbestos in the tile mortar;
- Evaluation of the feasibility of retention of the overhead cranes as static, non-functional objects.

• **Minimum Probable Scope of Work for the Main Machine Shop Rehabilitation**
  The rehabilitation of the Main Machine Shop will probably include the following scope of work at a minimum:
  - Abatement of lead paint and asbestos, the extent of which will depend on the future use;
  - Repair of select structural members or joints that have been compromised by corrosion;
  - Replacement of the roof glazing system;
  - Repair of the terra cotta tile system on the roof (replacement will depend on the condition of the supporting steel purlins and the tie wires);
  - Masonry restoration of the brick walls, and, in some instances, reconstruction;
  - Resurfacing of the floor;
  - Window and door restoration;
  - Limited systems for lighting and ventilation of the “Shed,” depending on the adaptive reuse strategy;
  - Reconstruction of a permanent east end wall, possibly reusing elements from the extant east wall.

In the “Buildings Under a Big shed” and “Buildings Under a Skeletal Shed” strategies, there would be new construction of the free-standing buildings. This work would be defined by the proposed use, and would be conventional construction, not restoration work.

**OFFICE**

• **Immediate Stabilization**
  The Office has recently been shored from the basement up to the second floor joists on the east side in the location of damage from water entry, improving the stability of the structure, and the obvious roof leaks on the east that permitted water entry have been patched on a temporary basis to halt further damage. A representative of the city should observe the interior and exterior on a regular basis, and undertake temporary repairs when needed, to halt further deterioration before it accelerates.

During recent investigation of the building for this report, the plywood securing the front door was removed by city employees to provide access. Currently, the front entrance double doors are chained together, and the openings where the glass is missing has plywood patches. However, this arrangement is not as secure as the full plywood boarding that was previously in place. The previous system of plywood should be reinstalled to guard against squatters attempting to live in the building, as has happened in the past. Potential unauthorized access into the building poses an extreme fire risk, either through accidental fire started by vagrants trying to keep warm, or through arson by vandals. The city should institute a brief but regular inspection program (once or twice a week), to ensure that the security of the building is not being compromised on the sides of the building that are not visible from the street.
FOUNDATIONS AND BUILDING ENVELOPE
The stone foundation should be spot repointed both above grade and to one foot below grade. The brick masonry requires more extensive repointing. It will be necessary to replace some of the spalled and disintegrating brick on the west elevation.

Repointing the brick will require a highly-skilled mason because of the narrowness of the mortar joints. Great care must be taken when the joints are cut back to avoid chipping adjacent brick. All joint cutting must be done by hand, and not mechanically. Preparation of the joint for repointing is important; cracked or unsound mortar should be carefully removed (minimum depth 1.0 to 1.5 times the joint width) without damaging the adjoining masonry.

The repointing mortar mix should be formulated to match the existing historic mortar, as found in protected areas such as under the porte-cochere, in color, texture and detailing; the design process should include analysis of mortar to be matched. The new mortar should be as soft, or softer, measured in compressive strength, as historic mortar. Repointing mortar should be damp cured to prevent shrinkage cracking or loss of bond with the masonry. Specific requirements may be established by the specifications; mock-ups and periodic observation will improve the end result.

STRUCTURE AND FRAMING
Joists that have been subjected to damage by water entry will need to be replaced or reinforced to return the framing system to its full load-bearing capacity. The ends of joists that are now concealed by finishes but that appear to have been subjected to water damage should be investigated at the time the rehabilitation is designed, and replaced or reinforced as found to be required.

When the adaptive reuse for the building is determined, the framing should be analyzed for load-bearing capacity. The required load for office use is 50 psf; other uses may require increased capacity. Joists should be reinforced as required to meet the determined capacity. Reinforcement of the first floor can be achieved by increasing bearing points in the basement. Reinforcement of the second floor could possibly be accomplished by inserting steel reinforcement in the ceiling of the first floor. The reinforcement will have to be designed as part of the rehabilitation.

ROOFING AND MOISTURE PROTECTION
The slate roofing is failing, and endangering the survival of the building. The slate roof needs to be replaced in its entirety. The slate roof is an important architectural feature, and it should be replaced with care to match the historic roof in respect to slate color, size, spacing and detailing.

Appropriate flashing should be constructed at the chimney and all other roof penetrations, as well as at ridges and valleys, at the time of roof replacement. New flashing should be fabricated from terne-coated steel or copper.

The weathervane at the pinnacle of the conical roof has historical significance for its particular association with Oberlin Smith, who had it installed so he could determine the direction of the wind from an indicator in his office. When the roof is replaced, the weathervane and its operating system should be restored and made operational.

EXTERIOR TRIM
Wood trim should be scraped prior to recoating, and areas of damage repaired to match the existing. The exposed wood should then be treated with a wood preservative. Sound trim should be retained as far as is feasible, and dutchmen inserted to replace deteriorated material. Small areas of deterioration can be consolidated and filled with epoxy. Replacement trim should be of a wood identical in size and profile, using durable wood species.
**Exterior Finishes**
The Office would benefit from sampling and testing exterior coatings that could provide information about the color of the trim at the Period of Interpretation. Coatings should be tested for lead content, which may impact removal precautions, protection, disposal and methodology. Wood surfaces should be scraped and repairs made before the wood is recoated. The paint colors selected should be compatible with the Period of Interpretation.

Proper preparation of the substrate is essential to a painting campaign. Existing coatings that are peeling or alligatored should be removed by chemical means, or by scraping down to adhered surfaces.

Under no circumstances should paint be removed by means of heat, including heat plates, heat guns, or open flames. Old buildings have accumulations of dust and debris behind wood members that can ignite from paint-removal heat sources, even though the wood itself appears to be unaffected. The debris can smolder for extended periods of time, long after workmen have left the area, and eventually ignite building material.

**Windows and Doors**
The frames of all windows, including the stained-glass transoms in Smith’s office, should be restored. The original sash should be retained; deteriorated wood should be consolidated. Sash or select members of the sash should be replaced where repair is not possible. Replaced members should match existing sizes and profiles and be constructed from deterioration-resistant hardwood.

The transoms in the tower that originally held stained glass are now boarded up on the inside and the outside. There is a good possibility that the original stained-glass sash are extant behind the boards. When rehabilitation is being designed, their existence should be investigated. If they are intact, they should be restored by a stained-glass conservator. If they are extant but beyond repair, they should be replicated by a stained-glass conservator. Restoration or replication of the stained glass is recommended due to the high historical significance of the tower room because it was Oberlin Smith’s office.

Transoms over the exterior windows in the rest of the building originally consisted of leaded squares of ribbed glass. At least some of these transoms are extant. Care should be taken to retain and restore all such transoms that survive. If some are missing, ideally new transoms should be fabricated to match the original surviving ones. If the cost of replicating missing transoms is prohibitive for the project, the extant transoms should be reused on the more visible elevations of the building on the south and east, and plain, unleaded transoms reconstructed for the less visible elevations on the west and north.

Generally, historic glass should be retained wherever it has survived. Broken or missing glass can be replaced with new commercial glass.

The historic double doors on the south elevation should be restored under shop conditions. Wood, such as in the lower rails, that is severely deteriorated can be replaced with the same species of wood as the existing. Repairs must be made with care. The doors and door frame should be returned to their original finish, which may have been natural; if the doors are not painted, repairs will be visible if not well constructed.

Missing and non-historic doors should be replaced with replica doors to match historic doors, on the exterior and Oberlin Smith’s office, where the Standards for Restoration apply; historically-appropriate doors should replace the modern flush doors in the rest of the interior where the Standards for Rehabilitation apply.

**Interior Spaces**

*Primary Space: Oberlin Smith’s Office*
The tower office is the most significant space, and should be restored rather than rehabilitated. Plaster should be retained and repaired; this is particularly important because of the curvature of the walls, which cannot be easily duplicated with gypsum wallboard.

In addition to the above-mentioned weathervane indicator and stained-glass transoms, another significant feature is the molded brick fireplace. The brick is in generally good condition, and should be preserved. The
mantel is missing, and before restoration there should be research to determine the appearance of the original; there appears to be some evidence in the outline of the paint regarding the profiles. It will not be necessary to make the fireplace operable. The fireplace should not be used after restoration because the building is too significant to be exposed to the resultant risk of fire.

The linoleum should be removed from the floor and the original floorboards should be hand scraped and hand sanded, then refinished. Refinishing should not be done by mechanical sanding, as it will remove too much of the historic material, and will leave gouge marks on the wood.

Paint should be stripped from woodwork such as door surrounds and the baseboard, and the natural stain and finish restored to the wood.

The historic color of the paint on the plaster should be investigated, and the plaster should be recoated in the historic color.

**Secondary Space: Vestibule**

The vestibule inside the primary south entrance is a secondary space, both because it is the first area seen on entering the building, and because it provides access to Oberlin Smith’s office. The room can be rehabilitated rather than restored, but it should be done in a manner that reflects the historic appearance of the space, and preserves remaining historic fabric.

Plaster on the walls is in relatively good condition and should be retained and repaired. Plaster on the ceiling, which is damaged, can be replaced with gypsum drywall. Woodwork should have paint removed and be returned to the historic natural finish.

The preferred treatment for the floor would be to have the modern floor covering removed and the floorboards restored as described for the office above. However, an acceptable solution would be to carpet the floor, preserving the historic floor beneath.

**Tertiary Spaces**

The rest of the first floor and the second floor can be considered tertiary spaces, and can be rehabilitated rather than restored. Insofar as it is feasible, the original room layout should be preserved, as well as historic materials such as plaster and trim. If necessary for the new use, supplementary partitions can be added, but the historic partitions should be left in place.

A previous owner has removed a large amount of plaster from the walls in some of these rooms; instead of having these rooms replastered, gypsum drywall can be substituted. Plaster that is in good condition should be retained, instead of being removed and replaced with gypsum drywall. Ceilings that are damaged can be rehabilitated with gypsum drywall.

Floors can be carpeted, but the historic wood floors should be left intact underneath.

Rather than refinish the wood trim, trim can be scraped and painted a color that corresponds to the original natural finish.

**BUILDING SYSTEMS**

**Heating, Ventilating and Air Conditioning (HVAC) Systems**

New conventional heating, ventilation and air conditioning systems are required throughout the building. Primary heating and cooling equipment can be located in the basement, and air handling and ductwork distribution can be installed in the attic and the basement.
**Plumbing System**
The extant restrooms are in the basement and are beyond salvage. A new barrier-free restroom will have to be located on the first floor to make the building accessible. Additional new restrooms can be built in the basement, depending on the requirements of the new use.

**Electrical System**
The electrical distribution, branch circuit, power, lighting and telecommunications systems must be replaced throughout and will depend on the building use.

**Intrusion and Fire Detection and Protection Systems**
Modern fire detection and intrusion detection systems will be required throughout. A fire protection sprinkler system is strongly recommended and would be easy to retrofit, given the extent of interior work in the building.

**PROJECT PHASING AND CONCEPTUAL COSTS**

**Conceptual Costs**
The conceptual costs of implementing the recommendations outlined in this Preservation Plan will vary with time and sequence of implementation and the method of execution. Construction and rehabilitation costs are very sensitive to the scope of the project, timing of the contract, and to the variety and number of specialized crafts required. Generally, it will be more efficient to perform all restoration at once rather than over a long period of time.

Given the absence of specific information on future use of the Office and the Main Machine Shop, a detailed cost breakdown is impractical, and possibly misleading.

For the Office, based on recent bidding for similar work in Bridgeton and adjusting for escalation, the conceptual cost for design and construction for rehabilitation would range from $1.75 to $3.0 million (FY2008), excluding hazardous materials abatement and owner soft costs.

For the Main Machine Shop, based on studies for similar buildings, such as historic aircraft hangars, the costs for design and construction, excluding hazardous materials abatement and owner soft costs, would be as follows:

- Immediate Stabilization $250,000 to $500,000 (FY2008);
- Investigation $30,000 to $50,000 (FY2008);
- Minimum Shed Rehabilitation $3,500,000 to $4,750,000 (FY2008);

Free-standing buildings will range from $175 to $275 per square foot depending on use and shed strategy.

**End of Recommendations**
BIBLIOGRAPHY

Bridgeton Evening News, 28 September 1903.

Bridgeton Evening News, 1 December 1903.


Federal census, 1850.


Smith, Oberlin, “The Ferracute And Its Prospects,” Bridgeton Evening News, 03 February 1904

www.fultoniron.net/About_us.html retrieved on 5 April 2006.
### LIST OF ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Area Location Map;</td>
</tr>
<tr>
<td>2.</td>
<td>Site Location Map;</td>
</tr>
<tr>
<td>3.</td>
<td>Sanborn Map, 1903;</td>
</tr>
<tr>
<td>4.</td>
<td>Sanborn Map, 1908;</td>
</tr>
<tr>
<td>5.</td>
<td>Sanborn Map, 1915;</td>
</tr>
<tr>
<td>6.</td>
<td>Sanborn Map, 1923;</td>
</tr>
<tr>
<td>7.</td>
<td>Sanborn Map, 1930</td>
</tr>
<tr>
<td>8.</td>
<td>Bridgeton Tax Map</td>
</tr>
<tr>
<td>9.</td>
<td>Proposed New Plant and Office (1903), Looking North;</td>
</tr>
<tr>
<td>10.</td>
<td>Aerial View (c. 1950s), Looking West;</td>
</tr>
<tr>
<td>11.</td>
<td>Aerial View (2007);</td>
</tr>
<tr>
<td>12.</td>
<td>Office Building, Looking Northeast;</td>
</tr>
<tr>
<td>13.</td>
<td>Main Machine Shop, Looking East;</td>
</tr>
<tr>
<td>14.</td>
<td>Main Machine Shop Interior, Looking West;</td>
</tr>
<tr>
<td>15.</td>
<td>Main Machine Shop Interior, Fire Damage;</td>
</tr>
<tr>
<td>16.</td>
<td>Main Machine Shop Main Column;</td>
</tr>
<tr>
<td>17.</td>
<td>Office Interior, Room 106;</td>
</tr>
<tr>
<td>18.</td>
<td>Office, East Elevation;</td>
</tr>
<tr>
<td>19.</td>
<td>Office Interior, Room 101</td>
</tr>
<tr>
<td>20.</td>
<td>Erie Maritime Museum, Erie, Pennsylvania</td>
</tr>
</tbody>
</table>
FIGURE 1
AREA LOCATION MAP
FIGURE 2
SITE LOCATION MAP
FIGURE 3

SANBORN MAP, 1903
Ferracute Machine Company before September, 1903 fire.
FIGURE 4

SANBORN MAP, 1908
FIGURE 5

SANBORN MAP, 1915
FIGURE 6

SANBORN MAP, 1923
FIGURE 7

SANBORN MAP, 1930
FIGURE 8

BRIDGETON TAX MAP
FIGURE 9

PROPOSED NEW PLANT AND OFFICE (1903)
Looking north. Office at lower left; pattern shop, dynamo and steam plant in long building behind office; employee lockers in triangular building; main Machine Shop at center right; blacksmith shop behind machine shop (north of locker building); bicycle sheds along fence. Oberlin Smith’s home to the left of the smokestack, between railroad tracks and East Lake.

Reproduced from A. Cox and T. Malim, Ferracute: The history of an American enterprise
FIGURE 10

_AERIAL VIEW (c. 1950s)_
Looking west, with Office at far left.
FIGURE 11

AERIAL VIEW (2007)
Office in lower left corner.

Image Courtesy of Google Earth
FIGURE 12

OFFICE
Looking northeast.

Watson & Henry Associates Photograph, April 2004
FIGURE 13

MAIN MACHINE SHOP
Looking east.

Watson & Henry Associates Photograph, February 2007
FIGURE 14

MAIN MACHINE SHOP INTERIOR
Looking west.

Watson & Henry Associates Photograph, February 2007
FIGURE 15

MAIN MACHINE SHOP INTERIOR
Fire damage at east end of Machine Shop.

Watson & Henry Associates Photograph, February 2007
FIGURE 16

MAIN MACHINE SHOP PRIMARY COLUMN
Note: impact damage and corrosion.

Watson & Henry Associates Photograph, February 2007
FIGURE 17

OFFICE INTERIOR
Room 106, east wall.

Watson & Henry Associates Photograph, February 2007
FIGURE 18

OFFICE
East elevation.

Watson & Henry Associates Photograph, February 2007
FIGURE 19

OFFICE INTERIOR
Room 101 (Oberlin Smith’s office). Note survival of brick fireplace, and loss of mantel.

Watson & Henry Associates Photograph, February 2007
FIGURE 20

_Erie Maritime Museum, Erie, Pennsylvania_

Note steam turbine retained as part of museum display, and mast and rigging replica filling full height of space at far end of room.

_Watson & Henry Associates Photograph, September 2007_
FIGURE 21

_Erie Maritime Museum, Erie, Pennsylvania_

Note inserted mezzanine, and retention of overhead crane.

_Watson & Henry Associates Photograph, September 2007_
APPENDIX A

Existing Arrangement Sketches

SK1.1 Office: Plan
SK1.2 Machine Shop: Key Plan
SK1.3 Machine Shop: Partial Plan, Bays 8 through 15
SK1.4 Machine Shop: Partial Plan, Bays 1 through 7
SK1.5 Machine Shop: West End Wall Elevation
SK1.6 Machine Shop: Typical Bay Elevation
SK1.7 Machine Shop: Typical Section
APPENDIX B

Concept Sketches for 25 July 2007 Workshop

SK1.8  Concept Sketch 1
SK1.9  Concept Sketch 2
EXISTING AREA: 23,000 sq. ft.
POSSIBLE OCCUPANCY:
1ST Floor - 11,804 sq. ft.
2ND Floor - 9,036 sq. ft.
TYPICAL CLEAR FLOOR HEIGHT: 10 ft.
APPENDIX C

The Secretary of the Interior’s *Standards for the Treatment of Historic Properties (1995)*
Secretary of the Interior’s  
*Standards for the Treatment of Historic Properties, 1995*

**Standards for Preservation**  
Preservation generally focuses upon the ongoing maintenance and repair of existing historic materials and features rather than extensive replacement and new construction. The “Standards for Preservation” state:

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.
Standards for Rehabilitation
Rehabilitation is the act or process of making possible an efficient compatible use for a property through repair, alterations and additions while preserving those portions or features which convey its historical, cultural, or architectural values. The “Standards for Rehabilitation” state:

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.

2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.
Standards for Restoration

Restoration is the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The “Standards for Restoration” state:

1. A property will be used as it was historically or be given a new use which reflects the property's restoration period.

2. Materials and features from the restoration period will be retained and preserved. The removal of materials or alteration of features, spaces, and spatial relationships that characterize the period will not be undertaken.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate and conserve materials and features from the restoration period will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Materials, features, spaces, and finishes that characterize other historical periods will be documented prior to their alteration or removal.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the restoration period will be preserved.

6. Deteriorated features from the restoration period will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials.

7. Replacement of missing features from the restoration period will be substantiated by documentary and physical evidence. A false sense of history will not be created by adding conjectural features, features from other properties, or by combining features that never existed together historically.

8. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

9. Archeological resources affected by a project will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

10. Designs that were never executed historically will not be constructed.
The Secretary of the Interior’s  
*Standards for the Treatment of Historic Properties, 1995*

**Standards for Reconstruction**

Reconstruction is the act or process of depicting, by means of new construction, the form, features and detailing of a non-surviving site, landscape, building or structure for the purpose of replicating its appearance at a particular period of time and in its historic location. The “Standards for Reconstruction” state:

1. Reconstruction will be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture, and such reconstruction is essential to the public understanding of the property.

2. Reconstruction of a landscape, building, structure, or object in its historic location will be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.

3. Reconstruction will include measures to preserve any remaining historic materials, features, and spatial relationships.

4. Reconstruction will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance of the non-surviving historic property in materials, design, color, and texture.

5. A reconstruction will be clearly identified as a contemporary re-creation.

6. Designs that were never executed historically will not be constructed.
APPENDIX D

Graphics for 25 July 2007 Workshop