

Reclaiming the Daylight Factory:

The Significance of Versatility in the Preservation of Early Twentieth
Century Concrete Frame Industrial Buildings in Dayton, Ohio

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Abstract

Reclaiming the Daylight Factory:
A Critical Examination of Early Twentieth Century
Industrial Buildings in Dayton, Ohio

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The daylight factory, a multi-story concrete frame industrial building that proliferated in the built environment in the early twentieth century, has become industrially obsolete. Despite this current status, the daylight factory is a valuable typology for understanding the American industrial landscape in the early twentieth century. This thesis will detail the daylight factory as an architectural type, its development in the American industrial landscape, and its potential for adaptive use. It will also examine three representative case studies in Dayton, Ohio to explore the particular influence of the daylight factory in a particular historic context. The thesis concludes by determining that the most historically significant element of a daylight factory is the versatile industrial space within and that historic preservation strategies should be sensitive to that characteristic.

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Preface

Industrial architecture is underrepresented in scholarly fields and not widely accepted as an essential component of significant American architectural history. As America becomes more distanced from its industrial past, however, these buildings have lost their original utilitarian functions and must now take on new societal meanings to avoid obsolescence. Their industrial purposes have largely disappeared, so a significant portion of the task of utilizing historic industrial architecture now falls to adaptive use. Industrial buildings call for creative preservation strategies as we work to preserve the historic built environment and its legitimacy as a broad historic record. In particular, this thesis will address the significance of the daylight factory, a concrete frame industrial building from the early twentieth century. The daylight factory dominated the American industrial landscape in the first thirty years of the twentieth century, embodying the ideals of a progressive and innovative American industrial atmosphere, but they are disappearing.

This thesis will detail the national development of the daylight factory and the significant technological advancements that made this architectural type possible. With the foundation of the nationally significant historic context, this thesis will then explore specific case studies in Dayton, Ohio to address challenges for preservation and adaptive use of the daylight factory in a specific setting with a particular historic context. During two research trips to Dayton, Ohio, I was able to tour six daylight factories and visit a variety of archives, collections, libraries, and museums. Exploring Dayton and being able to tour and photograph the physical buildings, majorly influenced the conclusions presented in this thesis. Of the six buildings I visited, I selected three case studies that typify the daylight factory. Even though construction between them spans a mere seven years, these buildings demonstrate a distinct progression in technology, design, and architectural aesthetic. Additionally, their current situations represent an interesting variety of contemporary uses that achieve varying amounts of successful preservation.

This thesis then presents the idea that industrial open space is a historically significant, character-defining trait for the daylight factory. In particular, the space is significant because the technological advancements in the concrete frame were specifically designed to expand and improve the space. Additionally, it was the open space that allowed the daylight factory to be a versatile building type that was able to accommodate the changing needs of industry in early twentieth century America. This thesis then proposes that the most effective way to preserve the historic character of the daylight factory is to preserve the versatility of the industrial space. In other words, new uses that are incorporated should be reversible and allow for continued flexibility and changes in the industrial space.

The existing body of scholarly work and published books about American industrial architecture is limited, but already contains several excellent resources. The literature about the daylight factory specifically is even more limited, and is usually secondary or supportive material toward larger topics such as industrial architectural histories, social histories, biographies, or histories of concrete as a building material. The one major exception is Reyner Banham's *A Concrete Atlantis*, which was the primary inspiration for this thesis topic. Banham sought to lend architectural legitimacy to these underrepresented structures. Using his text as a starting point, I wanted to further explore the historic significance of the daylight factory on its own merit as an architectural type, and address the challenges of preservation and adaptive use they face.

Major shifts away from the social context of America's industrial history has created a general lack of understanding and appreciation for the significance of the daylight factory as an architectural type. It is through their historic context, however, that their significance as a utilitarian structure can be understood and the case for their preservation justified. Daylight factories in Dayton and across the Midwest accommodated dramatic industrial changes during the early twentieth century, making versatility one of their most important characteristics. Through innovative preservation approaches, the versatility of the daylight factory can continue to reflect the significant elements of their historic industrial character and encourage the daylight factory's continued utility.

1. Typology: The Daylight Factory

In his seminal work on American industrial architecture, *A Concrete Atlantis*, Reyner Banham revisited the link between American industrial architecture and the Modern Movement as described by Le Corbusier in, *Toward A New Architecture*. Banham reiterated that American engineers laid the foundation for the Modern Movement, but perhaps more importantly, he argued that industrial forms, like the daylight factory and the grain elevator, represent truly significant American architectural achievements. Banham asserts that these buildings “deserve far more respect and honor than what they currently receive in America,” because “they represent the triumph of what is American in American building art” and are “one of the earliest and most powerful building influences of American building art on the rest of the world.”¹ Banham seeks to lend scholarly legitimacy to these structures, a task inherently difficult due to their utilitarian type.

A daylight factory² is a multistory reinforced concrete frame building with large window spans enclosing a spacious grid of concrete columns on each floor of the interior.³ Although this basic form is identified by Banham as the “daylight factory,” other building types utilized this layout as well, including warehouses and some commercial buildings. Many early twentieth century

1 Reyner Banham, *A Concrete Atlantis: U.S. Industrial Building and European Modern Architecture, 1900-1925*, Cambridge, Mass: MIT Press, 1986: 20.

2 Grant Hildebrand, University of Washington Professor Emeritus and Albert Kahn biographer, disagrees with the use of the term “daylight factory” as presented by Reyner Banham and as used in this thesis. The definition of the daylight factory according to Banham and presented in this thesis is based around the multistory component, the specific technology of the concrete frame, and the resultant large window spans. Hildebrand argues that the term should be reserved for designs that are specifically exploitative of natural light penetration, not simply buildings that possess large windows. He suggests this might include buildings with plans of limited breadth to allow for decent illumination from perimeter windows; buildings with sizable lightwells that accomplish the same effect while allowing for wider overall breadth; or, most dramatically, buildings that use roof lighting to obtain more even light distribution over a plan of indeterminate length and breadth. He asserts that the “daylight” term is not justified by the natural light characteristics of buildings of routine configuration that simply have large windows and is not convinced that this is merely a matter of opinion. By Hildebrand’s definition, the Dayton Motor Car Company building presented as a case study later in this thesis would likely not qualify because it is a relatively square and “routine configuration,” with no additional lighting than the perimeter windows. The two other case studies, Delco Plants 1 and 2 would likely qualify. Delco Plant 1 has a strategically placed lightwell for added daylighting and the first phase of Delco Plant 2 was designed specifically to be of limited breadth and later possessed a sizable lightwell after two major additions.

3 This definition is illustrated through the many examples Banham cites and describes throughout Chapter 1 in *A Concrete Atlantis*, but his initial textual definition describes the type as: “multi-story American industrial buildings with exposed concrete frames, filled in only by transparent glazing; buildings like X-ray images, their very bones on public display.” A few pages earlier, in the introduction, he characterizes the daylight factory interior by describing that Bethune Hall’s “columned interior had a grave pre-Classical regularity that did indeed look as if it might contain some ancient secret law of great architecture.” (Banham, 20, 23, 26)

warehouses were built in this manner because of the form's solid structure and well-lit interiors. The windows proved convenient for many uses and the concrete frame served to make the building more versatile and more easily reused. Many commercial buildings also took advantage of the concrete frame as a means of fire protection. Decorative street facades, usually of brick, were often added to commercial buildings as concrete was not a well-regarded building material. The development of the concrete frame, however, was driven primarily by the needs of the factory. The innovations and specifications of the concrete frame that developed were geared toward increasing the efficiency and utility of the factory building.

The era of the daylight factory represents a relatively small period of time within the larger manufacturing history of the United States. American engineers began experimenting with concrete frames for industrial purposes at the turn of the twentieth century and the technology became obsolete by the mid 1930s. Banham wrote that the classic concrete-framed form of the daylight factory emerged in 1903, reached a "startling and precocious maturity by 1910" and was well on its way to being replaced by the single-story workshed in 1915.⁴ However, Banham's timeline appears to refer to the forefront of industrial building design, rather than the more common use of the form. Evidence indicates that daylight factories continued to be built well into the 1920s, especially for smaller-scale industries.

The architecture of the daylight factory represented a unique period in the industrial world. It was developed at a time when industries began employing more rigorous scientific methodologies. As historian Amy Slaton wrote of this time period, "The routine application of scientific and technical knowledge to production . . . was science working to enhance the productivity of industry; it was also industry offering unprecedented opportunities to scientific and technical occupations."⁵ American industry achieved a reciprocal relationship with scientific processes, working to increase

4 Reyner Banham, *A Concrete Atlantis*, 20.

5 Amy E. Slaton, *Reinforced Concrete and the Modernization of American Building, 1900-1930*, Baltimore: Johns Hopkins University Press, 2001: 5.

efficiency and output for maximum profit gains. The development and refinement of the daylight factory embodied the relationship between science and production through architecture.

Concrete revolutionized the technology and aesthetic of the American industrial building. This building material has long been noted for its compression strength rather than tensile, so early experimenters like François Hennebique (1842-1921) and Ernest Ransome (1852-1917) innovated with the addition of steel reinforcement. This critical innovation allowed the concrete to support itself for greater spans between columns, about twenty feet on average. Reinforcing made concrete a much more versatile material for industry, leading to dramatically open floor plans and significantly larger window spans when compared to the common industrial building just a few years prior. The aesthetic of concrete-framed industrial buildings reflected these technological changes with the structural frame visible on the exterior of the building and windows composing the bulk of the wall surface. Some daylight factories feature decorative detailing or brick inlays, and there are a range of window-to-wall ratios found throughout the type, but despite these aesthetic variations, the daylight factory is strongly characterized by the clear concrete frame surrounding expansive fenestration.

To fully appreciate the innovation the daylight factory represented, it is necessary to briefly examine the prevalent industrial building types in the United States as they evolved. Robert Kohn wrote that in early Industrial America, “manufacturing buildings were mostly modifications in size and detail of the ordinary types of houses”⁶ with wood framing and sheathing that offered tensile strength and elasticity. All-wood industrial buildings held two major disadvantages: combustibility and limited strength. Stone, brick, and tile became the preferred industrial building materials after 1800, though buildings still featured wood framing. About 1810, cast iron was experimented with as a structural material and while it could support wider spans than wood, it was found to be susceptible to fire. About 1825, masonry building systems began to feature “slow-burning” construction,

6 Robert D. Kohn, “Architecture and Factories.” *Architectural Record* 25 (1909): 131.

although the term would not be used until in the 1870s.⁷ The structures were framed with heavy timbers that would char, but not burn.⁸ Thick timbers also had the advantage over cast iron of being cheaper, resistant to vibration, and less prone to defects, and so retained their economic appeal.

As industries continued to expand, both economically and geographically, the buildings to house them increased in size and scope. Within the variety of industrial building types there was very little consistency between the pairing of a building form to an industry type, with textile mills being the one major exception:

Textile production was one of the few industries housed in a standard type of building, the textile mill, which had distinctive architectural characteristics, such as form, size, and even building materials. In other fields, there was no definitive correlation between building name and form. A machine shop was as likely to occupy a floor in a multistory building as a one-story structure.⁹

Some of the most iconographic examples of large mill structures still stand today in Lowell, Massachusetts (Fig. 1.1).¹⁰

In her extensively researched book, *The Works: The Industrial Architecture of the United States*, Betsy Hunter Bradley argues that early industrial buildings up through the late 1800s were designed more empirically rather than rationally. Buildings were conceived and built by a combination of efforts led by manufacturers who knew the processes and specifications needed, with input and support from local part-time carpenters, masons, and building contractors. Because the building plans were flexible and informal, the industrial complexes typically became accretionary, with additions made as needs increased. With the rapid growth of manufacturing and industry, however,

7 Betsy H. Bradley, *The Works: The Industrial Architecture of the United States*, New York: Oxford University Press, 1999: 127.

8 Amy Slaton makes the observation that “The large dimensions of timbers in slow-burning factory buildings presaged the reinforced-concrete skeletons of early-twentieth-century buildings.” (Slaton, *Reinforced Concrete and the Modernization of American Building*, 132)

9 Bradley, *The Works*, 5.

10 The textile mills in Lowell formed the largest industrial complex in the United States by the 1850s, but by the 1920s the industry in Lowell decreased. Fortunately, the buildings were being considered for adaptive use as early as the 1970s, resulting in their inclusion in the Lowell National Historical Park in 1978. Decades of planning and re-zoning followed the initial preservation of the mill buildings, and today the complex of preserved structures includes National Park buildings and a variety of adaptive uses. The factory town of Lowell still stands as evidence of an early boom period of American industry, preserving excellent examples of a distinctive industrial building type.



Fig. 1.1 Mills on the Merrimack River in Lowell, Massachusetts, built c. 1840s. Photo: c. 1908, from the Library of Congress.

by the mid-nineteenth century, more expertise was sought in the design of industrial buildings to maximize efficiency and take advantage of natural resources for lighting and ventilation. Bradley writes:

As the mechanization, automation, and rationalization of the manufacturing process proceeded during the nineteenth century, corresponding changes took place in the design and construction of industrial buildings. Factory building design blended common engineering or building know-how, an empirical approach, with engineering based on rationalized, technological thought and strategic planning. In the course of the nineteenth century, engineering and mathematics contributed to, and then ultimately replaced, the empirical design of engineering structures, including factory buildings.¹¹

11 Bradley, *The Works*, 15-16.

Over the course of the nineteenth century, industrial buildings began to become more standardized. While many earlier industrial factories took on a variety of stylistic appearances with distinctive features like gables, turrets, or towers, gradually buildings became increasingly simplified. For a time, textile machinery firms, insurance companies, and steel suppliers even issued free building plans to customers and clients to increase standardization.¹² Slaton explains: “This practice eventually lost favor as factory design and construction became the responsibility of dedicated experts in the field, but a pattern of planned, standardized physical plants had been initiated.”¹³ Slaton points to the mills in Lowell and other large textile manufacturing centers as prime examples of simplified masonry structures. She elaborates:

Idiosyncratic design could lead to unpredictable erection and maintenance costs and increased fire risk. A simplified floor plan also meant that a building might be convertible to different uses for future owners. . . . [A]s the nineteenth century progressed, many industries and real estate speculators followed the textile industry’s lead and adopted uniform mill structures.¹⁴

Steel became another material used for industrial building, and in the latter two decades of the nineteenth century, steel, cast iron, and wrought iron were all used in industrial construction. It was also during this time that the single-story production shed emerged as an industrial type. Interior trusses not only allowed for wide building spans, but were able to accommodate important industrial machinery like cranes. A particularly notable early example of this is the Berlin Iron Bridge Company’s shop in East Berlin, Connecticut, built 1890-1891 (Fig. 1.2). Because of the relatively high cost of steel, it was selectively used for single building components to take advantage of its strength without the expense of an entire steel-framed structure.¹⁵ By the turn of the twentieth century, however, buildings built entirely of steel became common. Another material innovation at the turn of the twentieth century revolutionized the industrial building trades: reinforced concrete.

12 Slaton, *Reinforced Concrete and the Modernization of American Building*, 132.

13 Slaton, *Reinforced Concrete and the Modernization of American Building*, 132-133.

14 Slaton, *Reinforced Concrete and the Modernization of American Building*, 132.

15 Bradley, *The Works*, 145.

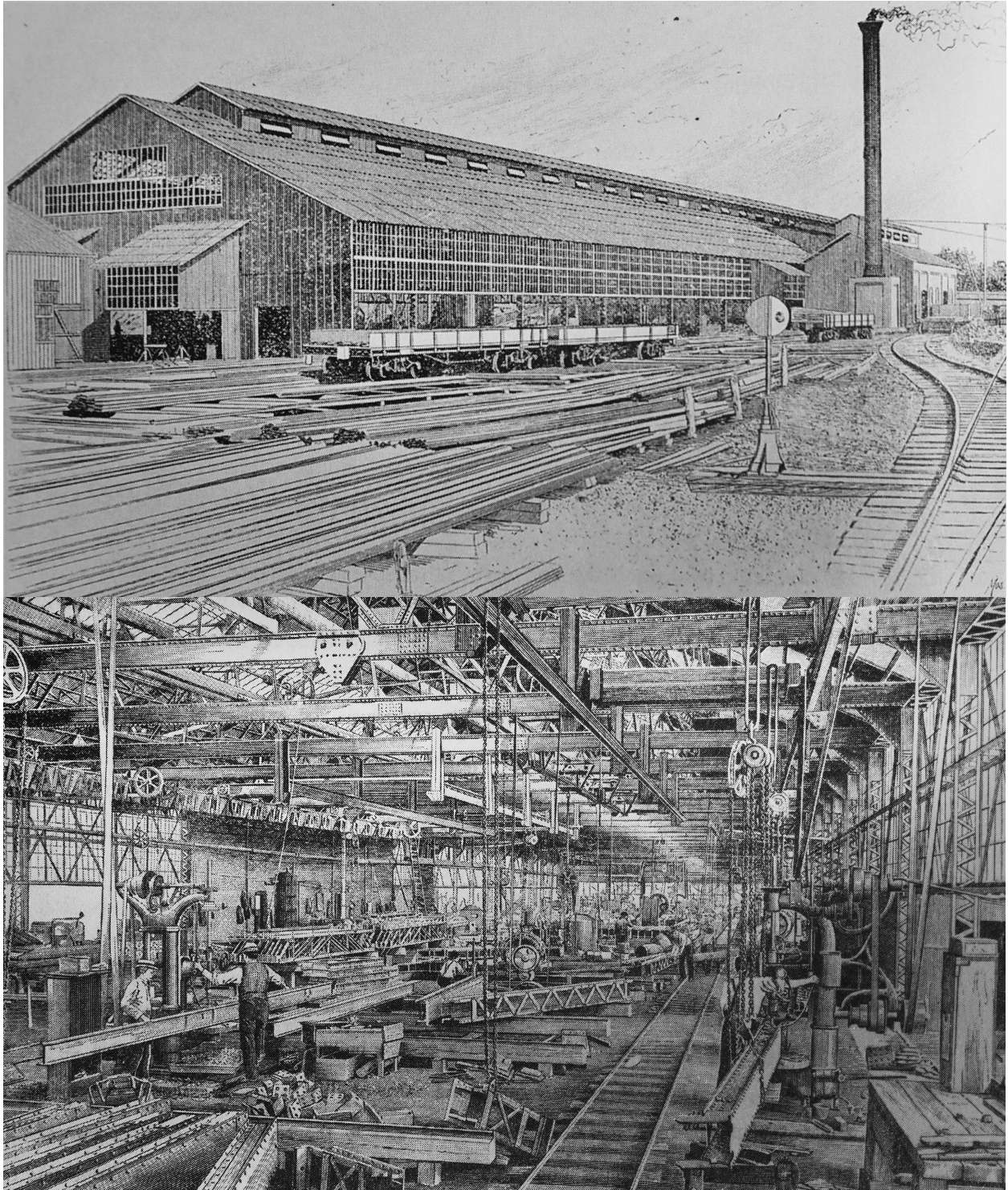


Fig. 1.2 The Berlin Iron Bridge Company Shop exterior (above) and interior (below), built 1890-1891. This structure was 80 feet wide and 400 feet long, framed in iron, and characteristic of an early production shed style building. Interior trusses were a combination of iron and steel. Photos from *The Works*, 150-151.

Building with Concrete

The history and “rediscovery” of concrete as an architectural material in the modern Western world, largely took place in Britain and France. François Cointeraux (1740-1830) experimented with the material as early as the 1780s.¹⁶ The first British patent for Portland cement was secured in 1824 by Joseph Aspdin (1778-1855), a bricklayer from Leeds, England. It would not be until the 1840s, however, that the production process of Portland cement was managed well enough for it to be a reliable material.¹⁷ Beginning in the 1820s, concrete began to be used as a foundation material, especially for civil engineering projects, and in the 1850s it became a more common material for walls and floors in domestic buildings. Several patents were filed in both Britain and France in the 1850s, including the 1855 patent of François Coignet (1814-1888) that included the recommendation of embedded iron ribs or latticework to strengthen the concrete. It was not until after the cement production industry was established in the United States in the 1880s that concrete was experimented with and understood more broadly in America. In his book, *Concrete and Culture: A Material History*, Adrian Forty describes that the development of concrete was not a singular, linear process:

The early development of reinforced concrete in the nineteenth century was not attached to a particular time or place; rather it was invented several times, in slightly different ways and in different places. Similar discoveries occurred over the same period in France, England and the United States, each without much apparent knowledge of or regard for the others.¹⁸

The first efforts toward the commercialization of concrete are attributed to the French engineer François Hennebique, who developed and patented a complete framing system for concrete and used steel reinforcements instead of iron.¹⁹ Peter Collins describes that during the 1880s,

16 Peter Collins, *Concrete: The Vision of a New Architecture*, Montreal, QC, Canada: McGill-Queen’s University Press, 2004: 21.

17 Susan Macdonald, *Concrete: Building Pathology*, Oxford: Blackwell Science, 2003: 22.

18 Adrian Forty, *Concrete and Culture: A Material History*, London: Reaktion, 2012: 15.

19 Also during this time, the American engineer Thaddeus Hyatt (1816-1901) developed research involving the controlled shaping of concrete reinforcement rods to optimize the strength of slabs, beams, and columns. Peter Collins notes that in his writing, Hyatt suggested the substitution of steel as a reinforcement material prior to Hennebique’s execution of the idea.



Fig. 1.3 Load-testing of the warehouse of the Chambre de Commerce in Nantes, France, built to Hennebique's standard system. The architects were Cléricceau and Tessiers, built 1902-1903. Image from *Architect and Engineer: A Study in Sibling Rivalry*, 222, date unknown.

Hennebique “carried out research on columns, beams and slabs, and eventually evolved a completely scientific system of frame construction. It is impossible to say how much of his own research was aided by contemporary publications on research in Germany and America, or even by earlier work constructed in France.”²⁰

In addition to his technical achievements, Slaton notes that, “Hennebique’s innovations in the design and marketing of concrete buildings had a significant impact on American practice, particularly in the development of systems of prefabricated reinforcing elements and their sale by licensed contractors.”²¹ After Hennebique patented his concrete frame system in 1892, he ceased contracting to focus on the management of his intellectual property, and the first efforts toward the commercialization of concrete are attributed to him. Forty elaborates:

This separation between design and construction enabled Hennebique to carry out an enormous number of projects – in 1898 he had 714 projects on his books, and by

20 Collins, *Concrete*, 65.

21 Slaton, *Reinforced Concrete and the Modernization of American Building*, 16.

1905 was estimated to control one-fifth of the world market in reinforced concrete construction – without himself needing either the capital or the human resources to execute them.²² (Fig. 1.3)

Ernest Ransome and the Concrete Frame in America

Ernest Ransome is universally cited as the pivotal figure who introduced the use of concrete in building construction on a wide scale in the United States.²³ Bradley described Ransome’s work as “Americanizing” concrete construction, speaking of his patented twisting treatment of reinforcement rods, “by developing a system of reinforcement that was simpler (and therefore cheaper) than the French Hennebique method.”²⁴ His innovations in reinforced concrete complemented the needs of American manufacturing, improving it to the point that it became significantly efficient to use and cheap to produce. In 1890, the annual domestic production of Portland cement in America was 300,000 barrels, which grew to over one million by 1896 and eight million in 1900. By 1906, the number rose to forty-six million barrels, and then to a staggering 146 million in 1924.²⁵

Ransome began experimenting with concrete in engineering projects during the 1870s, and in the 1884 he patented his famous technique for twisted reinforcement rods (Fig. 1.4).²⁶ In his personal reminiscences, Ransome says he was “simply laughed down” for the idea by members of a technical society in California, but that the resulting controversy over the subject brought about exhaustive tests until the superiority of the cold twisted steel was finally admitted by his colleagues.²⁷ In 1904 A. W. Buel explained: “The purpose in twisting the rods is twofold: first, to give the metal a mechanical hold on the surrounding concrete like that of a screw in wood, and, second to increase

22 Forty, *Concrete and Culture*, 18.

23 Ransome was English-born but moved to the United States some time in the 1860s or 1870s, following his father who had moved there to market his artificial stone business.

24 Bradley, *The Works*, 156.

25 Slaton, *Reinforced Concrete and the Modernization of American Building*, 134.

26 Ernest L. Ransome, “Building Construction,” Patent 305,226, 16 Sep 1884.

27 Ernest L. Ransome & Alexis Saurbrey, *Reinforced Concrete Buildings: A Treatise on the History, Patents Design and Erection of the Principal Parts Entering into a Modern Reinforced Concrete Building*, New York: McGraw Hill Book Company, 1912: 3.

(No Model.)

E. L. RANSOME.
BUILDING CONSTRUCTION.

No. 305,226.

Patented Sept. 16, 1884.

FIG. 1.

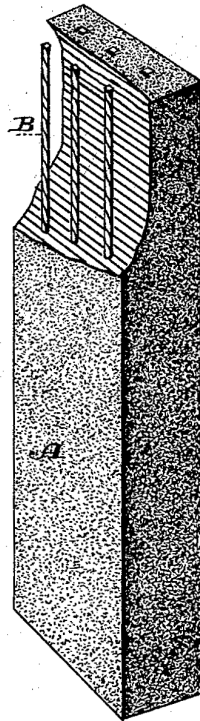


FIG. 2.



Witnesses,
Geo. H. Strong
J. H. Hourse

Inventor,
E. L. Ransome
By Dewey & Co.
attorneys

Fig. 1.4 The first page of Ransome's 1884 patent that described his new technique of twisting of reinforcing rods.



Fig. 1.5 Leland Stanford Junior Museum, now the Iris & B. Gerald Cantor Center for Visual Arts, at Stanford University, by George W. Percy, 1889-1891. Ernest Ransome was the concrete contractor. Photo from the Stanford University Archives.

the strength and decrease ductility.”²⁸ This revolutionary twisting technique went on to be heavily used in the Ransome systems of concrete construction.

In 1886 Ransome designed two small bridges in Golden Gate Park in San Francisco, the first concrete bridges in North America. Another significant structure was the Leland Stanford Junior Museum of Stanford University, California. The building was built between 1889-1891 with George W. Percy as architect and Ernest Ransome as the concrete contractor (Fig. 1.5).²⁹ Considered fireproof and earthquake-proof, the building was designed to imitate masonry construction and represented a significant advancement for concrete as a construction material:

The exterior may perhaps be criticized for the defects inevitable when one material is made to imitate another, but it has the distinction of being probably the first building in which the concrete, instead of being covered with a coating of cement, was tool dressed to show the texture of the aggregate. The fact that Ransome did this deliberately to imitate masonry is relatively unimportant; of much greater significance is the fact that by removing the thin film of cement which always forms

28 A. W. Buel, *Reinforced Concrete*, New York: The Engineering News Publishing Company, 1904: 333.

29 Various sources cite different construction ranges between 1889 and 1892. This figure comes from Collins, 62.

between the agglomerated aggregate and the form-work, he set a precedent for treating concrete as possessing a natural nobility of its own, instead of regarding it as a cheap infilling or backing to which a fair surface must be subsequently applied. For the first time in the history of architecture, concrete was considered to be the concern of skilled craftsmen, and capable of displaying an inherent beauty.³⁰

Because of its practical features, concrete was integrated into the construction of manufacturing buildings quickly as engineers became convinced of its unparalleled benefits. Concurrent with its increased popularity in the industrial architectural field, concrete was also used for other building types including civic, commercial, and residential buildings. In 1903 the groundbreaking sixteen-story concrete Ingalls Building in downtown Cincinnati, Ohio was completed, using Ransome's patented twisted steel reinforcement. The next year Buel wrote: "In the United States buildings constructed wholly of concrete-steel vary in character and purpose from factories and shops to tall office buildings, and from small residences to churches and courthouses."³¹

When he first began using concrete as a construction material, Ransome utilized it the same way builders had been utilizing brick: a poured concrete outer wall with wooden floors, beams, and columns on the interior. With the further development of new techniques, he began to construct internal elements of the building with concrete, although in the beginning, the parts were still conceived as separate pieces rather than a continuous frame. Ransome's factory in Alameda, California, for the Pacific Coast Borax Company in 1889 was the first systematic use of interior concrete columns and t-section floors³² in a building in America, and he later brought this technique to the East Coast through another structure for the same company in New Jersey.³³

Two major early building projects of Ransome's dramatically illustrate the difference between masonry-style concrete and concrete frame construction, both technologically and aesthetically: the Pacific Coast Borax Company buildings in Bayonne, New Jersey and the United Shoe

30 Collins, *Concrete*, 62.

31 A. W. Buel, *Reinforced Concrete*, 151.

32 A t-section floor featured a horizontal slab with vertical flanges to reduce sheer stress.

33 Collins, *Concrete*, 62.

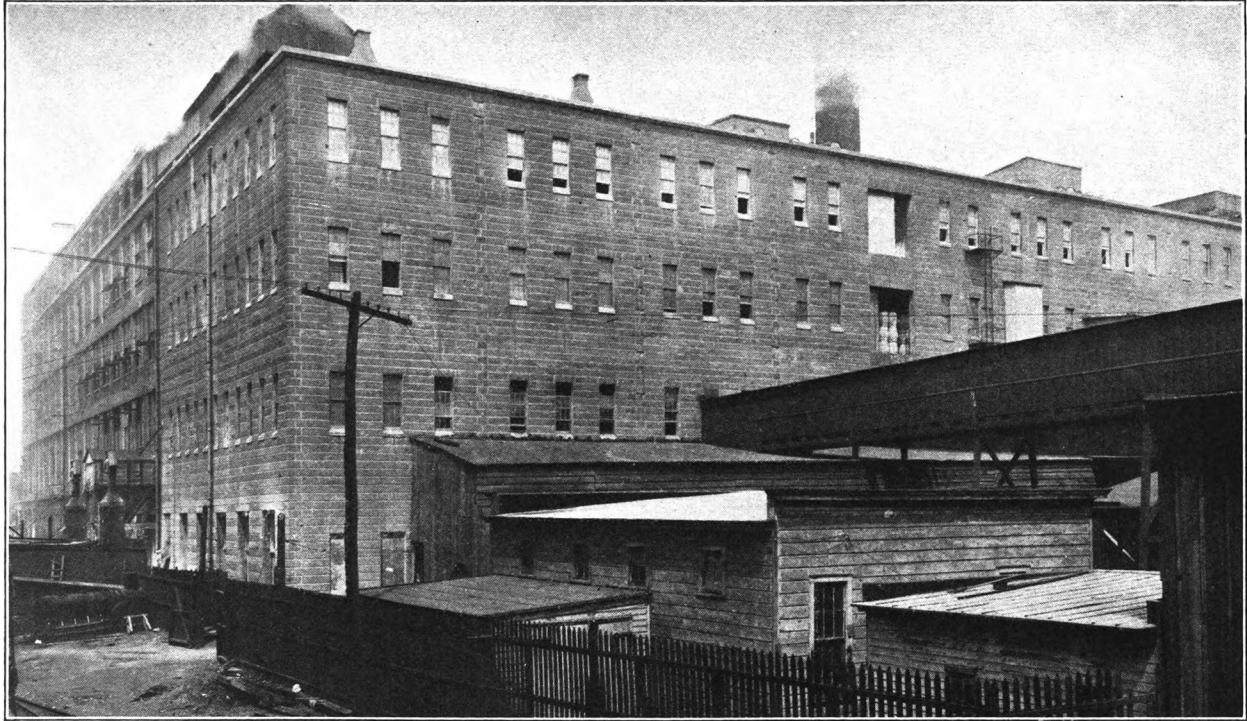


Fig. 1.6 First phase of the Pacific Coast Borax Refinery in Bayonne, New Jersey, by Ernest Ransome, 1897-1898. Photo from *Reinforced Concrete Buildings*, 11.

Machinery Company in Beverly, Massachusetts. Ransome himself described the Pacific Coast Borax Refinery loft building, built 1897-1898 (Fig. 1.6), as a transitional structure, noting that it “marks the closing of the old-time construction of reinforced concrete buildings, constructed more or less in imitation of brick or stone buildings, with comparatively small windows set in walls.”³⁴ The contract for the first portion of the Pacific Coast Borax Refinery was awarded to Ransome although his methods were still experimental, because the company desired particularly strong floors for heavy machinery and a fireproof building. The interior floors were built with sturdy beam-and-girder concrete construction (Fig. 1.7). The exterior walls, while made of concrete, were still “conceived as self-supporting masonry walls.”³⁵ The first portion of this facility, along with the contemporaneous structure in Alameda, California, was a technological advancement of materials, but not of architectural integrated and architectural design.

34 Ransome and Saubrey, *Reinforced Concrete Buildings*, 10.

35 Bradley, *The Works*, 156-157.

The first phase of the Pacific Coast Borax Refinery proved especially significant in 1902 when it suffered an exceptionally hot fire. All the mechanical equipment and furnishings in the interior were destroyed, including items made of steel and iron (Fig. 1.8). The concrete structure, however, according to Ransome, “came out of the fire with hardly any damage.”³⁶ Describing the fire as the “triumph and vindication of Ransome’s professional life,” Banham goes further to claim that because of the fire, the building “may be the most important structure in reinforced concrete in North America.”³⁷ Both the Atlas Portland Cement Company and the firm of Ransome and

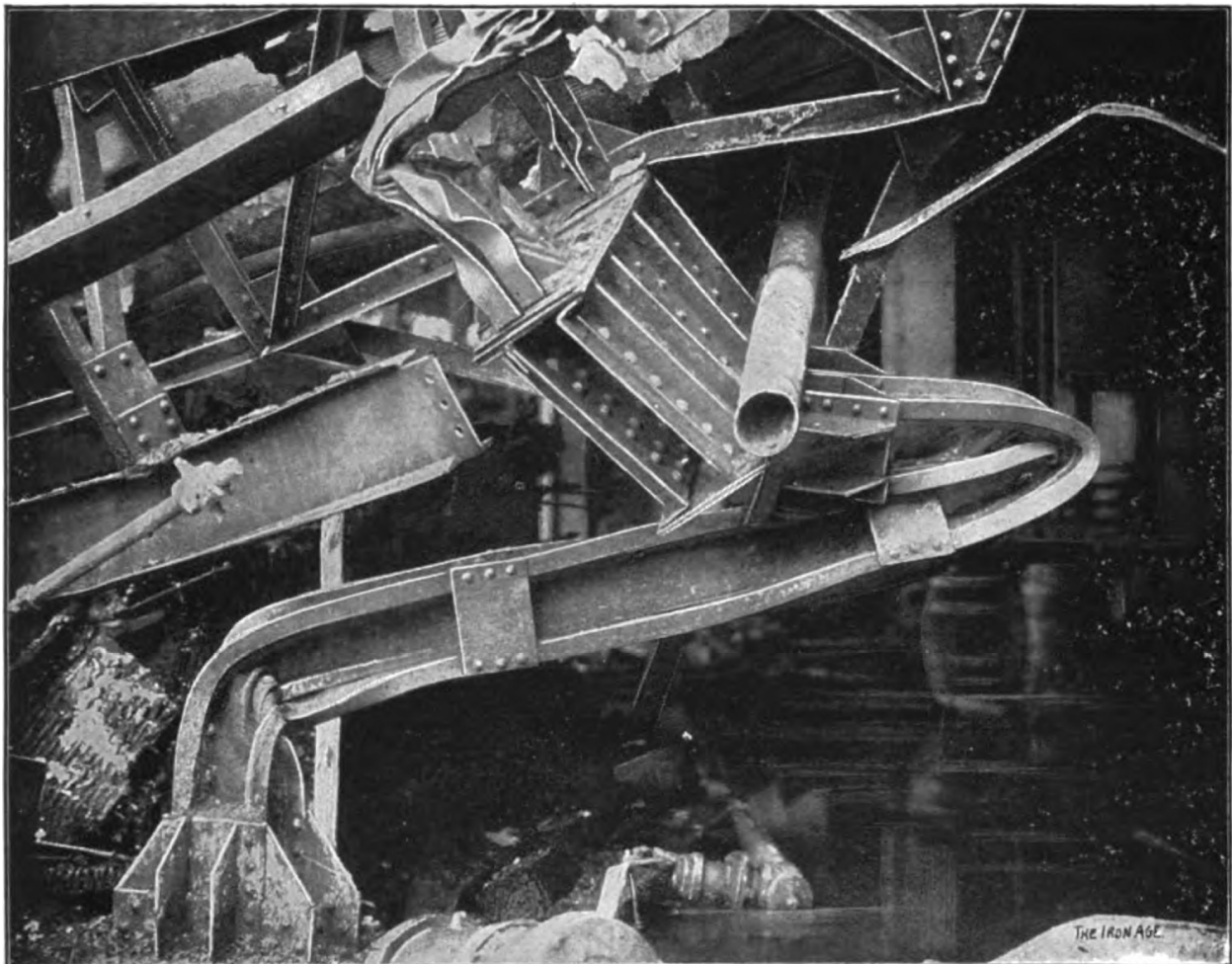


Fig. 1.8 The effect of the fire on steel in the tank house annex at the Pacific Coast Borax Refinery in Bayonne, New Jersey. Photo from *Reinforced Concrete in Factory Construction*, 58.

36 Ransome and Saurbrey, *Reinforced Concrete Buildings*, 185.

37 Banham, *A Concrete Atlantis*, 65, 107.

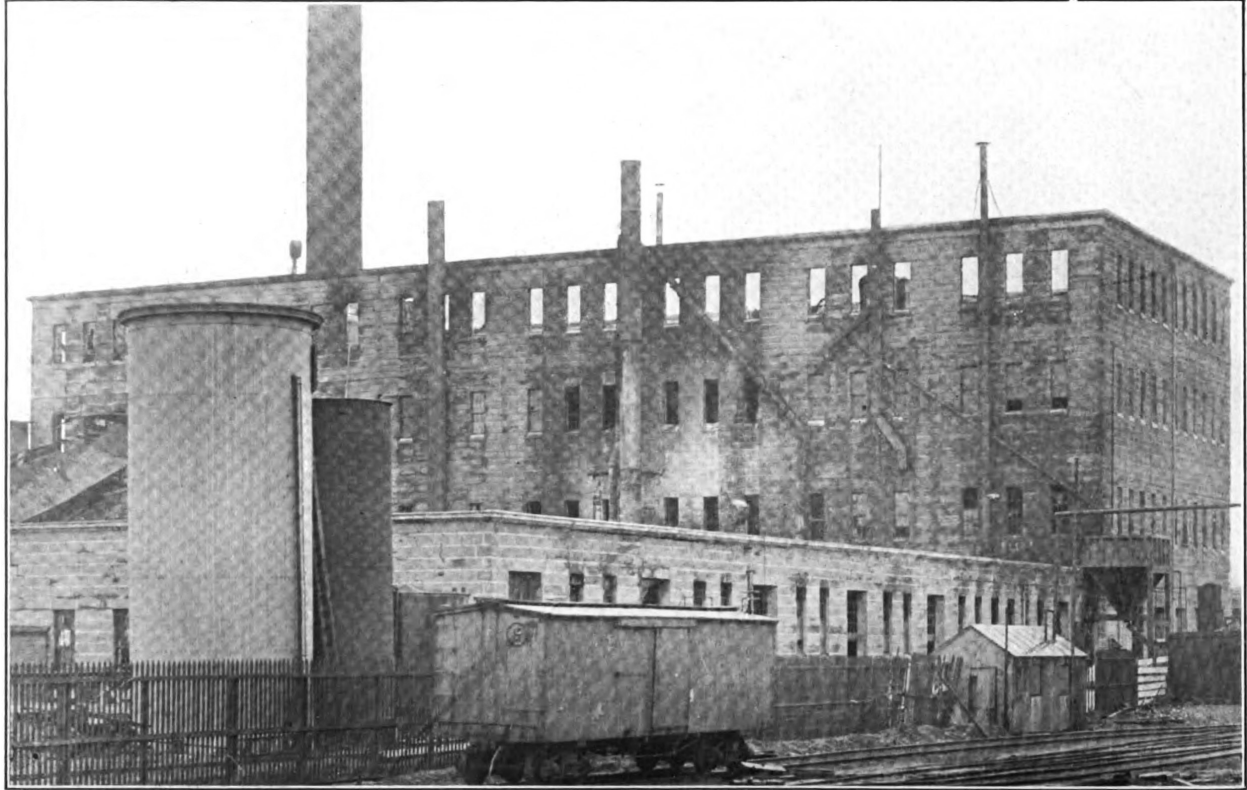


Fig. 1.9 The Pacific Coast Borax Refinery after the fire. Photo from *Reinforced Concrete in Factory Construction*, 57.

Smith wasted no time advertising how well the material had withstood the fire, citing it as irrefutable proof that concrete was a highly advantageous construction material (Fig. 1.9). Atlas Cement published a trade book titled *Reinforced Concrete in Factory Construction* in 1907, giving the Pacific Coast Borax Refinery significant attention. A lengthy testimonial by the company emphasized the building's "special features" including: the building is "absolutely fireproof," having withstood the fire "magnificently;" does not require expenditure for repairs because "being monolithic and like Spanish Wine, improves with age;" can carry terrific loads "without straining the building in the least;" and is an ideal construction method for factory buildings as "it can be kept perfectly clean—it being a simple matter to hose and wash out."³⁸ The fire not only proved the safety of concrete, but also amplified the appeal of its other practical benefits.

In 1902, Ransome patented a method he called "monolithic unit construction" which

38 Atlas Cement Company, *Reinforced Concrete in Factory Construction*, 1907: 237.

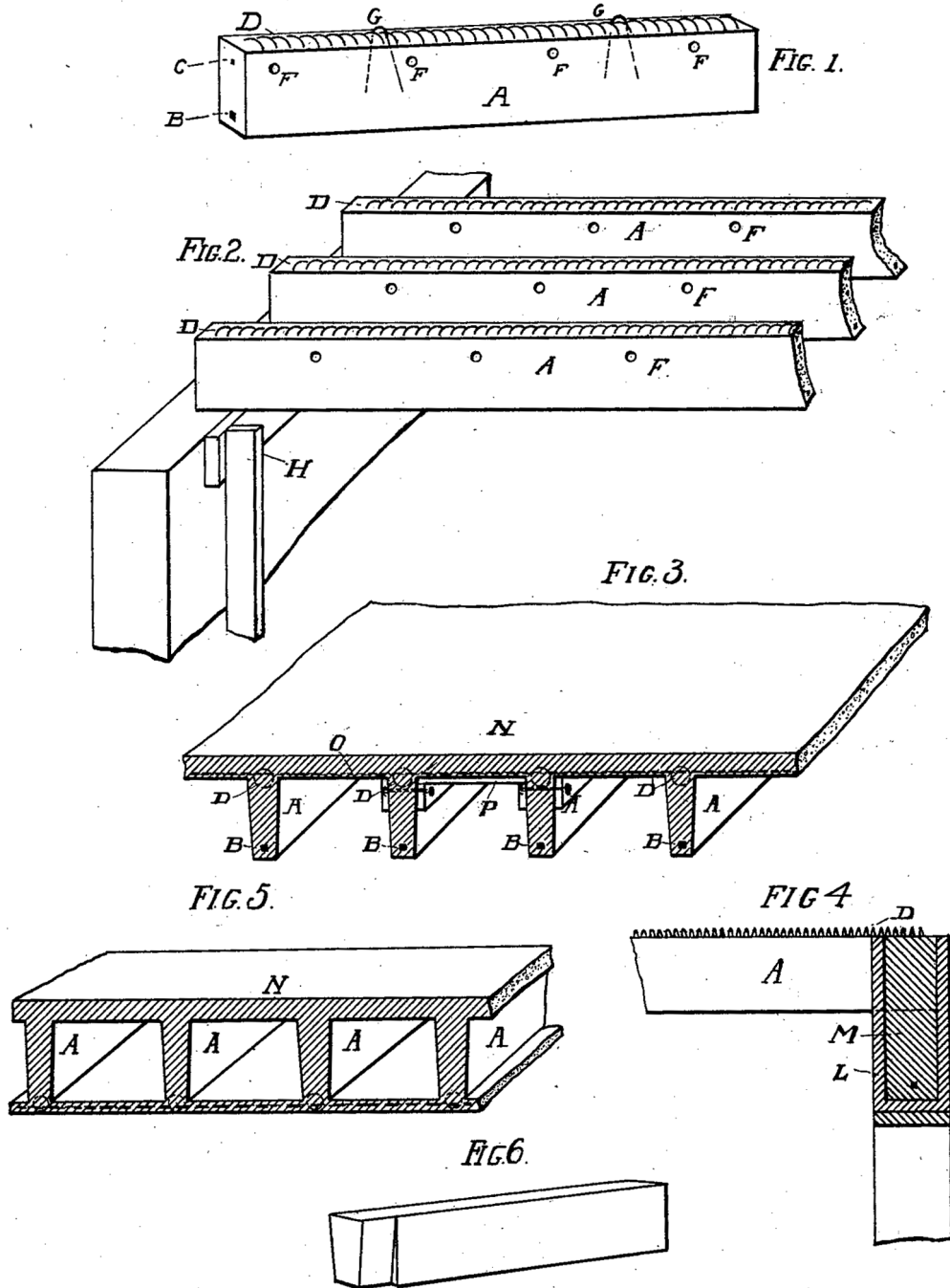
No. 694,577.

Patented Mar. 4, 1902.

E. L. RANSOME.
REINFORCED CONCRETE CONSTRUCTION.

(Application filed July 13, 1901.)

(No Model.)



WITNESSES:

George T. Allen
John Ellendo.

INVENTOR

E. L. Ransome

Fig. 1.10 The first page of Ransome's 1902 patent detailing unit construction methods.

involved molding individual pieces of the concrete frame, particularly columns, beams, and girders, prior to building construction (Fig. 1.10).³⁹ By dividing the building into smaller units that could be more efficiently handled and cast on the ground with reinforcement in place, unit construction improved speed, lowered cost, and reduced error. The units would then be assembled into a frame by means of tie bars and grooves, and then joined together with poured-in-place floor slabs and joint mortar (Fig. 1.11). As engineers continued to improve upon Ransome's pioneering technique, the engineer himself updated his own patent in 1909 (Fig. 1.12).^{40, 41}

In 1910, Ransome published an article in *Concrete Age* describing the benefits of his blend of unit pieces connected by poured-in-place floor slabs. He noted that it was practically impossible to erect a completely monolithic structure without obvious errors such as “indications of bulging forms, or of supporting shores having been carelessly wedged up, or corners fractured in prying the forms loose.”⁴² Instead, unit construction provided control and precision:

It is approximately 10 per cent lower in cost than monolithic. It is easier, quicker, requires less skilled labor and is more exact and cleaner. It is eminently adapted for the modern system of scientific management. It eliminates shrinkages, with the exception of those of the floor slab, which are secondary. It can be erected in cold weather . . . With all these advantages I am unable to see a single disadvantage and when one considers that this new system is in its infancy great things may properly be expected of it in the future.⁴³

Unit construction was significant and valuable because it dramatically improved efficiency, but more importantly, it demonstrated an advanced understanding of the material. By using pre-cast units, engineers created sophisticated systems that took better advantage of concrete's unique, customizable properties. In a trade article in 1906, engineer Ross F. Tucker criticized monolithic construction as being an inadequate use of concrete's material properties and design potential:

39 Ernest L. Ransome, Ernest L., “Reinforced Concrete Construction,” Patent 684,577, 4 Mar 1902.

40 Other pioneers include Grosvenor Atterbury active from 1904 to 1925 and John E. Conzelman who patented more than 51 designs between 1910 and 1916.

41 Ernest L. Ransome, “Concrete Building Construction,” Patent 918,699, 20 Apr 1909.

42 Ransome and Saurbrey, 169.

43 Ernest L. Ransome, “Monolithic ‘Unit’ Construction,” *Cement Age* 12.3 (February 1911): 135.

FLOOR SYSTEMS

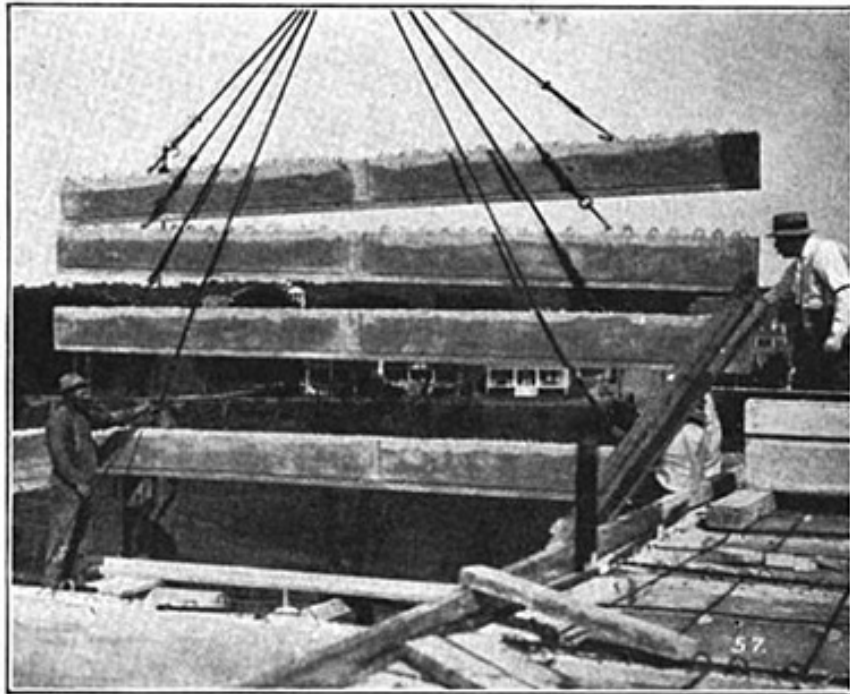


FIGURE 139. SETTING THE BEAMS.
United Shoe Machinery Co., Beverly, Mass. Ernest L. Ransome,
Managing Engineer.

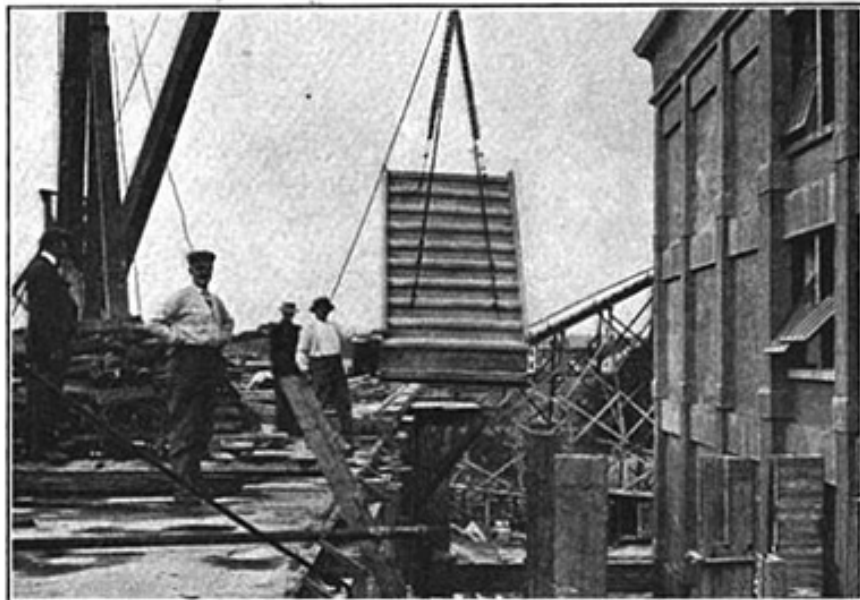


FIGURE 140. SETTING A FLIGHT OF STAIRS.
United Shoe Machinery Co., Beverly, Mass. Ernest L. Ransome,
Managing Engineer.

Fig. 1.11 A page from Ransome and Saurbrey's *Reinforced Concrete Buildings* with images demonstrating Ransome's unit construction technique at the United Shoe Machine Company, built 1903-1906, 167.

E. L. RANSOME.
 CONCRETE BUILDING CONSTRUCTION.
 APPLICATION FILED DEC. 31, 1906.

918,699.

Patented Apr. 20, 1909.

3 SHEETS—SHEET 1.

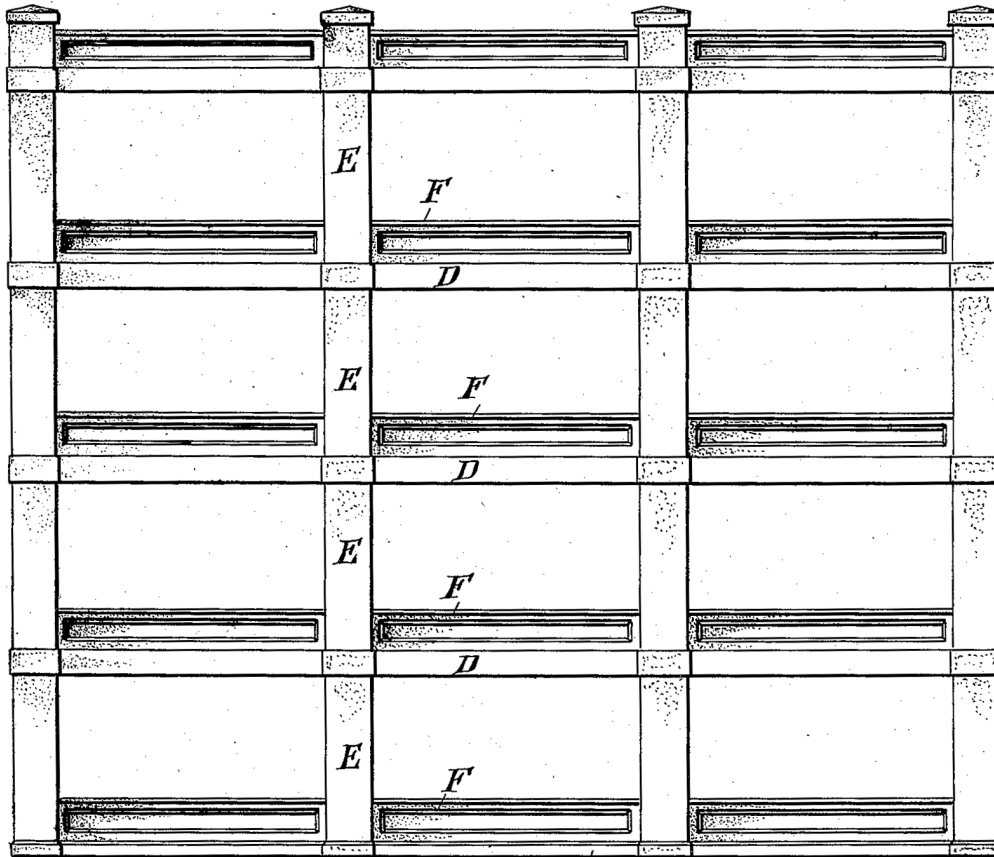


Fig. 1. D'

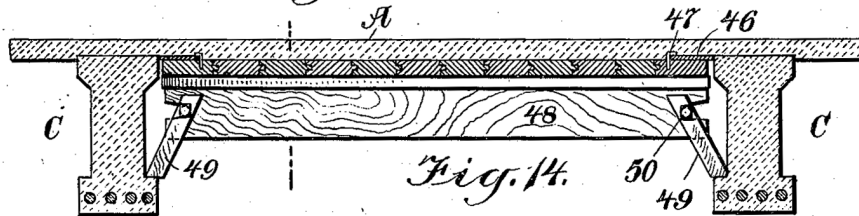


Fig. 14.

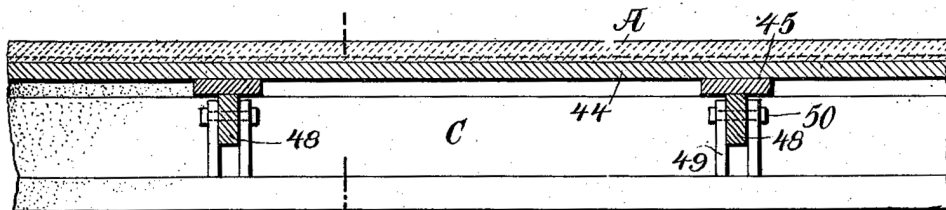


Fig. 15. Inventor
 Ernest L. Ransome
 By his Attorney
 Isaac B. Owens.

Witnesses
 E. J. McLaughlin
 A. C. Abbott

Fig. 112 The first page of Ransome's 1909 patent that elaborated on Ransome's unit construction techniques

“[M]uch has yet to be done in the education of the architect and the engineer and in the use of concrete in a logical manner and for its real value. Owing to the comparative youth of this type of building, architects and engineers generally have not as yet given any great attention to the development of design essentially suitable to reinforced concrete.”⁴⁴

Tucker went on to describe how the general practice of the day was to design a structure in brick, stone, or steel and then ask an engineer to refashion the design so it would be suitable for concrete construction. Tucker called this practice “imperfect” and “unscientific” writing,

[T]he architect who would design intelligently for reinforced concrete must think in terms of reinforced concrete . . . [it] is a structural method possessing peculiar characteristics which are essentially its own, and any design which is to be carried out in this material should be adapted to their characteristics and qualifications. . . . [T]he greatest economy in the use of reinforced concrete is to be attained by keeping this fact in mind and designing the structure accordingly.⁴⁵

Tucker understood that the most significant property of concrete was that it allowed for buildings and their design to be conceived in a completely new way. Beyond its low cost and efficiency, concrete opened entirely new concepts of what was physically achievable in building construction. The material properties of concrete allowed for industrial structures that were both incredibly strong and remarkably customizable.

The second phase of the Pacific Coast Borax Company in Bayonne, New Jersey was built with unit construction from 1903 to 1904, and demonstrated significant advancement for Ransome both technologically and in aesthetic expression. Banham cites this building as “showing the workings of Ransome’s mind when he finally achieves the Daylight factory”⁴⁶ (Fig. 1.13). In 1902, Ransome had secured another patent that detailed a building system where the floor slabs extended out beyond the thickness of the walls, which would then support the wall panels and the window

44 Ross F. Tucker, “The Progress and Logical Design of Reinforced Concrete,” *Building Trades Employers Association Bulletin* 7.7 (1906): 72.

45 Tucker, “The Progress and Logical Design of Reinforced Concrete,” 72-73.

46 Banham, *A Concrete Atlantis*, 72.

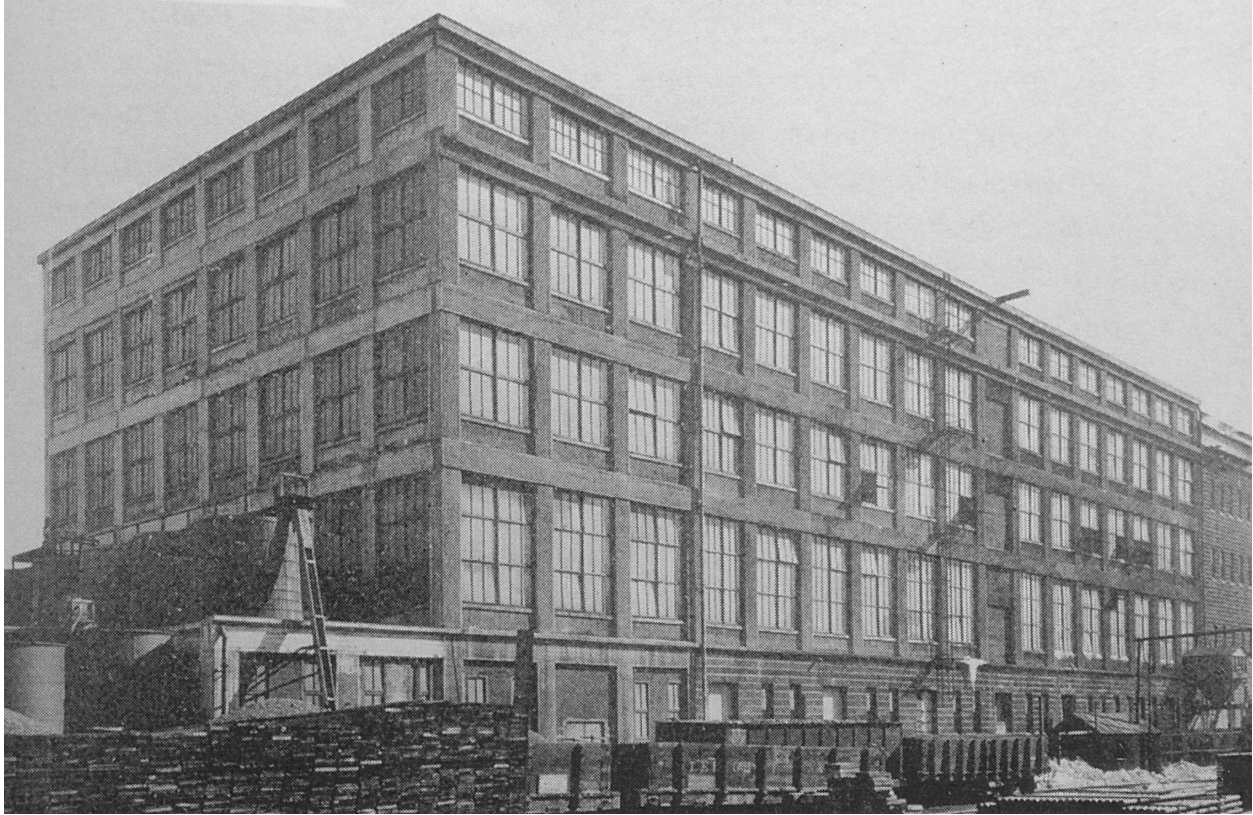


Fig. 1.13 The second phase of the Pacific Coast Borax Company in Bayonne, New Jersey by Ernest Ransome, 1903-1904. Photo from *The Works*, 157.

spans (Fig. 1.14).⁴⁷ This construction method gave the reinforced concrete frame a strong visual outline on the exterior of the buildings, exposing the form and producing a new and distinct aesthetic.

When writing in 1912, Ransome failed to cite European examples as inspiration for this technique: “In the years between 1900-1902 I developed a radical departure in the exterior construction of reinforced concrete factory buildings, consisting mainly in the extension of the floor plate or slab over the exterior columns, forming a belt course on the outside of the building.”⁴⁸

Similar concrete frames were being constructed in Europe, as L. J. Mensch indicated with photos in his *Architects' and Engineers' Hand-book of Re-inforced Concrete Constructions*. Chicago: Cement and Engineering News, 1904: 102-104.⁴⁹ A. W. Buel also commented on the

47 Ransome, Ernest L. “Concrete Construction.” Patent 694,580. 4 Mar 1902.

48 Ransome and Saurbrey, *Reinforced Concrete Buildings*, 12-13.

49 L.J. Mensch, *Architects' and Engineers' Hand-book of Re-inforced Concrete Constructions*. Chicago: Cement and Engineering News, 1904: 102-104.

No. 694,580.

Patented Mar. 4, 1902.

E. L. RANSOME.
CONCRETE CONSTRUCTION.
(Application filed Aug. 17, 1901.)

(No Model.)

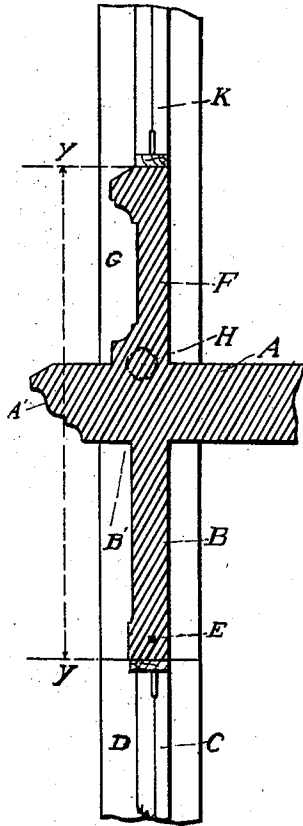


FIG. 2.

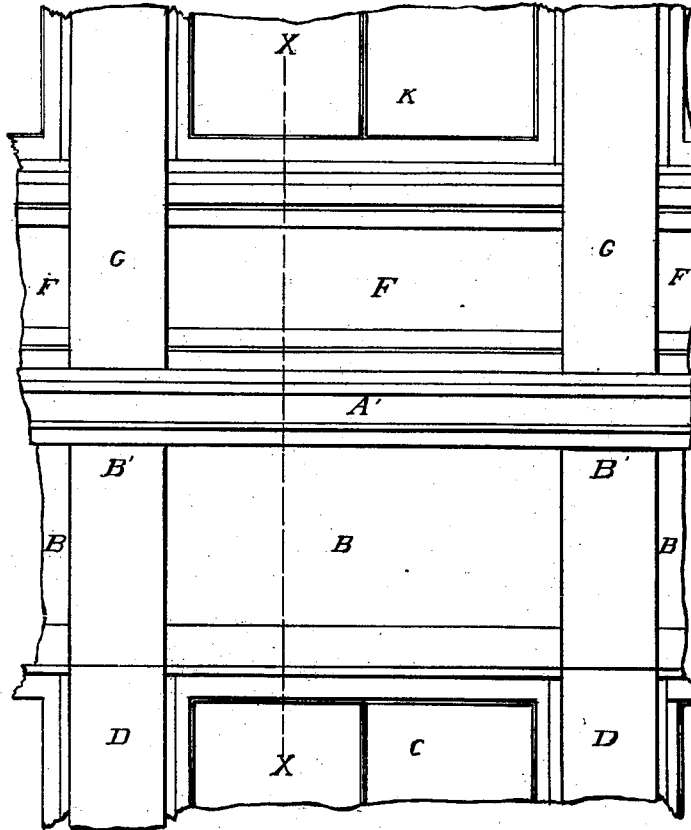


FIG. 1.

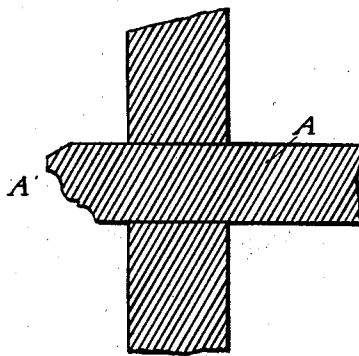


FIG. 3.

WITNESSES:

John Ellenaat.
George T. Allen

INVENTOR

E. L. Ransome

Fig. 1.14 The first page of Ransome's 1902 patent that demonstrated the floor slab protruding through the exterior wall, the defining structural characteristic of the daylight factory.

advanced European systems in his book, *Reinforced Concrete*, also published in 1904:

[I]t is only recently and following European precedents that whole buildings of concrete-steel have been erected in any considerable manner. The pioneer in this development was Mr. Ernest L. Ransome . . . Most of Mr. Ransome's work has, however, been done within the last few years. All the other systems of concrete-steel building construction employed in the United States are foreign systems imported direct or the adaptations of foreign practice.⁵⁰

Ransome may not have been quite the originator he purported to be, but he did secure the American patent and went on to popularize the method in the United States.

The buildings that were conceived and constructed in the unit construction method with floors extending to the exterior, marked the emergence of the daylight factory. Architectural critic Ada Louise Huxtable was a relatively early proponent of the significance of these buildings, writing in 1957: "Several large, revolutionary factories were built under these [unit construction] patents, some of which are still standing today. Since they predate the Detroit buildings for the automotive industry—long considered the precursors of reinforced-concrete industrial architecture in the United States—their rediscovery and study is of particular interest."⁵¹ These early unit construction buildings by Ransome and others have been overshadowed by later works, but as Huxtable recognized, these technological innovations led to a completely new conception of the capacity of industrial architecture. Although these techniques were developed simultaneously, and in some cases subsequently, to similar innovations in Europe, Banham cites Ransome's work as particularly significant because it was the beginning of the American version, "and thus of the true Daylight factory."⁵²

In a direct visual comparison in his book, *A Concrete Atlantis*, Banham demonstrated the effect of the concrete frame on the interior lighting of factory building. The older portion of the massive Larkin complex in Buffalo, New York was built over a decade, with the main building

50 A. W. Buel, *Reinforced Concrete*, 150-151.

51 Huxtable, Ada Louise. "Reinforced-Concrete Construction: The Work of Ernest L. Ransome, Engineer—1884-1911." *Progressive Architecture* 38 (September 1957): 142.

52 Banham, *A Concrete Atlantis*, 32.

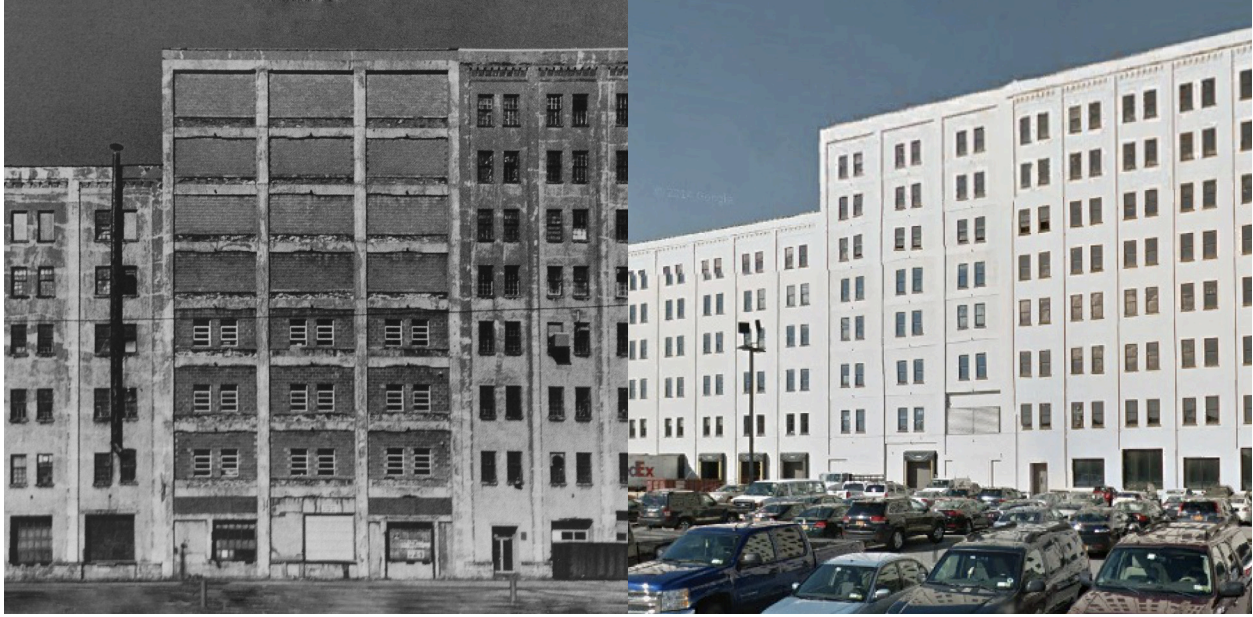


Fig. 1.15 Two views of Building C (1911): on the left in 1986, on the right in 2015. Photos from *A Concrete Atlantis*, 57, and Google Earth.

campaign ending in 1907. Between 1911-1913, several reinforced concrete frame buildings were added, including the enormous Larkin Terminal Warehouse. During this time, Building C, a modest three-bay, eight-story building, was built to replace an old boiler house building that had been removed. As an addition to the older building block, Building C was entirely surrounded by the earlier masonry buildings, providing a unique-side-by-side comparison (Fig. 1.15).

Banham published two photos, one from inside Building N, a traditional masonry structure, and the other from inside Building C, the added adjacent concrete frame structure. The photos were taken with identical exterior lighting conditions and at the same aperture and shutter speed, but the difference in photographs is remarkable (Fig. 1.16). The photos serve as a strong visualization of exactly how dramatic an effect the daylight factory had on interior industrial space. Banham characterizes the Larkin buildings as “[providing] a kind of monumental history of American industrial architecture on either side of the changeover from regular mill construction to concrete.”^{53, 54}

53 Banham, *A Concrete Atlantis*, 45.

54 At the time of the publication of *A Concrete Atlantis*, the bays of Building C had been bricked up in an effort to retain heat. Today those bay openings in Building C have been modified to mimic those found on the older structures around them (Fig. 1.15) in an ironic step backward for the historic architectural record. The treatment is a missed opportunity for a building to represent more than one period of significant building technologies.



Larkin N Building, Buffalo, New York; interior showing daylighting through brick exterior wall. (Photo, author)



Larkin C Building; interior showing level of daylighting using reinforced concrete frame. Photograph taken at the same aperture and shutter speed as the picture above and under identical external lighting conditions.

Fig. 1.16 Page 58 from *A Concrete Atlantis* with photos of Larkin Buildings N (above) and C (below) demonstrating the difference between the lighting effect of traditional masonry versus the concrete frame.



Fig. 1.17 The two phases of the Pacific Coast Borax Company buildings side-by-side for comparison.

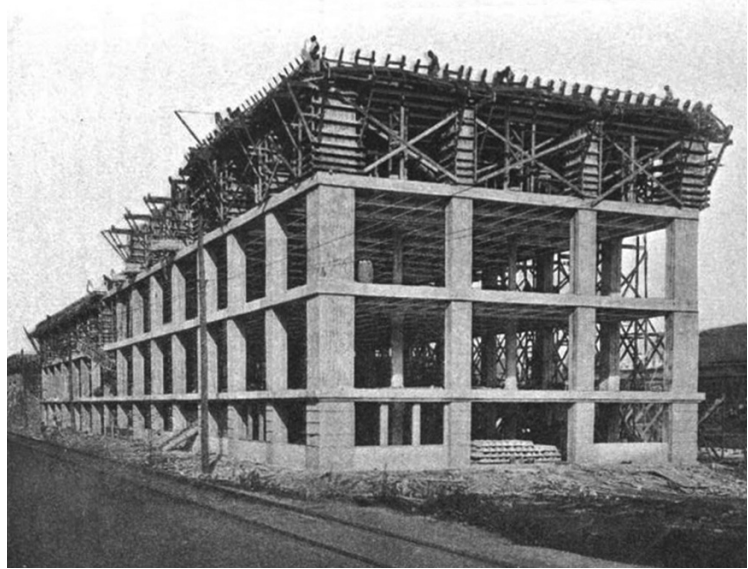


Fig. 1.18 The machine shop for the Kelly & Jones Company in Greensburg, Pennsylvania by Ernest Ransome, under construction 1903-1904. Photo from *Reinforced concrete buildings*, 14.

The difference in the aesthetic expression between the first and second phases of the Pacific Coast Borax building in Bayonne is remarkable when compared side-by-side (Fig. 1.17). As Bradley writes, “The contrast between the two sections of the Bayonne complex demonstrates how, in literally one step, Ransome advanced American reinforced concrete construction to the skeletal form used for decades.”⁵⁵ Ransome listed the Kelly & Jones Company machine shop, built c. 1903 in Greensburg, Pennsylvania (Fig. 1.18), as the first example of his method of extending the floor slabs beyond the exterior walls, but he called the United Shoe Machinery Company “chief” among the examples of this technique.⁵⁶ The United Shoe Machinery Company complex in Beverly, Massachusetts, primarily built in phases between 1903-1906, represented another significant step forward in the refinement of reinforced concrete factory construction.

The United Shoe Machinery Company had originally planned to build their plant complex with steel-framed structures, but Ransome and the Atlas Cement Company convinced executives to change to reinforced concrete construction and bring Ransome on as engineer. The complex was

55 Bradley, *The Works*, 156.

56 Ransome and Saurbrey, *Reinforced Concrete Buildings*, 15.



Fig. 1.19 Aerial view of the United Shoe Machine Company in Beverly, Massachusetts (1903-1906), Frank M. Andrews, architect, Ernest Ransome, engineer. Photo c. 1940s, from usingsexhistory.com.

one of the largest collections of concrete buildings when built (Fig. 1.19), and was unprecedented in its standardization of the daylight factory.⁵⁷ Its glazing system covered an impressive ninety percent of the factory wall area (Fig. 1.20). The design and execution of the complex was an orchestrated demonstration by the United Shoe Machinery Company, the Atlas Cement Company, and Ernest Ransome to showcase their expertise and confirm the advancement of American architecture and engineering.⁵⁸

From a technical standpoint, the buildings were exemplary. In 1907, Engineer Homer Reid wrote: “The methods of construction used in the United Shoe Machinery Co.’s building are a good

57 Homer Reid wrote that it was “probably the largest single reinforced concrete building construction ever undertaken in this country” and totaled eighteen acres in square footage (*Concrete and Reinforced Concrete Construction*, 502).

58 The United Shoe Machinery Company would later partner with Carl Benscheidt to build the canonical Fagus Factory (or Faguswerk) in Alfeld an der Leine, Germany, constructed between 1911 and 1913. In a personal correspondence with the author, Grant Hildebrand expounded upon the significance of the United Shoe Machinery Company complex to European Modernism. He described how about a year before Banham’s death, Banham gave a talk in Seattle wherein a main subject was that the German Faguswerk owned a controlling interest in Ransome’s United Shoe Machine Company. As Hildebrand wrote: “Banham had somehow discovered that when Gropius was commissioned to do the famous wing of the Fagus factory at Alfeld, he was given two photos. One was of Ransome’s Beverley plant, the other the famous Woodward Avenue photo of Kahn’s Ford Highland Park. The only corroboration, if it can be called that, is that Gropius called the Fagus ‘an American factory.’” As far as Hildebrand is aware, Banham did not publish this information before his death. (Email to the author, June 9, 2015.)

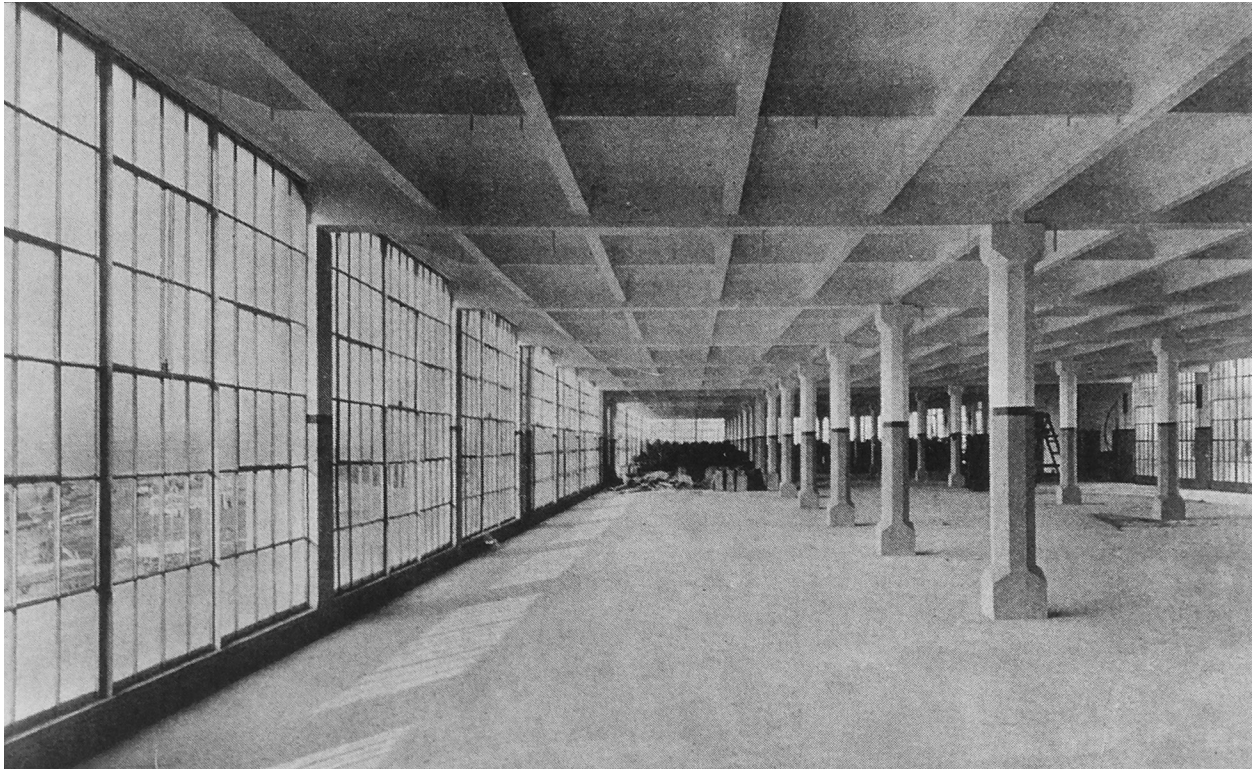


Fig. 1.20 Interior view of one of the United Shoe Machinery Company factory loft spaces showing the dramatic effect of the window glazing. Photo from *The Works*, 167.

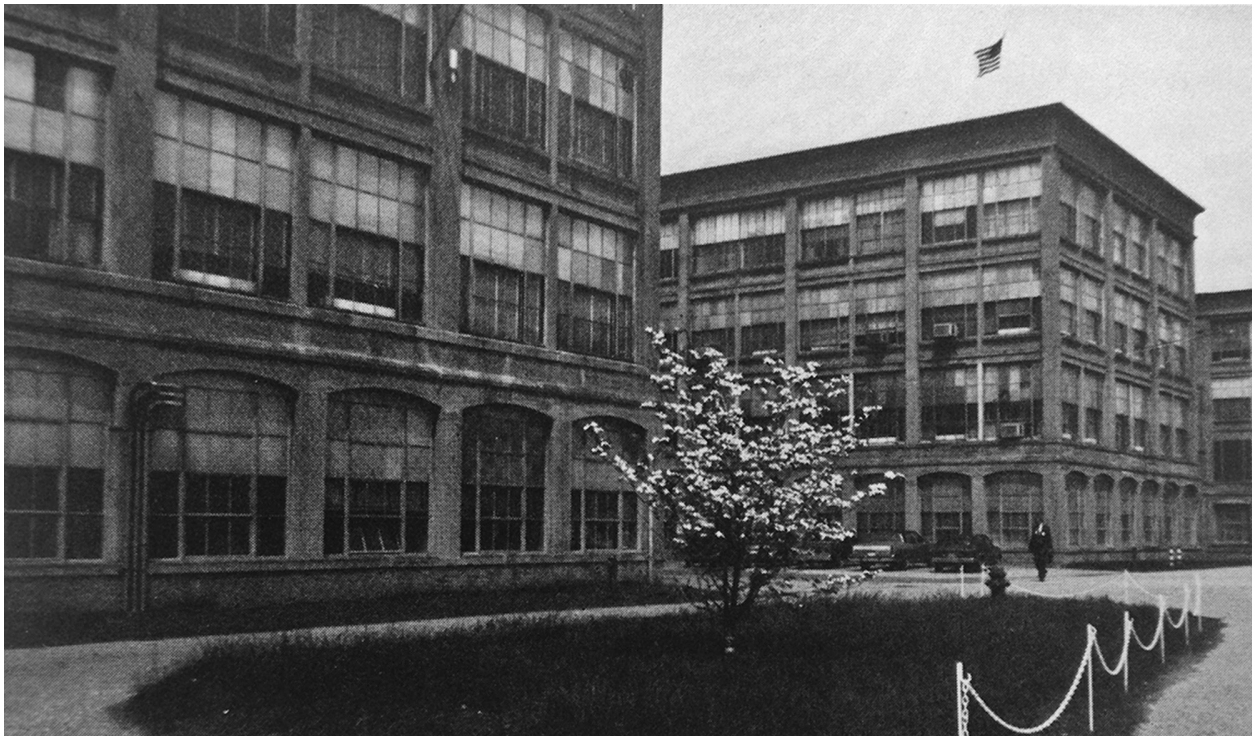


Fig. 1.21 Exterior of United Shoe Machinery Company buildings showing the advanced aesthetic expression of the daylight factory. Photo from *A Concrete Atlantis*, 68.

example of the best practice in reinforced concrete building construction.”⁵⁹ Banham describes the building as having an “appearance of crushing self-assurance” (Fig. 1.21) and goes on to lament that “its absence from the general literature on the history of modern architecture is a permanent reproach to scholarship[;] . . . on the score of stylistic ‘modernity,’ let alone technical proficiency and inventiveness, it is the match for anything built anywhere in the world at the time.”⁶⁰ A 1905 article published in *Engineering News* listed Ransome as the “consulting engineer” with George P. Carver as the resident engineer, Frank. M. Andrews of Dayton, Ohio, as the architect, and the Fosburgh Company of Boston as contractors.⁶¹ It is unclear exactly what role Ransome played in the design of these buildings, but most historians accept his involvement and influence on the concrete construction and overall design as significant.

Although Ransome is generally heralded as the expert of the field, there were certainly other contemporary American engineers and engineering firms advancing the technology of concrete construction. In 1905, C. A. P. Turner of Minneapolis (1869 -1955) popularized the flat slab floor system.⁶² This system included additional reinforcement in the floor slab, and distributed weight from the floor to the columns through widened “mushroom” column tops, as opposed to using concrete beams and girders (Fig. 1.22).⁶³ This design allowed for more natural light from windows to penetrate even farther into the space. It was recognized as a more aesthetically attractive interior. In 1922, referring to the images in Fig. 1.23, Engineer Willard Case wrote, “The interior appearance

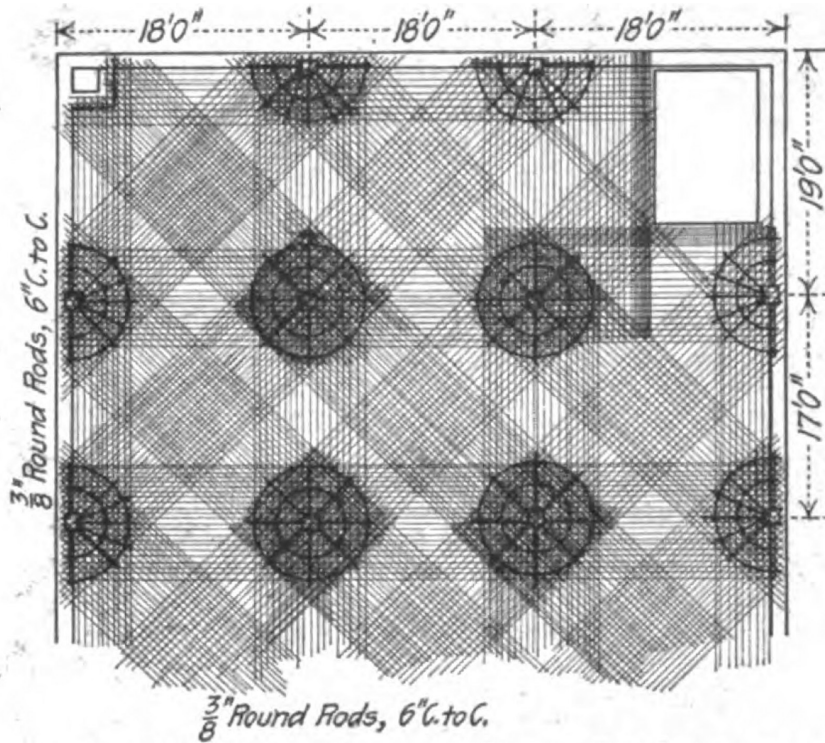
59 Homer A. Reid, *Concrete and Reinforced Concrete Construction*, New York, The M.C. Clark Publishing Co., 1907: 589.

60 Banham, *A Concrete Atlantis*, 68.

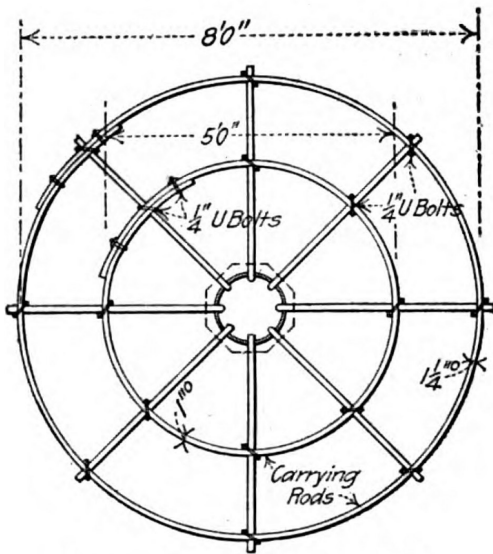
61 George P. Carver, “Reinforced concrete building work for the United Show Machinery Co., Beverly, Mass,” *Engineering News* 53.21 (1905): 541.

62 Turner’s first building to use the flat slab system was the Johnson-Bovey Building in Minneapolis, built 1905-1906.

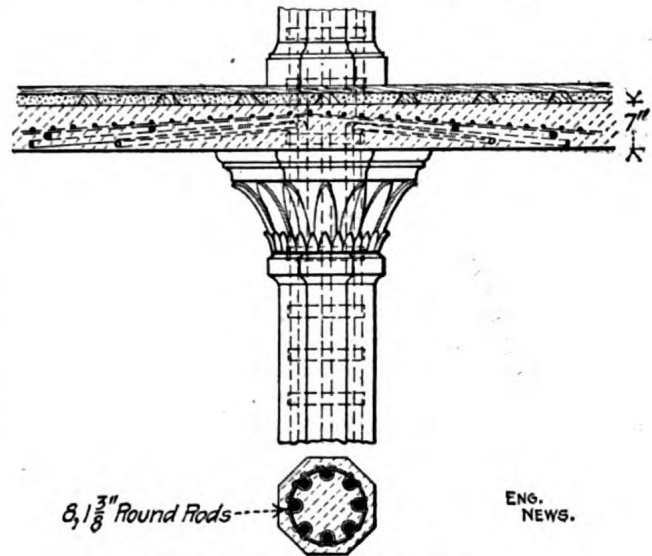
63 D. A. Gasparini’s article, “Contributions of C. A. P. Turner to Development of Reinforced Concrete Flat Slabs 1905–1909,” published in the *Journal of Structural Engineering* in 2002, goes into great detail about the development of the flat slab system. Instead of C. A. P. Turner, he attributes the distinction of the first engineer in the United States to design and build reinforced concrete flat-slab floors to George M. Hill, while also noting that Orlando W. Norcross is also often incorrectly given the distinction. Gasparini does acknowledge, “There is no doubt that C. A. P. Turner, with his ‘mushroom system,’ proved the reliability and cost effectiveness of flat-slab systems for both buildings and bridges from 1905 to the end of 1909.” Gasparini also notes that the ownership of the idea was disputed and there were extensive and destructive legal battles over the patents for this method. Additionally, in *A Concrete Atlantis*, Banham notes that Robert Maillart is credited with the same concept in Europe.



Partial Plan showing Floor Reinforcement.



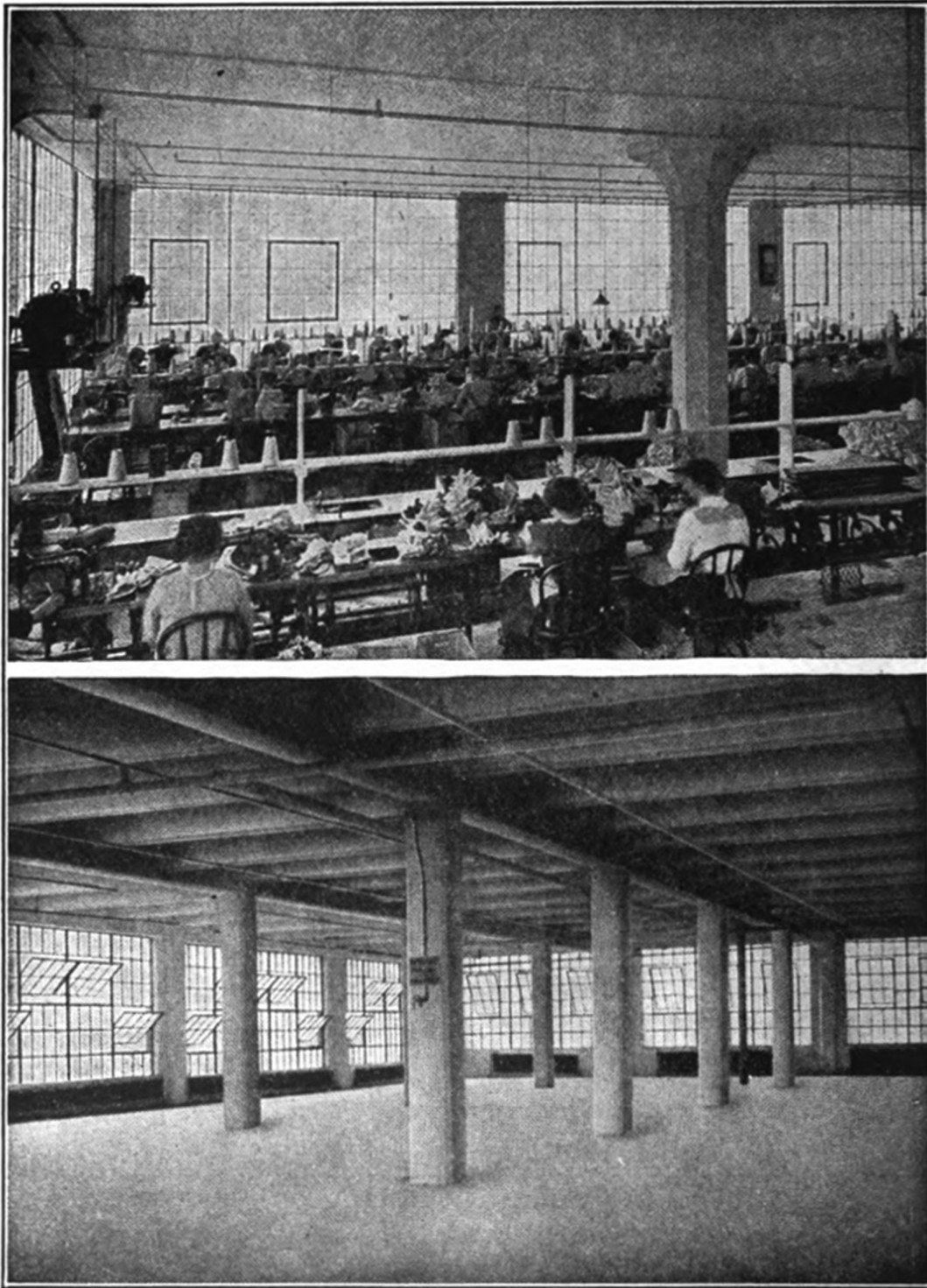
Top View of Column Framing.



Sectional Elevation.

ENG. NEWS.

Fig. 1.22 "Mushroom" system of concrete reinforcement as proposed by c. A. P. Turner in *Engineering News*, 1905.



FIGS. 106 AND 107. UNIFORM DISTRIBUTION OF NATURAL LIGHT FROM FLAT SLAB CEILING (above) AS CONTRASTED WITH BEAM AND GIRDER TYPE (below)

Fig. 1.23 Samples of two interiors showing the difference between the "flat slab" system versus "beam and girder" system. Photo from Willard Case's *The Factory Buildings*, 333.

and effect of the ‘flat slab’ as contrasted with the ‘beam and girder’ type of building is quite clearly indicated; and these illustrations emphasize particularly the greater attractiveness of the flat ceiling and the magnificent distribution of natural light its use affords.”⁶⁴ As to further practical advantages, Slaton summarizes:

The absence of beams and girders left more headroom—of particular value in rental properties where charges were based on usable space—and permitted light to diffuse more completely throughout a work space. This spare headroom also somewhat eased the problem of adding shafting or fixtures to a completed concrete structure. Flat-slab construction also required less carpentry for formwork, and was thus less expensive than beam-and-girder work. By 1920 it was clearly the preferred construction method for large reinforced-concrete industrial buildings.⁶⁵

The Kahn Legacy

In addition to Ransome and Turner, Albert and Julius Kahn were two more successful American innovators who are noted for developing and patenting the Trussed Concrete System.⁶⁶ Their names have become inextricably linked to the architecture of the automobile manufacturing industry in the United States, particularly because of their work on Ford Motor Car Company plants. The Packard Plant in Detroit was the means by which Albert Kahn became a major figure of industrial architecture, and enabled him to secure commissions with Ford. The main phase of Packard Plant construction took place from 1903-1905, with expansions added through 1911. Building 10 was famously built with the innovative Trussed Concrete System, using the “Kahn bar” (Fig. 1.24).⁶⁷ This new reinforcement design featured stirrups at a 45-degree angle to mitigate the

64 Willard L. Case, *The Factory Buildings*, New York: Industrial Extension Institute, 1922: 333.

65 Slaton, *Reinforced Concrete and the Modernization of American Building*, 134.

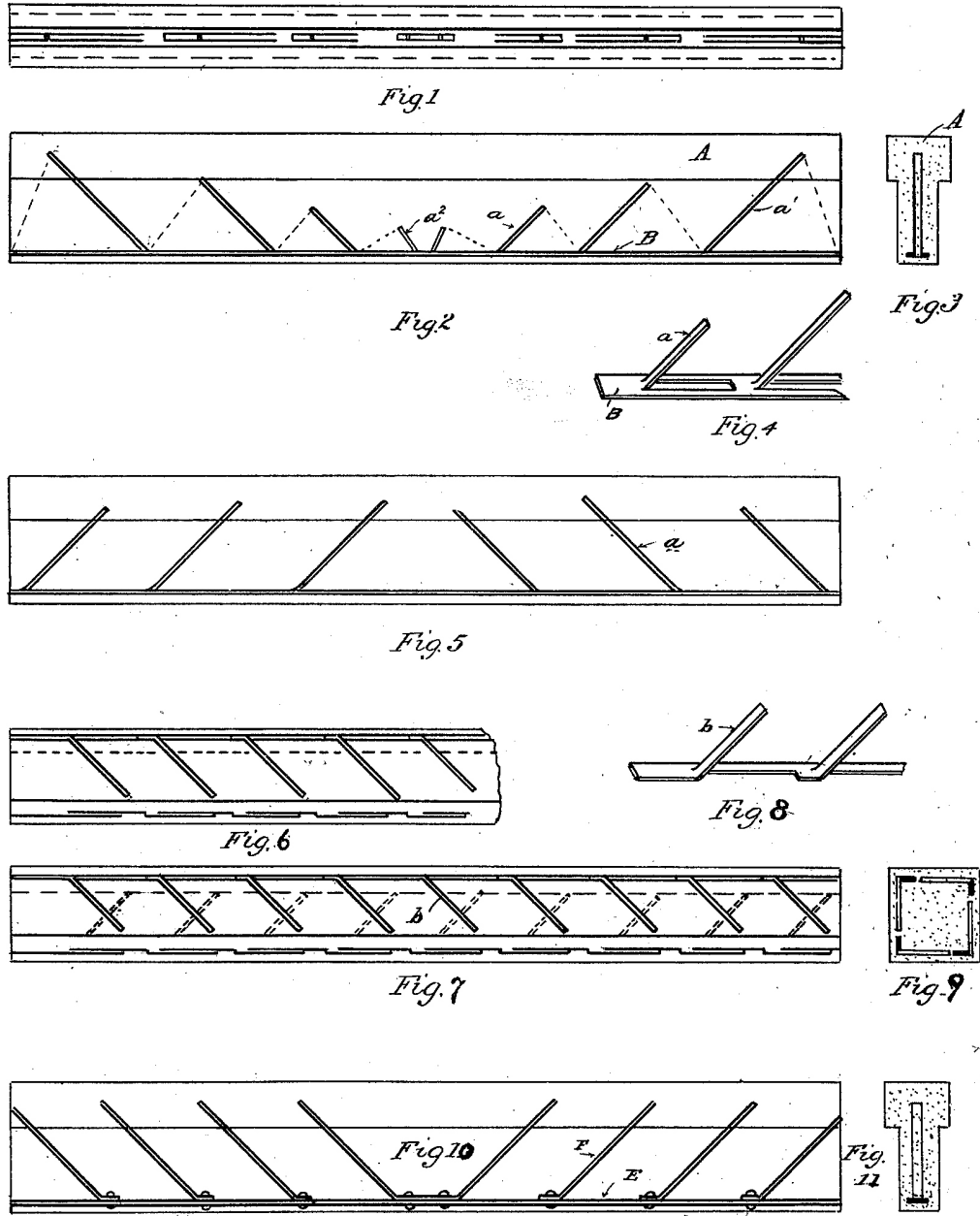
66 Banham called them “the most innovative of the younger industrial builders in concrete.” (*A Concrete Atlantis*, 65)

67 According to historian Andrew Saint in his 2007 book *Architect and Engineer: A Study in Sibling Rivalry*, there is some discrepancy in the historical record about which building was the first to use the new reinforcement technique. One iteration of the technique was certainly used in the Engineering Building at the University of Michigan campus, although it is unclear if the entire building used an older, less satisfactory technique that Julius Kahn later modified, or if the modification came during construction and the new system was indeed used in part. It is also possible the technique was used by Kahn in the Agricultural Building on the same campus. Additionally, the technology became more widely known after it was officially endorsed by Captain John Sewell of the U.S. Army Corps of Engineers who undertook trials with the buildings at the Army War College at Fort McNair, Washington in 1903. (*Architect and Engineer*, 243-245.)

J. KAHN.
CONCRETE AND METAL CONSTRUCTION.
APPLICATION FILED DEC. 11, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



WITNESSES.
W. H. Robertson
M. J. Murphy

INVENTOR.
Julius Kahn
 By *Wm. S. Macaulay*
 Attorneys.

Fig. 1.24 The first page of the patent for the "Kahn bar" filed in 1903 by Julius Kahn.

stress of shear force. The Kahns advertised the system as more efficient, arguing that the angled bar “gripped” the concrete more securely than other previous systems. The system was subsequently met with mixed reviews, with Carl Condit in *Technology and Culture* in 1968 calling it “expensive, redundant, and awkward to handle” with Albert Kahn’s biographer, Grant Hildebrand noting:

The Kahn bar reinforcing system had a certain attractive theoretical efficiency in that its sheer reinforcing wings, bent upward at 45 degrees, acted approximately parallel to the forces tending to cause fracture; but the Kahn bar was unquestionably difficult to fabricate, and it did not easily permit hooking of the ends of members to develop bond stress. Furthermore, the use of the projecting wing as shear reinforcement imposed a limitation on either the length or the spacing of the shear reinforcing elements; that is, the closer the spacing, the shorter the member, and vice versa. In these respects the Ransome system had the advantage; consequently it, and not the Kahn bar, was the prototype of future methods.⁶⁸

The initial phase of construction of Building 10 (Fig. 1.25) at the Packard Plant began in 1905, just as the new reinforcement system was being heavily promoted by the Kahns. Amidst the fervor of new technology, Building 10 of the Packard Motor Car Company became the first factory building to use this new technique and represented another step forward in the collective understanding of concrete reinforcement. Although it was not the first large-scale factory building, its ties to the automobile industry and its subsequent effect on American culture



Fig. 1.25 Building 10 at the Packard Automotive Plant by Albert Kahn begun in 1905, that was famously built with the Kahn-designed reinforcement bar. Photo: c. 1986 by Reyner Banham, from *A Concrete Atlantis*, 83.

68 Hildebrand, Grant. *Designing for Industry: The Architecture of Albert Kahn*. Cambridge, Mass: MIT Press, 1974: 33-34.

render it significant, as Ada Louise Huxtable explains:

It was a first for the automobile industry—and the automobile industry revolutionized the factory plan. . . . Because the manufacture of automobiles was experimental, methods were constantly changing, as were the specifications of the physical plant. Efficiency and speed were the only consistent rules of the business.⁶⁹

The building garnered the Packard Motor Car Company, as well as Albert and Julius Kahn, a significant amount of attention and praise. Even though the progression of Ransome’s work better reflects how the understanding of concrete advanced in the United States, Kahn has been much more extensively written about and is a more widely recognized name in architectural and industrial history.⁷⁰ Speaking to Albert Kahn’s distinct success and high profile, Andrew Saint explains that his fame is partly circumstantial:

Other “daylight factories” in concrete certainly existed by then, equal if not broader in bay-size. But Packard Plant Number Ten aligned two forces at work in Detroit: on the one hand, architect- and engineer-brothers of resource, eager to explore their new concrete patents to the full; on the other hand, an automotive industry avid for freer factory layouts, as it fumbled towards the almighty production line.⁷¹

Similarly, Hildebrand described the Packard Plant as representing American industrial architecture on a broader scale, rather than for its specific technological innovations:

If we compare Albert Kahn’s Packard Plant Number Ten with the slightly earlier work of Ransome and [Charles] Caldwell, we must conclude that it represented only a limited advance over those buildings. . . . But if we must qualify the intrinsic importance of the Packard Building, nevertheless in other ways it played a significant role: in the race that the development of industrial architecture represents, it marked the passing of the baton to Kahn, and it shifted the race to the fast track of the automotive industry.^{72, 73}

In other words, the work of the Kahns aligned with the needs of the auto industry, which would prove to be the heart of the manufacturing sector in the midwest.

69 Ada Louise Huxtable, “Factory for Packard Motor Car Company – 1905,” *Progressive Architecture* 38 (October 1957): 122.

70 Andrew Saint refers to Albert Kahn as the “prince of car-factory design,” 245.

71 Andrew Saint, *Architect and Engineer: A Study in Sibling Rivalry*, London: Yale University Press, 2007: 245.

72 Grant Hildebrand, *Designing for Industry: The Architecture of Albert Kahn*, Cambridge, Mass: MIT Press, 1974: 34.

73 Charles Caldwell was an American innovator in the technology of the steel-framed factory building. In 1904 he designed the Fischer Marble Company building in the Bronx, New York.

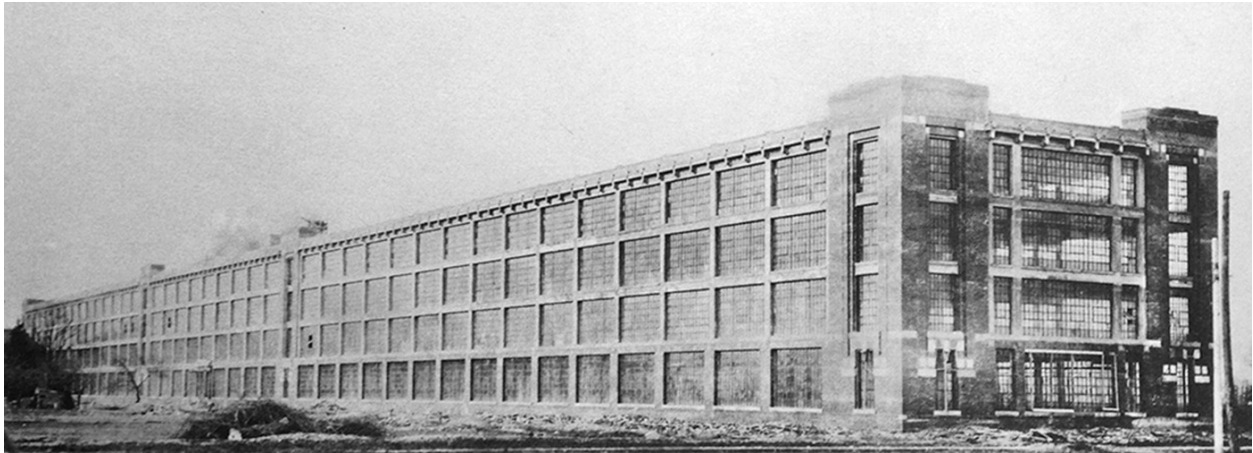


Fig. 1.26 The first structure at the Highland Park Plant in Detroit, Michigan, by Albert Kahn, 1909. Photo from *Designing for Industry*, 47.

It was most certainly the attention garnered by the Kahns for the Packard Plant that secured their commission from Henry Ford to design the Highland Park Plant for the mass production of the Model T (Fig. 1.26). With stunning speed, the plant was designed and built from the latter part of 1908 through 1909 and was occupied on the first day of 1910. Ford's construction engineer, Edward Gray, was involved in the design of the later stages, but the exposed concrete frame and expansive windows are widely attributed to Kahn. The first building at Highland Park was structurally similar to Packard's Building 10, but the aesthetic had been dramatically advanced. Unlike Building 10, the windows are of maximum size and not interrupted by smaller mullion subdivisions, so the effect is a much more continuous "skin" of windows. The thinness of the window frames as compared to the thickness of the corner piers gave the fenestration a distinct lightness.

Highland Park was also significant in that it embodied Ford's inclination to combine manufacturing operations under one roof to increase efficiency. This was not a new industrial concept, nor was it the first factory that Kahn designed to operate this way.⁷⁴ However, Highland Park is significant as an iteration of this concept in a multistory building, before large-scale manufacturing

74 Hildebrand notes that Kahn's George N. Pearce Plant was "a prototype factory whose planning principles laid the foundations of factory design for the next several decades." Because most operations occurred on a single floor, the Pearce Plant was horizontally organized, and the building layout was maximized for efficient work flow as the product moved through buildings and assembly stages. Hildebrand argues that the Pearce Plant was far more significant than the Packard Plant, even though it rarely receives attention. Additionally, with only a single story, roof lighting could be used for all area and structures could be made to accommodate any floor dimension the manufacturing process might dictate. (See *Designing for Industry*, 39-43.) No doubt this is a structure that would fit Hildebrand's definition of a true daylight factory.

complexes moved almost exclusively to single-story production sheds. In his earlier Piquette Plant, Ford used gravity chutes to transfer materials during the manufacturing process.⁷⁵ Highland Park was designed to expand on the operations at the Piquette Plant and increase the production of the Model T, including the use of gravity to transport materials. As Hildebrand notes, “The building was conceived as a three-dimensional matrix or grid whose planning relationships had to be studied not only within each floor but also from one floor to another” (Fig. 1.27).⁷⁶

Andrew Saint writes: “For a short time, the Highland Park façade influenced factory architecture the world over.”⁷⁷ The qualifying phrase “short time” refers to the fact that after about 1915, much of industrial architecture was designed as single-story buildings with steel as the primary

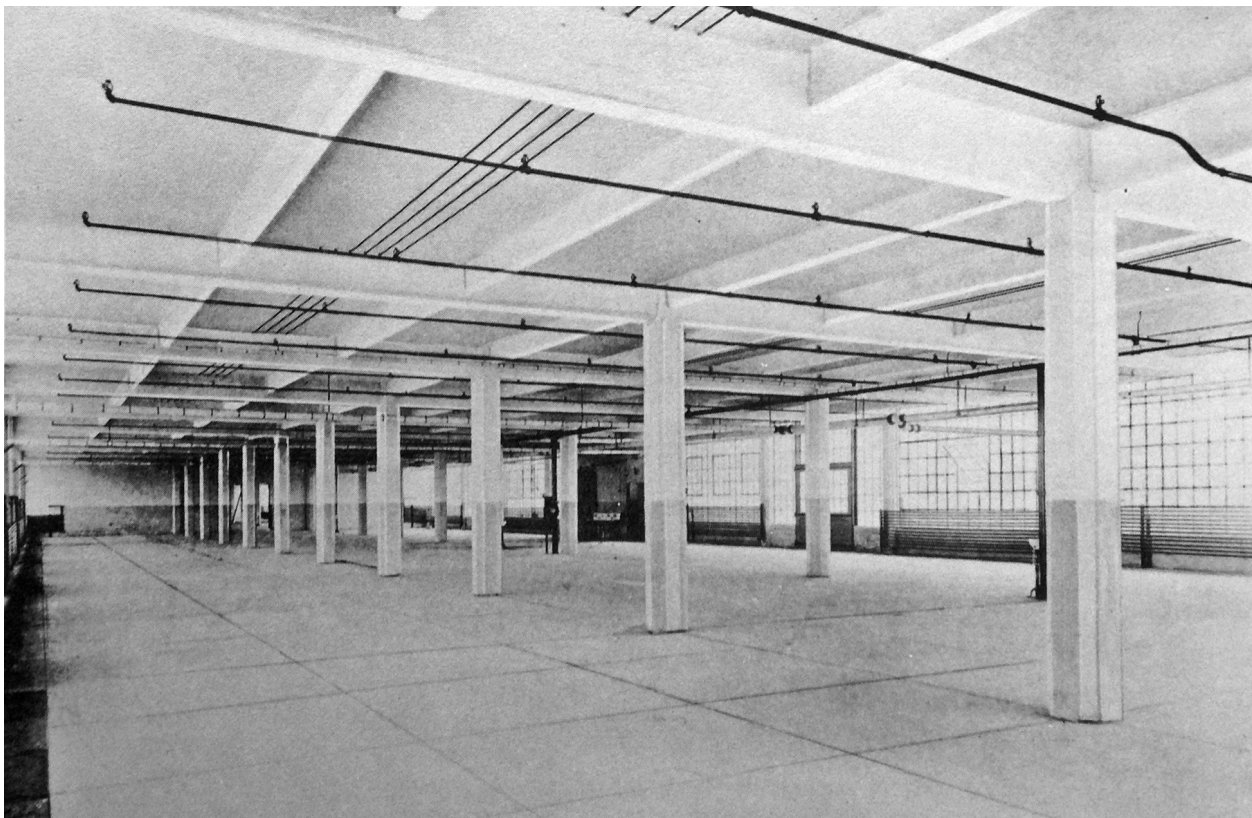


Fig. 1.27 Highland Park typical interior. Photo from *Designing for Industry*, 49.

75 The Piquette Plant, designed by Detroit firm Field, Hinchman & Smith, is a 1904 brick factory building on Piquette Avenue in Detroit, now on the National Register of Historic Places. It was the second home of Ford Motor Company and is known for being the birthplace of the Model T.

76 Hildebrand, *Designing for Industry*, 45.

77 Saint, *Architect and Engineer*, 243.

structural element rather than concrete. Steel construction technology had advanced alongside concrete and also developed design techniques that allowed for extensive window walls. Eventually, the single-story steel-framed production shed proved more advantageous for the demands of industry.

Concrete met literally every major facility need manufacturers were facing during the early part of the century including strength, low cost, fire resistance, light and ventilation, absorption of machinery movement and vibration, large floor plans with minimal structural interruptions, and flexibility of space. The particular benefits of concrete, however, were only significantly advantageous for the multi-story form. Manufacturers learned that vertical transportation, or gravity feed, was less efficient than horizontal processes of transporting and assembling parts. As industrial architecture evolved toward the single-story, steel provided a much lighter option with no formwork or curing time needed. The development of trussed roof systems eliminated the need for mid-span supports, providing an even larger, more flexible working space, and also allowed for the installation of overhead cranes for product transportation. Lighting and ventilation also were improved upon. Because the shell of the building supported nothing but its own roof and truss system, it could be manipulated in such a way to allow maximum light penetration from multiple heights and angles. One of Kahn's most refined early steel-framed designs was the Packard Forge Shop which was added to the complex in 1911. (Fig. 1.28) His most famous building of this construction type was the River Rouge Plant for Ford, begun in 1917 (Fig. 1.29). These later designs by Kahn encompassed the shift away from multistory concrete frame buildings into single-story production sheds, which became the standard industrial architectural form in the 1930s and 1940s.

Engineering as Architecture

Le Corbusier and his fellow modernists famously cited American factories and grain elevators as inspiration for the massive forms and smooth features of modern architecture, but were quick to point out that the beauty in the designs of the utilitarian buildings was not architectural.

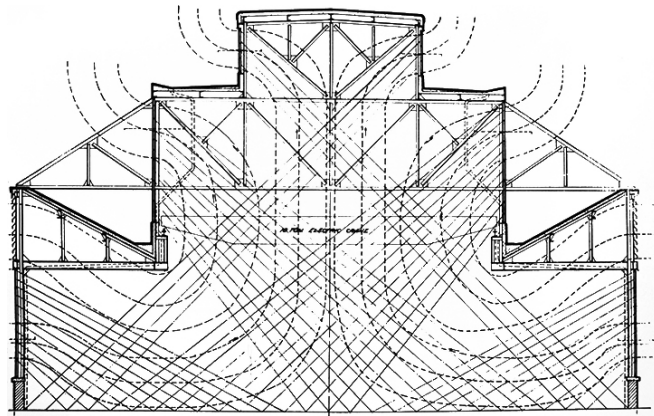
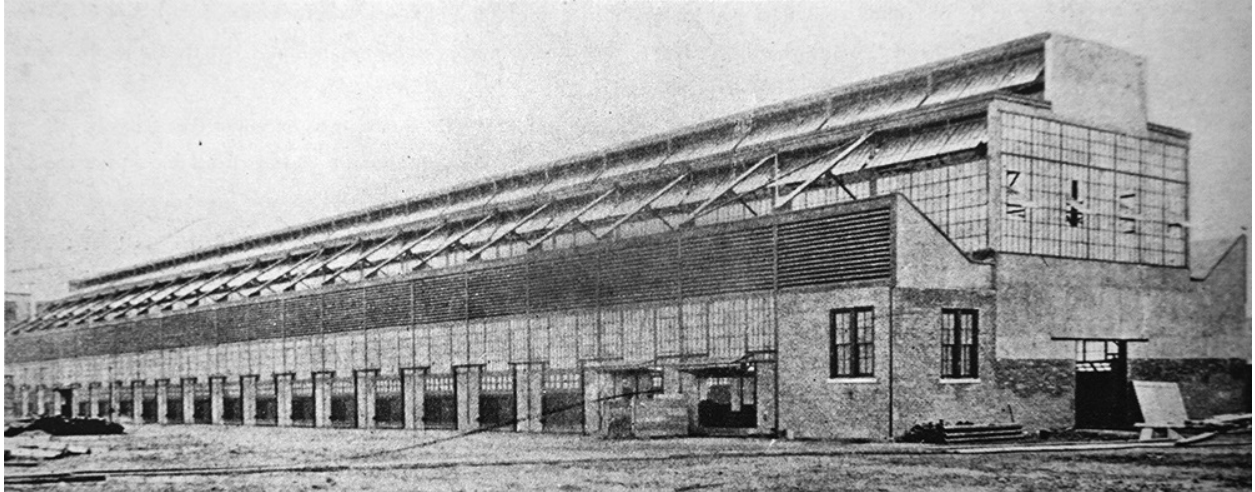


Fig. 1.28 Albert Kahn, Packard Motor Car Company Forge Shop exterior, interior, and section, Detroit, MI, 1911. Photos from *Designing for Industry*, 56-58.

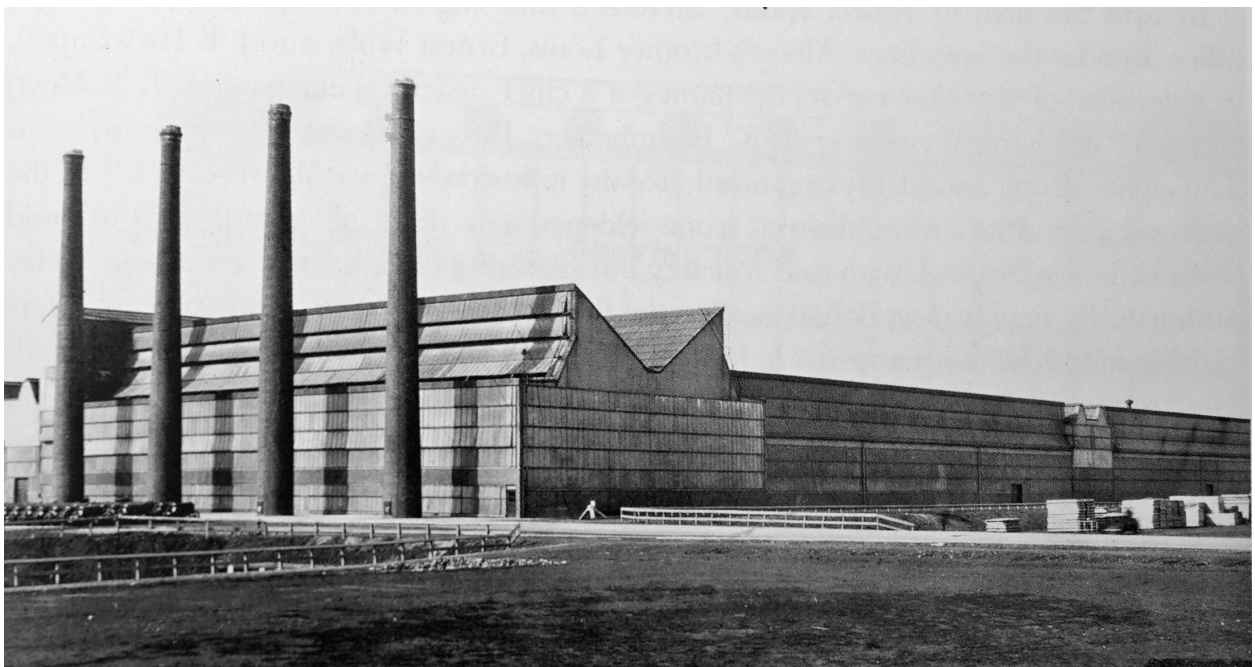


Fig. 1.29 Albert Kahn, Ford Gass Plant at the River Rouge Complex, Dearborn, MI, 1922. Photo from *Architect and Engineer: A Study on Sibling Rivalry*, 247.

Le Corbusier described the American engineer as an unknowing, mathematically-driven genius, writing that the engineers of these factories were

not in pursuit of an architectural idea, but simply guided by the results of calculation . . . the engineers of to-day . . . provoke in us architectural emotions and thus make the work of man ring in unison with universal order. Thus we have the American grain elevators and factories, the magnificent first-fruits of the new age. The American engineers overwhelm with their calculations our expiring architecture.⁷⁸

Le Corbusier clearly delineates American engineers as being different from, and by implication inferior to, the masterly architect. Presumably Le Corbusier's distinction is based around the concept of intent: "Architecture is a thing of art, a phenomenon of the emotions, lying outside questions of construction and beyond them. The purpose of construction is to make things hold together; of architecture to move us."⁷⁹ Le Corbusier further describes that engineers are governed only by the laws of mathematical calculation and architects by their own "spirit" of creation. He contradicts himself though, by using American industrial buildings to demonstrate mass and surface as the components of good architecture. The engineers of the daylight factory did have to answer to questions of mathematics and construction, but architects too are subject to those processes. As evidenced by the successful designs of daylight factories that clearly "moved" Le Corbusier and his associates, engineers are no less artistic or poetic in their process as architects. The daylight factory meets Le Corbusier's requirements for successful architecture by his own definitions.

It must be acknowledged, however, that the daylight factories of the early twentieth century were designed primarily to efficiently serve industry. Because the buildings had specifically utilitarian objectives, they were not documented as significant architecture would have been. In many cities across the United States, history has failed to record a single architect, designer, engineer or even firm for many daylight factories. Slaton explains:

78 Le Corbusier, *Towards a New Architecture*, London: Architectural Press, 1985: 33.

79 Le Corbusier, *Towards a New Architecture*, 19.

[R]einforced-concrete factories were often built without the involvement of well-known architects, or of any architect at all. The buildings' proliferation on the American urban landscape may have grown from the work of known figures, but the vast majority of these buildings were designed and erected anonymously, within a world of routine commercial transactions.⁸⁰

Today, the daylight factory is not categorized as being exclusively architecture nor exclusively engineering, and this dual existence makes it resistant to classification. To effectively examine the daylight factory, one must acknowledge its historic importance in both fields. The daylight factory is significant precisely because it used the principles of engineering to create buildings of elegant proportions and aesthetic expression. The practical constraints of the daylight factory combined with the creativity of its designers to produce a unique typology that embodied the ingenuity of American industry.

One example of the combination of practical constraints and design creativity was interpreted by Ross F. Tucker in his argument for unit construction in concrete over monolithic construction. The unique traits of concrete, Tucker argued, should have a direct effect upon the design and construction process of the building. The process of unit construction should inform the building's overall aesthetic. In addition to affecting the construction and assembly of the structures, Tucker wrote that ornamentation on the buildings should be minimal in order to reduce the number and complexity of units that would be needed, which would also reduce the cost. His conclusion was surprisingly elegant considering his focus was strictly efficiency and cost reduction: "The reinforced concrete building must be essentially a plain building and its architectural effect must be developed by the study of the relation of the openings to the masses."⁸¹

Even as an engineer, Tucker tapped into a very prominent theme from Le Corbusier that would become a mainstay of worldwide architectural design for decades to come: "Mass and surface are the elements by which architecture manifests itself. . . . Architecture is the masterly, correct

80 Slaton, *Reinforced Concrete and the Modernization of American Building*, 138.

81 Tucker, "The Progress and Logical Design of Reinforced Concrete," 73.

and magnificent play of masses brought together in light.”⁸² Beyond both the public contemporary perception at the time of these buildings’ construction and the public perception today, exists the translation of utility and efficiency into beauty by Le Corbusier’s own definitions. There is certainly no lack of aesthetic intent for these structures. Engineers sought to allow the elements of the building and the material determine the appropriate aesthetic, rather than allow the design to be driven by a preconceived or prescribed aesthetic. The style of the daylight factory then, emerged from the shapes and elements of the materials that best suited the manufacturing process itself. The daylight factory not only serves its intended function, but also emphasizes its own purpose through its visually prominent structural elements, much like many of the most important buildings of the International Style would a few short decades later.

Although some are attributed to individual architects, daylight factories are for the most part products of a collective nature. At a time when the principles of scientific management were reshaping American industry, the daylight factory was a physical and visual response. At its core, industrialism was a system of production and as a result it was optimized it for the greatest amount of profitability. Technique even became a means unto itself with the development of “scientific” approaches as documented in Frederick W. Taylor’s *Principles of Scientific Management*, published in 1911. Maury Klein writes that with the growing influence of science on American life that accompanied the development of industry:

attention shifted from “why” something should be done to “how” it could best be done. This proved to be a profound shift because a technical or “how to” decision is quantitative; it shirks any broader moral or philosophical questions involved. “Best” comes to be equated with “most efficient” way to perform the task at hand without inquiring into the broader consequences or even whether the task needs to be performed at all.⁸³

The daylight factory is a direct response to this shift. Every aspect of the daylight factory

82 Le Corbusier, *Towards a New Architecture*, 31.

83 Klein, Maury. *The Genesis of Industrial America*. New York: Cambridge University Press, 2007:18.

was engineered for maximum efficiency, which directly influenced the evolving form. As American engineers refined their understanding of the capacity of reinforced concrete, the daylight factory frame evolved to have thinner components, wider distances between columns, larger workspaces, and extensive window spans. The material properties of reinforced concrete allowed for a multi-story building type that possessed both sturdiness to resist the processes of heavy industry and the potential for enormous spaces.

Like its structural elements, the aesthetic of the daylight factory evolved in relationship to the requirements of the industry, becoming more sophisticated over time. The exterior effect of the concrete frame and fenestration served another very important purpose: uniformity and visual organization. In addition to being a direct result of the materials and technological processes with which they were built, these buildings were consciously-designed representations of a confident and competent public image for the industries that built them.

2. Dayton: A Center of Industry and Innovation

The daylight factory was ubiquitous in the Midwest during the early part of the twentieth century, and in order to understand its particular influence, it is necessary to examine and understand the industrial history and development of a particular place. Dayton, Ohio is an ideal case study because historically it had a strong manufacturing base with a wide variety of products. The manufacturing economy of Dayton was dynamic, and embodied the innovation, change, and modernization that the daylight factory was built to accommodate. Dayton is also particularly relevant to the daylight factory because it experienced its most significant period of growth during the time in which they proliferated: 1890-1930. Unlike earlier decades when the percentage of growth was high and overall population was low, or later decades when overall population was high but percentage of growth was low, these decades saw both a relatively high percentage of growth and a significantly sized overall population (Table 1). This set of conditions left Dayton with a diverse collection of industrial structures, including some exceptional examples of the daylight factory.

The economic situation that made Dayton an opportune location for the daylight factory began in the city’s earliest years. After several years of land speculation in the Miami Valley, a group of settlers from Cincinnati moved to the current site of Dayton in 1796, drawn by the ideal farming conditions. Dayton became an industrial city almost immediately when early entrepreneur Daniel C. Cooper (1773 - 1818) built a “corn cracker” gristmill in 1798 on the corner of Mill and Water Streets,¹ and likely also

Census year	Population	Percentage of population change from previous year
1830	2,950	—
1840	6,067	+105.7%
1850	10,977	+80.9%
1860	20,081	+82.9%
1870	30,473	+51.8%
1880	38,678	+26.9%
1890	61,220	+58.3%
1900	85,333	+39.4%
1910	116,577	+36.6%
1920	152,559	+30.9%
1930	200,982	+31.7%
1940	210,718	+4.8%
1950	243,872	+15.7%
1960	262,332	+7.6%
1970	243,601	-7.1%
1980	193,536	-20.6%
1990	182,044	-5.9%
2000	166,179	-8.7%
2010	141,527	-14.8%
2014 (est.)	141,003	-0.4%

Table 1 Dayton population data taken from the U.S. Census at factfinder.census.gov.

¹ Now Patterson Boulevard and Monument Avenue, respectively.

a sawmill at the same location around the same time.² Cooper was a significant figure in the early settlement of Dayton. In addition to building the first industrial buildings, he would later serve in several prominent civic roles and be instrumental in the design and construction of the canal races that provided water power to these early industrial sites.³

Historian Joseph Sharts attributed the initial growth of manufacturing in Dayton to its isolation, noting that the increase in farm productivity and the limitations of transportation created a surplus beyond the scope of local consumption. Regular droughts and floods in the area made shipping goods along the Miami River unreliable and transportation of goods became a major economic concern, particularly the need for efficient export. Dayton's manufacturing was varied and growing; Sharts provided a picture of early Dayton's economy:

In 1810, Dayton had a printing office, 6 licensed taverns, 5 stores, 2 cut-nail factories, a tannery, a brewery, 3 saddlers' shops, 3 hatters' shops, 3 cabinet makers' shops, 1 rifle gunsmith, 1 jeweler, 1 watchmaker, 1 sicklemaker, 1 wagonmaker, besides smiths, carpenters, masons, weavers, dyers and tailors. The population was 383.⁴

Although in many ways Dayton was an ideal geographic setting with access to plenty of natural resources, it had one major drawback: Dayton had been established in a flood plain. Dayton is located at the confluence of the Miami River and three of its tributaries: the Mad River, the Stillwater River, and Wolf Creek. In the 1810s, Dayton began building levees along the Miami River to manage the regular flooding. Despite efforts, major flooding events occurred about every other decade; comprehensive flood control would not be implemented until after the Great Dayton Flood of 1913.⁵

After a brief economic depression following the War of 1812, Dayton's economy grew again

2 Charlotte Reeve Conover, ed., *Dayton and Montgomery County: Resources and People*, New York: Lewis Historical Publishing Company, Inc., 1932: 463.

3 Conover, *Dayton and Montgomery County*, 464-465.

4 Joseph W. Sharts, *Biography of Dayton: An Economic Interpretation of Local History*, Dayton, OH: The Miami Valley Socialist, 1922: 14.

5 Major flooding events in Dayton occurred in 1805, 1814, 1828, 1847, 1866, 1898, and 1913.



Fig. 2.1 An early view of the Miami Canal, built 1825-1829, from a watercolor painting titled "Head of the Miami Canal," painted by Thomas K. Wharton in 1831. Image from the Dayton Metro Library.

and the city's need for better, cheaper transportation of surplus goods to outside markets became more pronounced. The campaign to build a canal from Dayton to Cincinnati began, and the idea gained further support when the Erie Canal in New York began construction in 1817. After years of campaigning and planning, ground was broken for the Miami Canal in July 1825 and the first boats from Cincinnati arrived in Dayton in January 1829. An early representation of the canal was painted in 1831 by Thomas K. Wharton, as seen in Fig. 2.1, and historian Charlotte Conover wrote of the canal's immediate success:

No sooner was the route open than traffic became at once heavy . . . in the month of April, 1829, seventy-one boats arrived at the Dayton Wharf and seventy-seven departed. For a little city of only two hundred and thirty-five dwellings and three churches this was indeed "big business." . . . The canal basin on Second Street was a crowded and busy place, the banks piled with merchandise as the river bank had used to be. . . . Naturally, it was not long before the passenger service followed the freight. It became both a pleasure and a practical necessity to travel by canal.⁶

The completion of the canal reduced transportation costs and further spurred industrial

6 Conover, *Dayton and Montgomery County*, 35-36.

development, prompting the construction of several additional mills and factories which created an industrial district along its banks (Fig. 2.2). Light manufacturing of products as varied as cloth, carpet, hats, soap, guns, candles, lumber, and paper flourished in the city along with several distilleries and foundries. With these growing industries, the canal was expanded northward and reached Lake Erie in 1845. The growth of the city was also aided by the expansion of land transportation in the form of turnpikes, roads, bridges, and stagecoach lines. The first weekly coach service was established in 1818 and the first bridge was built over the river at Stratford Avenue and Salem Avenue in 1819.⁷

Prominent Dayton historian and professor Dr. Carl Becker noted that the construction of the hydraulics were the most significant infrastructural development that stimulated manufacturing at this time, even more so than the construction of the canal.⁸ Hydraulics, or races, were artificial channels cut from a canal, river, or

lake from which industrial users could lease “water privileges,” and install water wheels to produce power.⁹ The first significant hydraulic was the Cooper Hydraulic built in 1838, which was 700 feet long and 50 feet wide, running parallel to the Miami Canal. Fed by the canal, its power was quickly leased after its opening in 1839. The second, the Upper Hydraulic, ran for four miles starting

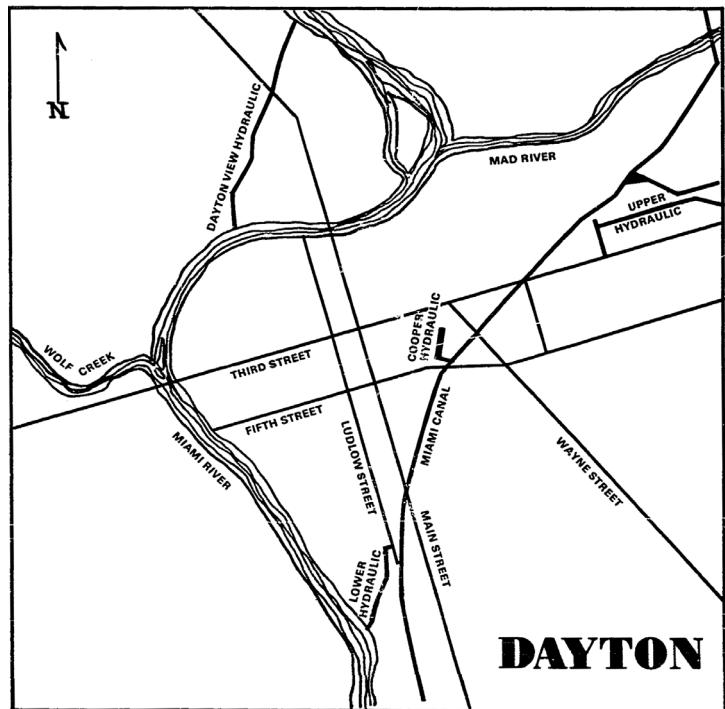


Fig. 2.3 Water power in Dayton: the Miami Canal and hydraulics. Diagram from “Mill, Shop, and Factory.”

7 Conover, *Dayton and Montgomery County*, 34.

8 Becker, Carl M. “Mill, Shop, and Factory: The Industrial Life of Dayton, Ohio, 1830-1900.” Diss. U of Cincinnati, 1971: 17.

9 Becker, “Mill, Shop, and Factory,” 17-18.

from the Mad River running into Front Street in downtown Dayton. Before it was even completed, the water power had already been leased, and the surrounding property lots were quickly sold. Three other smaller hydraulics were built in Dayton, each servicing smaller firms in other parts of the city.¹⁰ (Fig. 2.3)¹¹ This network of water transportation was critical to the early growth of Dayton and sustained the city through technological transitions in the coming decades.

By the 1840s, Dayton had dozens of factories and businesses concentrated along the canal and adjoining hydraulics whose production was largely for export. With the increases in the availability of power and the more widespread use of machinery, the smaller one- and two-man shops declined. While the city was clearly thriving on manufacturing by the mid-point of the nineteenth century, Dayton had no particular specialization or dominant firm, leaving its identity as an industrial city somewhat ill-defined. As Becker explains: “No one industrial group had emerged by 1850 as the leading force in the industrial life of the community; and similarly, of course, no one firm had appeared as a pre-eminent element setting a distinctive tone for that life.”¹²

With its energies focused on the expansion of the canal and hydraulic network during the 1830s and 1840s, Dayton initially had little interest in investing in rail lines. The Mad River and Erie Railroad company attempted to sell stock in Dayton as early as 1832, but were unsuccessful. Many Daytonians did not support the railroad, fearing that the connection to larger manufacturing markets in Cincinnati would bring in too much competition. Rail was also controversial in Dayton because it threatened the relevance of water power. Water was the foundation of Dayton’s electricity supply, but was quickly proving inefficient in comparison to coal and becoming obsolete in larger cities. Ultimately, civic leaders recognized that failure to connect to the developing transportation

10 Becker, “Mill, Shop, and Factory,” 17-21.

11 The Lower Hydraulic pictured in the diagram was built about 1847, but was small and removed from the industrial core of the city. Becker notes that a sawmill and a paper mill were built along its banks, but it was drastically underused. The fourth hydraulic on the diagram, the Dayton View Hydraulic, was built much later in 1869 after the prevalence of steam power had been established. It was also underutilized. Two other small hydraulics built in the 1840s, but not pictured on the diagram, took water from the canal at Fifth Street and at Wayne Avenue.

12 Becker, “Mill, Shop, and Factory,” 30.

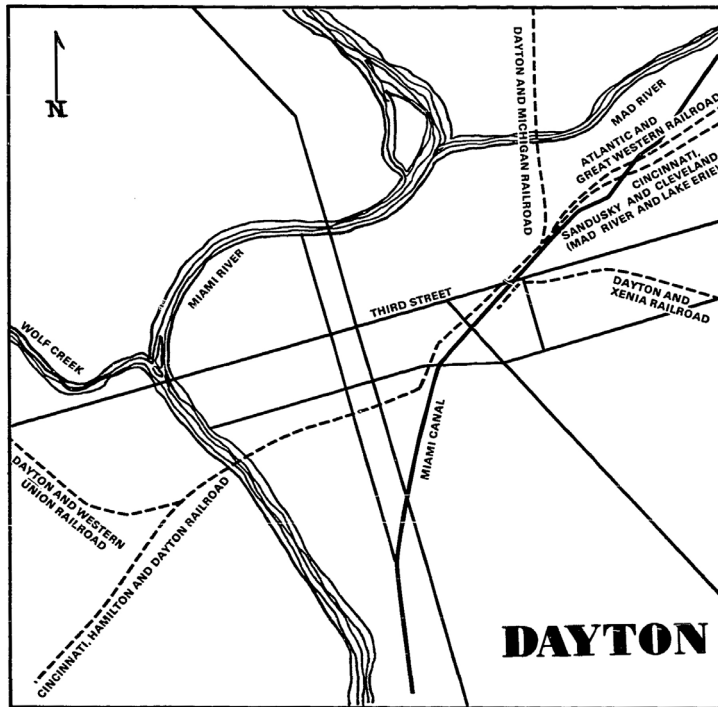


Fig. 2.4 Rail lines in Dayton, 1850-1870. Diagram from "Mill, Shop, and Factory."

network would be devastating for the future of the local manufacturing sector. In 1845 the city authorized a \$25,000 subsidy for the Mad River and Lake Erie Railroad, and a similar amount was authorized for the Dayton and Western Railroad four years later.¹³ Rail finally arrived in Dayton January 1851 with a line from Springfield to the north, connecting through Dayton and south to Cincinnati. In the next two

years three more major rail lines were established, and yet another in 1859. Within just a few years, Dayton was connected by rail in all directions and was firmly planted within the emerging transportation network. (Fig. 2.4)

Ironically, even with the delay toward building rail lines, the first major manufacturing firm in Dayton was a rail car manufacturer. In 1849, E. E. Barney and Ebenezer Thresher formed the Barney and Thresher Company and built a plant on the upper hydraulic (Fig. 2.5). Predating the arrival of rail in Dayton by two years, the company first shipped rail cars to major cities by boat. The firm grew rapidly as Ohio added more miles of rail than any other state during the 1850s. The company was vital to the economy of the city because it used iron from local foundries and wood from local lumberyards, and also accumulated a large, skilled workforce. Bruce and Virginia Ronald report that "by 1853, about 150 workmen were forming 15,000 tons of pig iron and 2.5 million cubic feet of lumber into six freight cars and one passenger car a week."¹⁴ After Thresher left in 1854,

13 Ronald, Bruce R. and Virginia Ronald. *Dayton: The Gem City*. Tulsa, OK: Continental Heritage Press, Inc., 1981:37.

14 Ronald and Ronald, *Dayton: The Gem City*, 37.

the firm would become the more widely recognized Barney & Smith Company. The company also diversified by producing iron farming implements. This agricultural division eventually formed an independent business in 1852, which was one of many successful farming supply manufacturers in Dayton during the 1850s and 1860s.

The foundries and machine shops in Dayton were well-established industries and as a result, exemplified the most current techniques and technology in the trade. As Dayton grew in the 1850s, the metal-working trades remained a dominant economic driver. During this time, Dayton also began to shape its identity as an innovative industrial city. Companies began to take out patents for inventions, which received significant praise from local newspapers. Whether or not these patents



Fig. 2.5 The Barney and Smith Company buildings, built c. 1849. Photo: 1889, from the Dayton Metro Library.

were particularly valuable or groundbreaking, they were used by the newspapers as evidence of the dynamic character of the community.¹⁵

As Dayton was distant from the battle grounds of the Civil War, it did not experience a dramatic industrial change during wartime. After a slight depression at the beginning of the war in 1861, production, retail, and trade recovered, and then continued to develop. The foundry and metalworking industries of Dayton especially grew during this time, as rail cars were needed for troop transportation. The demand for farm implements and industrial machinery also increased as enlisted men left a deficit in the workforce. A major setback to the industrial economy of the city occurred in 1866 with a major floor that caused a quarter of a million dollars in damage.

With the end of the war, a variety of new firms were founded which further fueled the city's industrial progress. Paints and varnish, paper manufacturing and bookbinding, and tobacco were among some of the new industries that began to take a significant foothold and diversify Dayton's economy. The Panic of 1873 briefly slowed the growth of Dayton, but by the mid-1870s, the economy had recovered and stabilized. Dr. Becker described Dayton's industries, characterizing them whether they produced goods for local or more distant markets.

The industrial face of Dayton . . . was deeply etched, of course, by the large city-forming industries. . . . Selling nearly all their output outside of Dayton, these industries drew to the community income that encouraged the establishment of city-serving manufacturing and that enabled them to expand their facilities, production, and employment. . . . Giving additional lines to the industrial appearance were industries acting both in city-forming and city-serving ways. . . . But the central feature remained the city-forming industries. The producers of income and the progenitors of new manufacturing, they gave structural definition and vitality to the industrial life of the city.¹⁶

In the 1870s, the four largest industries that produced goods to distribute to markets beyond Dayton were rail car manufacturing, agricultural implement manufacturing, foundries and machine shops, and paper mills. These industries were the economic foundation of industrial Dayton

15 Becker, "Mill, Shop, and Factory," 81-82.

16 Becker, "Mill, Shop, and Factory," 161-162.

and generated the income and prosperity that allowed Dayton to be a center for new business and innovation. This economic foundation supported Dayton during its most formative years, 1890-1920, when the number of industries skyrocketed.

The 1870s was a time of fluctuation for the industrial life of Dayton. A second smaller railroad boom took place, which included the development of a coal rail line. Although many industries still relied on the water power generated from the canal system, steam power had become increasingly prevalent and was bolstered by the access to coal brought by the rail network. Since firms no longer had to physically congregate around water sources, they began to spread out from the downtown core, east and south (Fig. 2.6). Community leaders still believed that water was the main source of power supporting industries, even though, according to the 1870 census summaries,

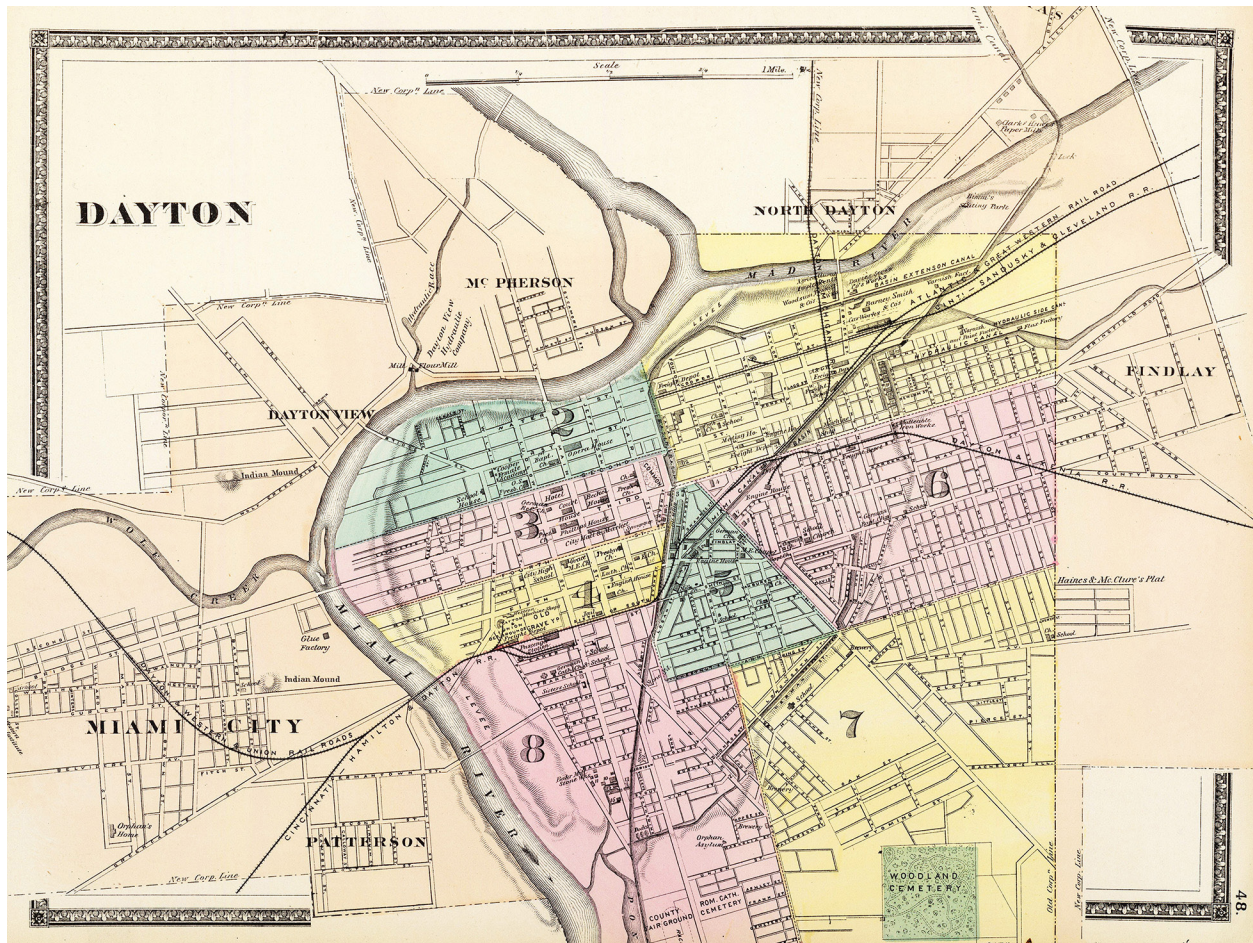


Fig. 2.6 Map of Dayton drawn in 1872 by Stedman, Brown & Lyon of Cincinnati. With the boundary of the Miami River to the west, the city expanded east and south when industrial firms no longer relied on the proximity to water for electricity. Image from davidrumsey.com.

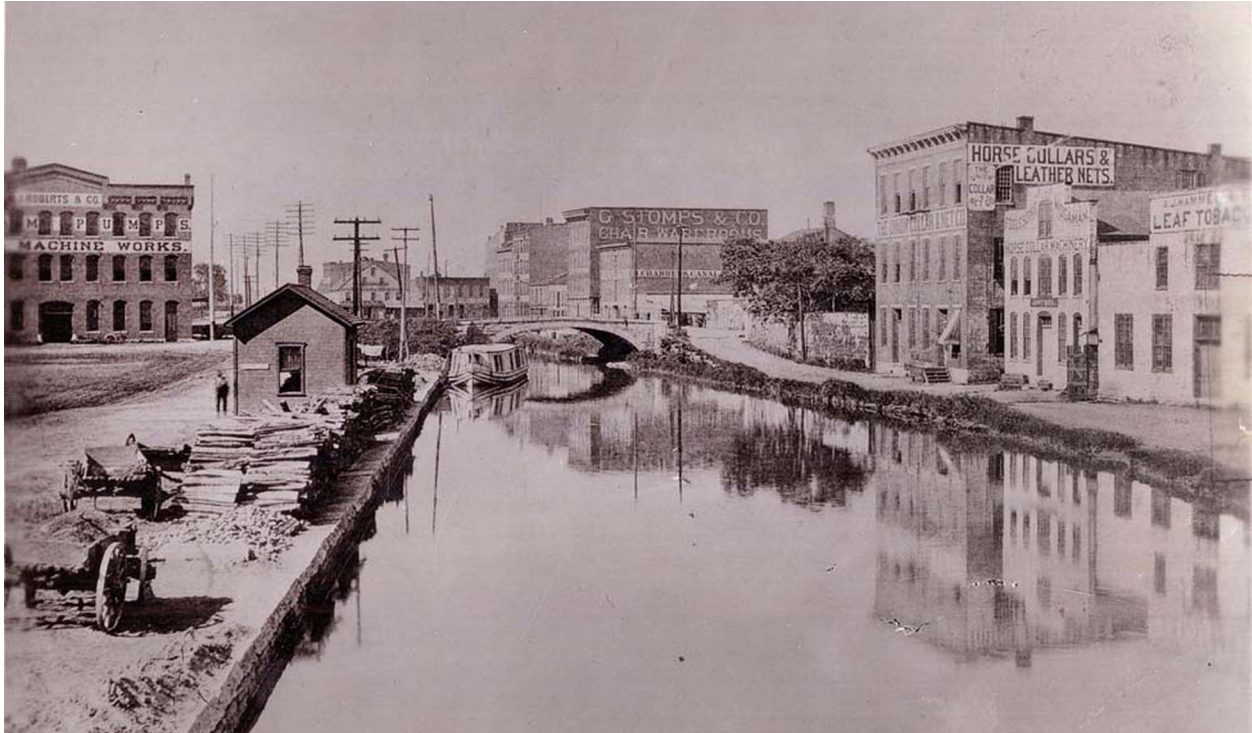


Fig. 2.7 The Miami Canal in downtown Dayton, north of Third Street, pictured here c. 1900. Although the canal had declined in use by this point, the image reflects the development of Dayton's industry: firms established in the mid nineteenth century lined the banks of the canal to have better access to water for power and transportation. Photo from the Dayton Metro Library.

steam power accounted for almost twice the horsepower of water power.¹⁷ Steam power increased only 28 percent between 1870 and 1880, indicating that the local industrial culture was significantly more reluctant to transition from water to steam than industries elsewhere. The rail lines also affected the use of the Miami Canal as a means of transportation, which declined significantly in the last few decades of the nineteenth century. The canal continued to be in use, however, until it was severely damaged by the 1913 flood (Fig. 2.7).

By 1880, Dayton had become a formidable industrial center, one of the top fifty in the nation. Nationwide, Dayton ranked 47th in population, but 43rd in value of product and in Ohio, Dayton was third in value of product, wages paid, and capital invested in manufacturing, despite being only fifth in population.¹⁸

17 According to Becker: "Steam engines in manufacturing firms in Dayton, the summaries suggest, generated about 2,400 horsepower in 1870; water wheels accounted for about 1,300." By 1880, steam was producing more than three times the power: 3075 horsepower versus water's 875." ("Mill, Shop, and Factory," 167)

18 Becker, "Mill, Shop, and Factory," 162-163.

The 1890s was a period of industrial transition in Dayton, and three of the four largest industries went into decline. The combination of technological changes, market instability, and shifting industrial attitudes proved overwhelming even for the leading Dayton industries. Rail car manufacturing in Dayton, in particular the Barney & Smith Car Company, had been one of the largest and most significant industries in the city for decades. After the Panic of 1893, the company was able to return to previous operating levels, but with diminished reserves had difficulty responding to the rapidly changing marketplace. Steel was becoming the material of choice for rail cars because it was cheaper and proved safer than wood. By the time the company decided to devote resources to constructing steel cars in 1905, they were too late and already could no longer adequately compete in the market. The company went into its final decline after unsustainable damages from the Great Flood of 1913, going into receivership by 1918, and dissolving in 1922.¹⁹

The farm implement industry also declined in the 1890s, which Dr. Becker attributed to an attitudinal shift. He described the older founding entrepreneurs of the industry as having “spent their energy” and the younger generation of entrepreneurs as looking for “more attractive industrial pursuits.” The farm implementation industry was unable to reach out to new markets which were expanding westward, and it began to be outsold by firms in cities that were closer to large agricultural areas. By 1897, when economic conditions had improved from the Panic of 1893, four of the eight major firms had already closed their doors. Despite having been a key industry in the last half of the nineteenth century, no farm implement firms remained in Dayton by 1910.²⁰

The other major industry to decline, the paper production, experienced less severe setbacks as the rail car or farm implement manufacturing industries. The paper mills had largely relied on straw produced in the Miami Valley for their raw material, but the straw producers began to relocate to Illinois and Indiana. The industry did not disappear altogether, but rather stagnated until the 1900s.²¹

19 Becker, “Mill, Shop, and Factory,” 233-234.

20 Becker, “Mill, Shop, and Factory,” 327-238.

21 Becker, 328-239.

Of all the industries that were the foundation of Dayton's economy in the nineteenth century, it was the machine shops and foundries that recovered best from the 1893 panic and went on to thrive. In addition to continuing to produce a major portion of the added-value products in the city, by 1900 the sector employed seventeen percent of all industrial workers in the community. Many manufacturing firms began to establish their own, integrated foundries for the production of specialized parts. The Davis Sewing Machine Company, for example, created a firm for small, specialized sewing machine parts, and were later able to expand into bicycle manufacture using their foundry skills.

Dayton's transition into the twentieth century was marked not just by the decline of older industries, but also the establishment of a new generation of manufacturing. It was during this transition that several firms that would dominate Dayton's economy in the twentieth century would emerge. Building on over fifty years of strong industrial development, Dayton was primed for the new era of industrialism with strong resource and transportation networks, but most importantly, a skilled and capable workforce. With the wave of new firms that were established and the technologies that would lead to mass production beginning to develop, came the need for more sophisticated industrial buildings. With such massive shifts in its economic base, Dayton was particularly poised to begin integrating the daylight factory into the industrial urban landscape.

One of the largest and longest-lasting firms that dominated the Dayton economy in the twentieth century was also among the first of the new wave of industries, and probably the first in the city to incorporate the concrete frame in factory construction. The National Cash Register Company, or as it became known later, NCR, was established in 1884. In 1879, brothers James and John Ritty invented and patented the first cash register, but were unable to successfully market the product. They sold their business and after it changed hand several times, the company was finally taken control of by John H. Patterson (1844-1922) in 1884.²²

22 Becker reports that between 1886 to 1893 the capital invested went from \$100,000 to \$1,500,000 (1500% increase), the workforce expanded from 100 to 1200 (1200% increase), the salesforce from 20 to 350 (1750% increase), and annual sales went from 500 units to 15,000 (3000% increase). ("Mill, Shop, and Factory," 253)



Fig. 2.8 The Callahan Power Building in downtown Dayton with annotations showing the location of the National Cash Register Company in 1884 and its expansion in 1886 and 1887. Photo and annotations from urbanohio.net.

That same year, Patterson rented space in the Callahan Power Building in downtown Dayton. NCR expanded to another floor in the same building in 1886 and expanded again into an adjacent building in 1887. (Fig. 2.8) Citing overpriced real estate costs, Patterson decided to build the first NCR campus building on family farm land south of downtown. The first NCR buildings were constructed of masonry and designed to maximize natural lighting and ventilation (Fig. 2.9). While Patterson was not the innovator of this concept, he did employ it on a large scale and with impressive effect.²³ Patterson hired architect Frank Mills Andrews (1867-1948), who had worked with Ernest Ransome on the United Shoe Machinery Company complex, which no doubt affected the construction of the NCR buildings.²⁴ The first four structures had impressively large windows,

23 In *Dayton: The Gem City*, Bruce and Virginia Ronald write that “Patterson invented the modern factory,” (62). Innovators around the country were simultaneously experimenting with factory improvements, and the “invention” of the modern factory is not universally attributed to any one individual. With the aid and expertise of architect Frank Mills Andrews, Patterson did incorporate large window spans and (after 1906) the concrete frame at a relatively early date.

24 It is unclear how many buildings Andrews designed as the early buildings demonstrate a variety of architectural styles, but he is the only architect associated with the campus. It is likely he designed most if not all of the campus buildings at least through 1909.



Fig. 2.9 Building #1 of the National Cash Register Company, designed by architect Frank Mills Andrews c. 1887. The factories were known for their large windows that provided ample lighting and ventilation for the comfort and safety of their workers. Photo: 1953, from the collections of Dayton History.



Fig. 2.10 Building #7 of the National Cash Register Company, designed by Frank Mills Andrews, built 1906. According to Sanborn maps, Building #7 was probably the first concrete frame daylight factory built in Dayton. The actual frame is not exposed, however, as the building is faced in brick to match the earlier buildings. Photo: 1939, from the collections at Dayton History.

but were built with brick pier structural systems (Fig. 2.9). According to Sanborn maps, daylight factories with reinforced concrete frames were constructed at the NCR campus beginning in 1906 (Fig. 2.10)²⁵. By 1909, the plant was 140 acres with attractive landscaping surrounding thirteen factory buildings. With such early construction dates, Patterson and Andrews are likely responsible for the first daylight factories in Dayton.²⁶ Patterson also became nationally known for unorthodox management methods including training a sales force and providing industrial welfare programs for his workers.

The innovations of NCR characterized the changing industrial landscape of Dayton, in large part due to Patterson's progressive ownership and management. Patterson sought to create a modern, socially conscious manufacturing operation, and his factory buildings reflected that effort. Not only were the new factory buildings designed to increase efficiency and benefit the worker, but they also changed the visual character of factories in Dayton. The strong, organized facades of both the brick pier buildings (Fig. 2.9) and the concrete frame buildings (Fig. 2.10) were the physical manifestation of the changes in technology and production that were taking place in the manufacturing sector. NCR led Dayton in its industrial transition at the turn of the twentieth century, and its factory complex demonstrated its domination in that leadership.

Dayton would go on to gain a national reputation for precision machinery, NCR being the most prominent, but many other firms founded in the 1890s also contributed to this reputation. Other major firms that manufactured precision machines included the Dayton Scale Company, which made computing scales to measure the weight of merchandise; the Egry Register Company, which produced auto-graphic registers mainly used in grocery and meat markets; the Ohmer Fare

25 Several other buildings on the campus were also built with concrete in 1906, but they were not of this type. Building #10 was a ten-story office building designed in a Beaux Arts style and Building #8 was a single story production shed with concrete structural components and a concrete Beaux Arts style facade.

26 Unfortunately, none of the early buildings of the NCR campus survive. All factory buildings were demolished in the 1970s, except one that was constructed in 1951. NCR relocated to Georgia in 2009 and the area is now owned by the University of Dayton. The remaining 1976 former headquarters building and the 1951 factory building are used by the University for administrative and classroom purposes.

Register Company, which produced fare registers for street cars and train cars; and the Monarch Marking Company that manufactured tags and labels for merchandise as well as manufacturing the tag marking machines.

The precision machinery companies were reshaping Dayton's economy and gaining the city national attention, but the development of the combustion engine opened an entirely new field of manufacturing. Compared to other Midwestern cities, Dayton had relatively few auto manufacturing companies that produced whole automobiles. However, the city played a significant role in the auto industry through the innovation and manufacture of automobile parts. In particular, the advances made by the Dayton Engineering Laboratories Company, known commonly as Delco.

Delco was founded in 1909 by two former National Cash Register Company employees, Edward A. Deeds (1874-1960) and Charles F. Kettering (1876-1958). Delco's major early contribution to the automotive industry was the invention of the electric self-starter. Contracting with several prominent automobile companies, Delco gained a foothold in the market and grew rapidly. The company established its headquarters downtown in 1911, and expanded their downtown complex in subsequent years to include three large daylight factory buildings. Delco was also a pioneer for many other electric automobile systems, including interior lighting and electric headlights. Delco affiliated with United Motors in 1916, which was in turn purchased by General Motors (GM) in 1918, and became a division of the Detroit-based company. Delco continued operating from Dayton, and innovating as part of GM.

Like NCR, Delco was one of Dayton's largest firms and shaped the industrial life and economy of the city. While the founding and early success of NCR in the 1890s characterized the early part of Dayton's shift toward being a nationally-known, mass-producing industrial center, the founding and early success of Delco in the 1910s characterized the realization of that shift. Both companies were tremendously successful, but Delco emerged alongside the success of the automobile and all the technological and societal changes it wrought. The company was a modern



Fig. 2.11 The Wright Brothers, Orville on the left and Wilbur on the right, with their second power machine at Huffman Prairie, in Dayton, May 1904. Photo from Dayton Metro Library.

corporation, innovating in an exciting and completely new industry. Although many firms built daylight factories in and near downtown Dayton, none were as prominent, as large, or belonged to a company as successful as Delco.

Dayton also emerged as a national center of aviation, most notably being the testing ground for early Wright Brothers' flying experiments before and after their famous flight at Kitty Hawk, North Carolina, in 1903. After that first flight, the Wright Brothers returned to Dayton and continued building and testing planes on what would eventually become Huffman Prairie Flying Field. In 1909 the Wright Brothers established the Wright Airplane Company to manufacture airplanes and in 1910 established the Wright Company School of Aviation to train pilots. In 1917 the United States Army purchased the field for the Experimental Division of the Army Air Corps, naming it along with an additional 2,000 adjacent acres, the Wilbur Wright Field. In 1948 this merged with

the nearby Patterson Field, forming the Wright-Patterson Air Force Base which remains in active use today and is now the largest employer in the Dayton area.²⁷

One of the features that made Dayton an attractive location for early settlers and industrialists was its proximity to the Miami River and surrounding waterways. This proximity also caused some of the most devastating economic setbacks in Dayton's history through severe flooding. The Great Dayton Flood, the largest flood in Dayton's history, occurred in 1913, causing tens of millions of dollars in property damages along with significant casualties. When the levee at the confluence of the Mad and Miami Rivers broke, the river flooded downtown through the canal. Downtown



Fig. 2.12 View of the Great Dayton Flood in 1913 on West Fourth Street. Photo: from Dayton Metro Library.

27 The historic Huffman Prairie Flying Field is currently operated by the National Park Service and was designated a National Landmark in 1990. It is now part of the Dayton Aviation Heritage National Historical Park which also includes the Wright Cycle Company Building (the fourth location of the bicycle shop operated by the Wrights and the only building remaining as testament to their bicycle business), the Hoover Block (Wilbur and Orville Wright operated Wright & Wright, Job Printers, on the second floor), Huffman Prairie Flying Field, the 1905 Wright Flyer III housed at Dayton History's Carillon Historical Park (the world's first practical airplane, built by the Wright brothers in 1905 and flown at Huffman Prairie Flying Field), Hawthorn Hill (Orville Wright's residence until his death in 1848), and the Paul Laurence Dunbar State Memorial (the former residence of Paul Laurence Dunbar, an African-American poet and novelist who was a long-time friend of the Wrights). (www.nps.gov/daav/learn/historyculture/index.htm)

Dayton was submerged almost entirely, with the water reaching a depth of twelve feet in some places (Fig. 2.12). The Dayton citizens' relief committee estimated the damage to be over \$73 million, worsened by the fine mud and silt everywhere. Documents, records, and valuable papers were destroyed. The death toll was variously reported to have been between 100-300. For several days, thousands of people were stranded in buildings across the city as flood waters slowly receded. A fire also broke out, destroying two entire city blocks before spreading to nearby residential areas. The flood damaged hundreds of downtown business and factories, many of which did not recover. Firms with significant enough momentum like NCR and Delco were able to survive, but it was the death knoll for firms that had not kept up with innovation like the Barney and Smith Car Company. While the flood slowed industrial progress for a short time, the city as a whole made a remarkable recovery.²⁸ To protect their city and its commercial and industrial assets in the future, in 1914 thousands of Daytonians rallied to raise \$2.16 million for a comprehensive flood prevention program.²⁹

A few years later, World War I contributed to an industrial boom, with the city's efficient industries quickly adapting to the manufacturing needs of war. One of Dayton's most notable war-time products, the DeHaviland Mosquito bomber, was produced by the Wright Airplane Company. Other established industrial firms also shifted to meet military needs. The National Cash Register Company produced airplane parts and accessories, along with precision instruments for airplanes. The Davis Sewing Machine Company supplied fuses, detonators, special sewing machines, and bicycles for wartime efforts. Platt Iron Works and the Maxwell Motor Company engineered and

28 After the Great Dayton Flood in 1913 and the ensuing fire, Daytonians were tasked with rebuilding their city and chose to do so with the concrete frame. In addition to the concrete industrial buildings that already dotted the downtown and other industrial corridors, dozens of commercial buildings after the flood were built with concrete frames, brick infill, and brick facades facing the street. Despite their concrete frames, many of these buildings have faux brick "piers" that protrude from their faces making them appear to be masonry buildings. One only need walk to the back of the buildings, though, to see the clear outlines of their concrete frames.

29 The Ohio Conservancy Law was passed by the Ohio Legislature in February of 1914 and signed into law by the governor, and plans to build five dams commenced: two dams on the Miami, one on the Stillwater, one on the Mad River, and one on Twin Creek. The dam projects were completed one year ahead of schedule in 1922 and while there has been some minor flooding in the lowest areas, Dayton has not suffered a major flood since 1913. The Miami Conservancy District was America's first comprehensive flood control project, an engineering feat that would serve as a model for other similarly endangered areas in the country

produced tanks. A variety of other manufacturing firms produced many other military supplies including ammunitions and additional airplane parts.³⁰

This manufacturing boom was followed by an economic slump when the war ended, from which it took the city several years to recover. The situation was further complicated by the returning of soldiers to the workforce. As historian Charlotte Conover described: “Gearing up to fuel the flames of war left overbuilt industries and more workers than the peacetime economy could absorb.”³¹ A 1918 industrial survey of Dayton noted that the registering and recording machines sector of the city’s economy, which led the world market in that field, at that time only employed 4,500 when NCR alone usually employed 7,500.³²

By 1920, industries in Dayton had been successful enough that many had been purchased by national firms, and become subsidiaries. Delco by this time had become a division of GM which was headquartered in Detroit, and the Dayton Motor Car Company had been bought by the Maxwell Motor Company also out of Detroit. The Dayton Scale Company and several other similar scale companies had come under the control of the International Business Machines Corporation (IBM), headquartered in New York State. The Davis Sewing Machine Company had also come under the control of an eastern-based conglomerate. NCR remained headquartered in Dayton, but historian Joseph Sharts noted that it “was itself the head of a great international manufacturing plant . . . in the hands of outside interests.”³³

During the 1920s, Dayton again thrived. In 1926, a new industrial survey of the city was completed, citing Dayton as an ideal place for manufacturing due to its favorable climate, location, water supply, transportation network, and highly skilled workforce. By the end of the decade, Dayton’s economy was strong and exemplary of a mid-size, fast-growing manufacturing city in

30 Conover, *Dayton and Montgomery County*, 502.

31 Ronald and Ronald, *Dayton: The Gem City*, 116.

32 *Industrial Survey of Dayton, Montgomery County, Ohio*. Baltimore, MD: Baltimore and Ohio Railroad Co., 1918.

33 Sharts, *Biography of Dayton*, 102.

the Midwest. There were over 500 separate manufacturing firms in the city and the population was just under 200,000. When the Great Depression hit in 1929, production dropped and work weeks were reduced. Dayton also benefited from Federal relief programs such as the Civil Works Administration, the Public Works Administration, and the Works Progress Administration. These programs gave employment to some Daytonians and allowed for park improvements and street and bridge repair. Some relief factories were set up, providing a small amount of employment and relief supplies such as rain coats, stoves, and mattresses. Public money also supported some white collar jobs surveying home improvements, sewer systems, and public property.

Dayton reached a turning point in 1936 as manufacturers slowly began going back to full work weeks and gradually generating more jobs. Steadily, the economy crept toward recovery until the United States entered World War II and the entire Midwest returned to wartime production. Dayton was again noted for its production of aircraft and aircraft parts, munitions, and precision instruments. Finally hitting the \$100 million payroll mark in 1940, just three years later the city had more than doubled it to over \$210 million. The economic demand was so high that a labor shortage



Fig. 2.13 Looking at downtown Dayton over the Main Street Bridge in 1957. Photo from Dayton History Books Online.

persisted in the city. When the servicemen returned in 1945 industries boomed yet again, and so did universities. As Daytonians took advantage of the GI Bill, the University of Dayton, Miami University, Miami-Jacobs Business College, and Sinclair College all became overcrowded for a time.

In the 1950s Dayton followed the pattern of many U.S. cities as the popularity of the automobile and the lifestyle it promoted drew people from cities into the suburbs. Downtown retail and business growth slowed dramatically and the ridership on city transit lines decreased from 66.4 million riders in 1946 to only 33.5 million in 1957. The city experienced significant urban renewal in the 1950s and 1960s, receiving an \$8.6 million grant through the Federal Housing Administration in 1959. Dayton's population peaked in the 1960s, but then began a steady decline. With the decline of the economic manufacturing base and the population, the overall health of the city deteriorated

The most significant manufacturing losses occurred in the 1970s, especially when national firms began consolidating assets. By 1979, General Motors had closed all its downtown plants in Dayton. Dayton Rubber Company, closed its plant in 1980 when its parent company Firestone consolidated operations at their main plant in Oklahoma, abandoning the Dayton location. In the 1970s, NCR switched completely from mechanical cash registers to electronic terminals.³⁴ With the transition, thousands of workers were laid off as their skills became obsolete. During the 1970s, worldwide NCR employment fell from 103,000 to 68,000, and in Dayton from 20,000 to 5,000.³⁵ In addition to technology changes, many other firms in Dayton were negatively effected by inflation and the competition of cheaper labor markets.

With the industrial markets slipping and population declining, a downtown revitalization effort was undertaken in the 1970s and 1980s. The Grant-Deneau Tower was built in 1969, the Kettering Tower in 1971, and the First National Bank building in 1972 (Fig. 2.14). Additionally, the

34 Tom Dunham reports that the transition was prompted by NCR witnessing a spectacular fall in profit: \$50 million in 1969 plummeted to only \$2 million by 1971. His text cites the Dayton History-published *Cash Registers to Computers: NCR, the First 100 Years, 1884-1984*, published in 1984.

35 Tom Dunham, *Dayton in the 20th Century*, Bloomington, IN: AuthorHouse, 2005: 122.

1896 Reibold Building underwent a major renovation and modernization in 1972. This wave of construction displaced many long-time downtown merchants, only about half of which were able to relocate, and caused the razing of several historic commercial buildings and the demolition of the 1884 courthouse. Another building wave swept downtown in the 1980s, resulting in the loss of several historic buildings along Second Street, including the 1878 Cooper Building, one of the oldest buildings in Dayton.³⁶ The last tower to be completed in the 1980s was the Arcade Centre in 1989, designed to support the adjoining historic Arcade Building. Beginning in the 1990s, the City of Dayton began actively formulating citywide urban planning strategies, that continue to evolve today as the city plans for its future. The building boom in the 1970s and 1980s, combined with an



Fig. 2.14 Downtown Dayton in 1970. The Kettering Tower (built as the Winters Tower) at center left can be seen under construction, and the recently completed Grant Denau Tower can be seen at center right. Photo by Rollyn E. Puterbaugh Sr.

³⁶ Preservationists managed to raise funds enough to preserve the facade of the Cooper Building and move it to the East Third Street side of the Wright Stop Plaza on the south east corner of East Third and Main Streets.

Rank	Employer	Dayton-area full time employees	City	Distance from downtown Dayton
1	Wright-Patterson Air Force Base	29,000	Dayton	8.5 mi
2	Premier Health	14,765		
	Corporate Headquarters		Dayton	0 mi
	Miami Valley Hospital		Dayton	1.3 mi
	Atrium Medical Center		Middletown	21.0 mi
	Upper Valley Medical Center		Troy	23.7 mi
	Good Samaritan Hospital		Dayton	3.4 mi
	Miami Valley Hospital South		Centerville	9.4 mi
3	Kettering Health Network	7,000		
	Fort Hamilton Hospital		Hamilton	34.7 mi
	Grandview Medical Center		Dayton	1.1 mi
	Greene Memorial Hospital		Xenia	15.5 mi
	Indu and Raj Soin Medical Center		Beavercreek	7.5 mi
	Kettering Medical Center (headquarters)		Kettering	4.7 mi
	Southview Medical Center		Centerville	10.0 mi
	Sycamore Medical Center		Miamisburg	10.2 mi
4	Kroger, Inc.	4,950	Cincinnati	51.6 mi
5	Montgomery County	3,884	Dayton	0 mi
6	LexisNexis	3,600	Miamisburg	10.5 mi
7	Miami University	3,313	Oxford	38.5 mi
8	Sinclair Community College	2,613	Dayton	0 mi
9	Honda of America Manufacturing Inc.	2,500	Anna	45.9 mi
10	Wright State University	2,403	Dayton	7.3 mi
11	AK Steel Holding Corp.	2,400	West Chester	35.3 mi
12	University of Dayton	2,297	Dayton	1.5 mi
13	Community Mercy Health Partners	2,259	Springfield	25 mi
14	Dayton Public Schools	2,085	Dayton	0 mi
15	VA Medical Center	2,002	Dayton	4.6 mi

Table 2 List of largest employers in the Dayton area sorted by number of employees. 2013 employment data taken from "Top 27 Largest employers in Dayton region" in the *Dayton Business Journal*.

Rank	Employer	Dayton-area full time employees	City	Distance from downtown Dayton
2	Premier Health	14,765	Dayton	0 mi
5	Montgomery County	3,884	Dayton	0 mi
8	Sinclair Community College	2,613	Dayton	0 mi
14	Dayton Public Schools	2,085	Dayton	0 mi
12	University of Dayton	2,297	Dayton	1.5 mi
15	VA Medical Center	2,002	Dayton	4.6 mi
3	Kettering Health Network	7,000	Kettering	4.7 mi
10	Wright State University	2,403	Dayton	7.3 mi
1	Wright-Patterson Air Force Base	29,000	Dayton	8.5 mi
6	LexisNexis	3,600	Miamisburg	10.5 mi
13	Community Mercy Health Partners	2,259	Springfield	25.0 mi
11	AK Steel Holding Corp.	2,400	West Chester	35.3 mi
7	Miami University	3,313	Oxford	38.5 mi
9	Honda of America Manufacturing Inc.	2,500	Anna	45.9 mi
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Table 3 List of largest employers in the Dayton area sorted by distance from downtown Dayton. 2013 employment data taken from "Top 27 Largest employers in Dayton region" in the *Dayton Business Journal*.

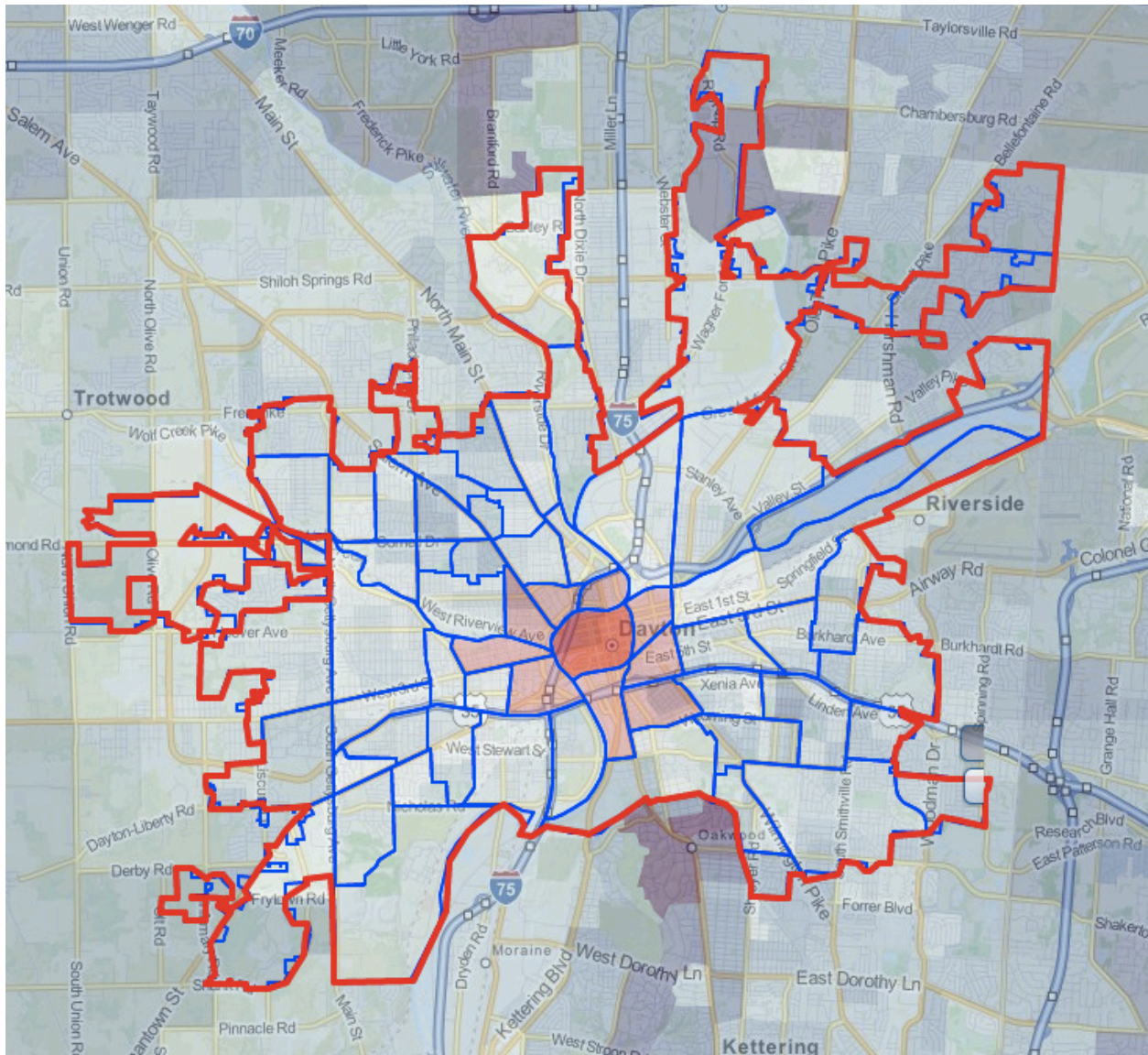


Fig. 2.15 Map of Dayton neighborhoods from City-Data. The darker shaded area in the center is the “Downtown” neighborhood, which City-Data reports to have a population of about 1,555. The lighter shading indicates neighborhoods within about a one mile radius of downtown, which City-Data reports to have a population of 10,135 (including the Downtown neighborhood).

overall declining population, has resulted in about five million square feet of vacant office space in the downtown core today as Dayton struggles to retain residents, retail, and business.³⁷

While manufacturing in the Dayton area has shrunk significantly, many smaller firms have retooled and remained competitive in their respective markets. The large conglomerates have pulled out of the city, but a small manufacturing base remains. To compensate, Dayton has diversified its

37 John Gower, “Delco Plant 2 and Dayton’s Future,” Personal interview, 11 Apr. 2015.

economy and today the largest employers in the area are military, health care, and education. (Table 2). Of the top fifteen largest employers, eight are located within Dayton city limits and four are located within the downtown core (Table 3).

Despite the downtown location of several large employers, the suburbs still house the bulk of the population. The Downtown Dayton Partnership reports that about 21,000 people work downtown while it houses only about 2,000 residents.³⁸ Population statistics indicate about 10,000 people live within a mile of the downtown core.³⁹ (Fig. 2.15) While

the industries of Dayton spread to several areas of the city during the early part of the twentieth century, many of the most notable and historic industrial structures are in or near downtown. The health and vitality of downtown businesses and the amount of residents in the downtown core will directly affect the future of historic industrial resources in the city's built environment. Several city partners released a plan at the end of 2014 detailing goals for Dayton for the next five years.⁴⁰ By 2020, Dayton plans to increase downtown residency 50% by promoting residential development projects; as well as retain and grow Greater Downtown's workforce by 4,500 jobs, or roughly 20%;

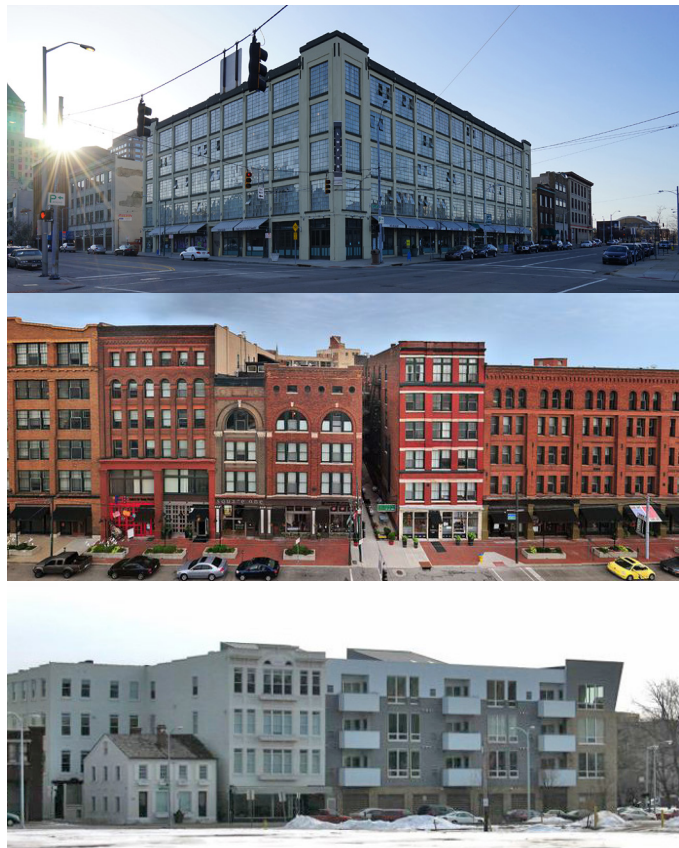


Fig. 2.16 Recent downtown residential developments. From top to bottom: St. Clair Lofts renovated in 2001, the Cannery Lofts renovated in 2002, and the Cooper Lofts addition completed in 2003. Photos: by author, from cannerydayton.com, and urbanohio.com

38 "About Downtown: Quick Facts." *Downtown Dayton Partnership*. Web. 10 June 2015. <www.downtowndayton.org>

39 "Dayton, Ohio Neighborhood Map." *City-Data*. Web. 10 June 2015. <www.city-data.com>.

40 Partners listed on the Greater Downtown Dayton Plan include the Downtown Dayton Partnership, The City of Dayton, CityWide Development, Greater Dayton RTA (Regional Transit Authority), Montgomery County, and Five Rivers MetroParks.

and increase the occupied first floor space in downtown's core 20% by providing support services and sweat equity.⁴¹

Some successful downtown development has already taken place in the last fifteen years. Fifth Third Field, a stadium for the Dayton's minor league baseball team was completed in 2000 and has been an extremely popular public amenity. Another recent and on-going construction development in Dayton is Tech Town, located at the former Frigidaire site along Mad River, which is designed to attract high technology startups to Dayton. City planners are also working to increase the amount of residential units in downtown to help bring activity back into the core. Three recent housing projects are the St. Clair Lofts, opened in 2001; the Cannery Lofts, opened in 2002; and the Cooper Lofts, opened in 2003 (Fig. 2.16). Both the St. Clair and Cannery Lofts are located within rehabilitated historic buildings, and the new Cooper Lofts are an addition to a historic building. Historic properties are beginning to be recognized as an untapped economic asset in Dayton, particularly after Ohio introduced a competitive statewide historic tax credit in 2008. Just this year, the *Dayton Business Journal* reported:

A rehab-driven renaissance is around the corner in downtown Dayton, if local developers can finally leverage State Historic Tax Credits the way other cities have. . . . Having more downtown development projects would be especially significant for downtown Dayton. That's because new housing projects add to downtown's population, and more projects help create a nucleus of revitalized areas. In addition, unlike new construction, retaining historic buildings makes downtown unique from other areas, which will make it stand out.⁴²

The historic tax credit has significant potential to positively affect the historic built environment in Dayton and in particular, the daylight factory. The daylight factory as a type possesses significant obstacles to reuse, and this additional economic incentive will not only help preserve the buildings by providing potential funding, but also ensure that a significant portion of the historic

41 *Greater Downtown Dayton Plan: Progress Summary & Updated Recommendations 2015-2020*. 19 November 2014. PDF document.

42 Olivia Barrow, "Downtown Dayton Poised For Redevelopment Boom," *Dayton Business Journal*, 10 Apr. 2015.

materials will be preserved as per the State of Ohio's preservation guidelines. A significant redevelopment of a former Delco daylight factory that is underway is already seeking to take advantage of the tax credit. Details about the challenges in rehabilitating daylight factories and specific case studies in Dayton, including the Delco building just mentioned, will be presented in the following chapters.

Despite the still-struggling economy and the overbuilt downtown, city officials and partners are devising plans to help make the Dayton a desirable place for people to live and work. Despite having lost a good portion of buildings to urban renewal, a significant collection of historic buildings from all eras of Dayton's history remain compared to other Midwest cities of its size. Relatively few examples of the daylight factory have survived in comparison to how many were likely built between 1900 to 1930. But the ones that remain still have significant potential to reflect Dayton's industrial history as it seeks to restructure its economy.

3. The Daylight Factories of Dayton

With Dayton's most significant wave of growth and change spanning the years in which the daylight factory developed, it is no surprise that the city offers several excellent examples of the type. The two largest and most significant industries in Dayton's history, NCR and Delco, both constructed massive daylight factories in the first two decades of the twentieth century. The necessity of these large-scale factory buildings not only met these firms' practical needs, but were also representative of their enormous commercial success. In addition to the major industries that took advantage of the daylight factory type, dozens of smaller firms built daylight factories in sizes to suit their needs. The daylight factory was highly adaptable and versatile in both form and material, making it an economically sound choice for any industrialist in the early twentieth century.

The daylight factory was used by Dayton firms in a variety of ways. The Dayton Motor Car Company built two daylight factories, one in 1907 and a second in 1908. Unlike NCR and Delco where the construction of modern factories represented the founding of their industrial complexes, the Dayton Motor Car Company daylight factories were an addition to an already well-established campus. Manufacturing operations at that site had been underway in a variety of capacities since 1869, and the concrete factories represented the continuing prosperity of the firm. The Dayton Scale Company similarly added a daylight factory to another already-established campus, but much later in 1920. The Monarch Marking Company was another moderately-sized Dayton firm that employed the daylight factory. Monarch established their plant with a daylight factory in 1916, but instead of accommodating their growth by building additional buildings, it built additions. The daylight factory's regular form and solid structure made it an ideal building type for seamless expansions. Some daylight buildings in Dayton were built not for a specific industry, but rather to be rented out to a variety of firms. The first Beaver Power Building, commissioned in 1910 by Frederick P. Beaver, was designed to cater to small firms that did not yet have capital enough to

build their own headquarters. The concrete frame of the daylight factory not only had the potential to be versatile in its specifications, but also in its adaptability to a variety of firms and settings.

The multistory daylight factory was, in every aspect, a product of its time. It was designed specifically to accommodate technological advancements in the early twentieth century, and thus versatility was a necessity. As manufacturing methods and machinery became more sophisticated in the 1910s through 1930s, the industrial buildings that housed them necessarily changed to fit those demands. No matter the size of the specific product, more industrial space was needed as manufacturing processes grew in scale and relied more heavily on larger machinery. By the 1930s and 1940s, single-story industrial plants built on the outskirts of cities proved to be more practical. They became the most financially favorable because industrial assembly could take place more efficiently on a single level as goods were more easily transported horizontally rather than vertically. Multistory industrial buildings in city centers continued to be economically useful for several more decades, but their rate of construction slowed dramatically after the early 1930s.

The daylight factories that survive in Dayton are not only significant in relation to the history of Dayton as an industrial city, but are model examples of a type that proliferated across the Midwest. Multistory concrete frame industrial buildings were important assets for industrial cities because they were economical, flexible, and quickly erected. Descriptions of the advantages of the concrete frame, the best practices for its construction, and the success of extensive materials testing flooded construction trade literature across the nation. Because of the ease of construction and availability of concrete, a mid-sized city like Dayton, and even those of smaller size and fewer resources, could adopt the new technology and provide the local economy with buildings that would bolster industry and protect investment. These buildings were ubiquitous in the early twentieth century landscape, but each one represents the factors that shaped it, the manufacturing it supported, and the larger community. Today, despite being remnants of their era, they continue to reflect how the national trend of concrete translated to and shaped cities across the United States.

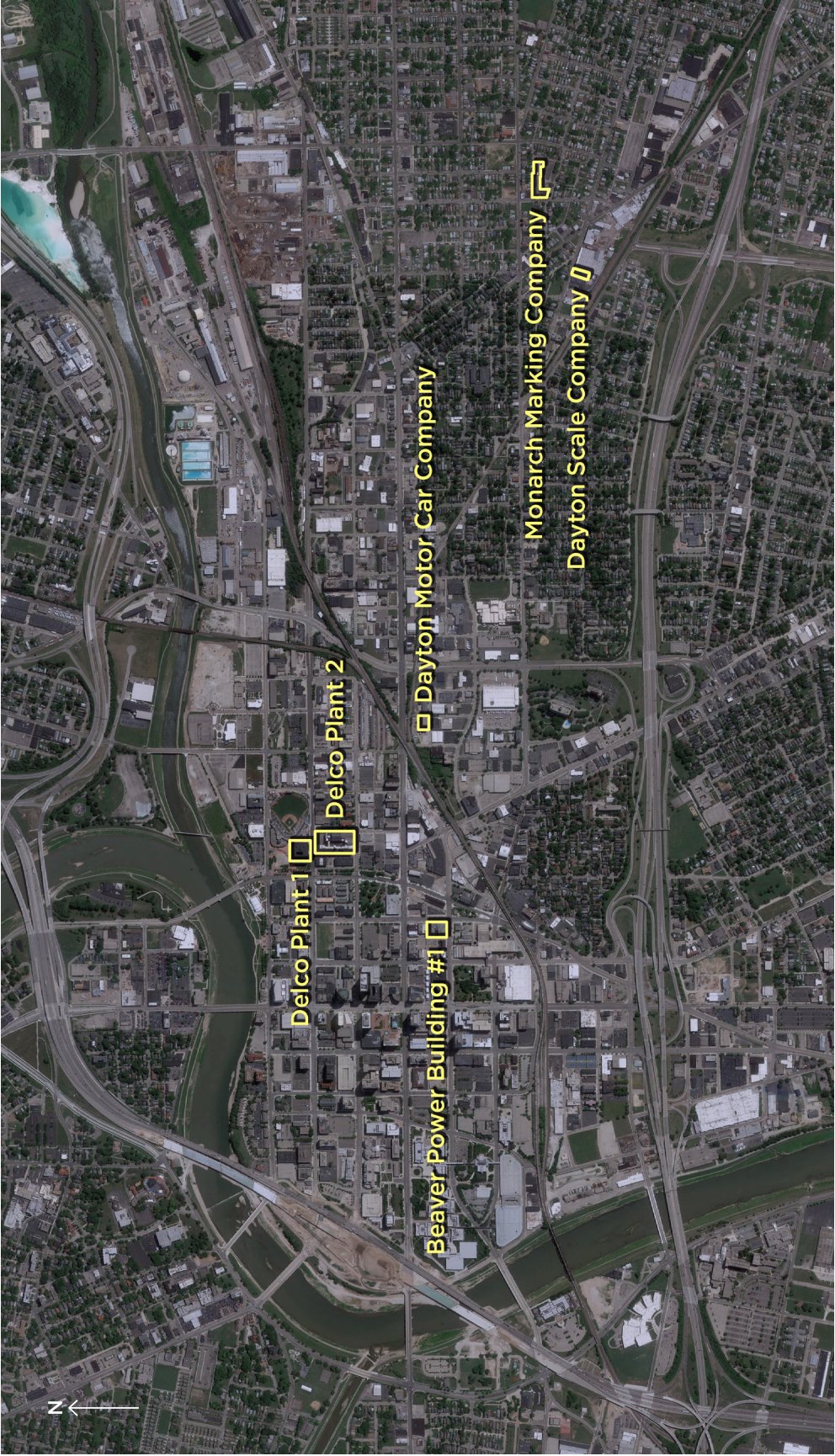


Fig. 3.1 Aerial map from 2015 showing the location of the six daylight factories selected for study.

Selecting Case Studies

Among the remaining daylight factories in central Dayton, six stand out as particularly notable examples of the daylight factory type. As seen in Fig. 3.1, three of these buildings are located in the downtown core; one is only slightly removed, separated by a rail line and about a one mile distance; and two are along a stretch of industrial development in the southeastern part of the city along the rail lines, about two miles away from the city center. All six were constructed to house local Dayton industries: two were associated with Delco, a major manufacturer in Dayton's history; three were associated with large, prosperous Dayton manufacturers including Monarch Marking Company, Dayton Scale Company, and the Dayton Motor Car Company; and the sixth housed dozens of small Dayton-based businesses through the years. (See Appendix A for more detailed tenant lists for each building.) All but one of these six were at some point in the ownership of a national corporation, but currently three are locally owned, two have Ohio-based owners, and only one has an out-of-state owner. These facts directly reflect the trends of industrial history in Dayton (Fig. 3.2). The first stage of the survey of these six daylight factories involved identifying the date and order of construction, structural technology of each, historic use and users, and the assessing current conditions.

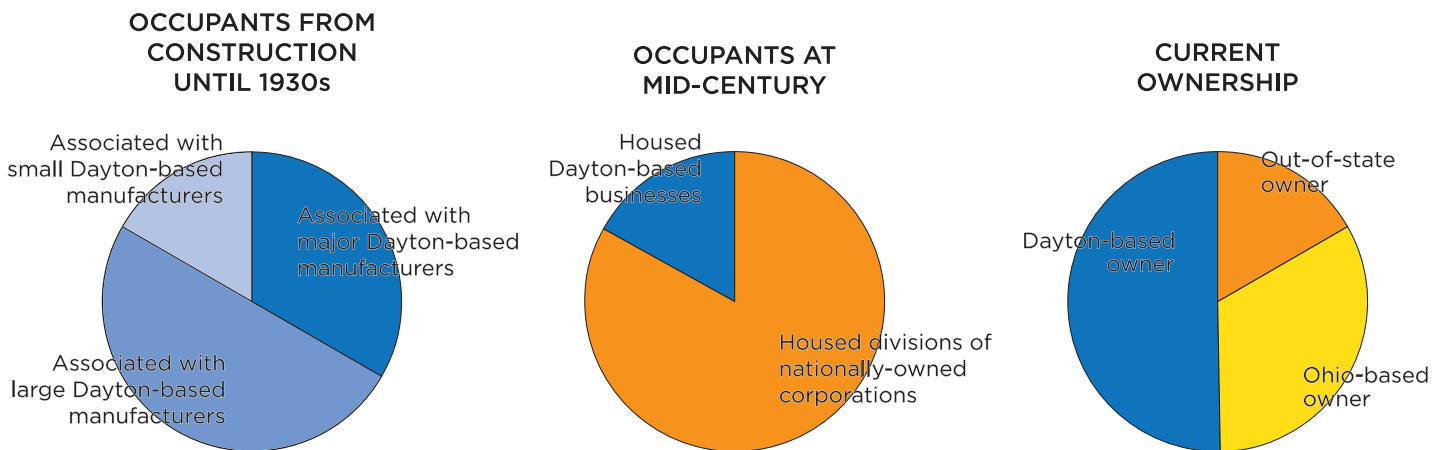


Fig. 3.2 Charts representing the types of occupants for the six potential case study buildings through time.

The oldest of the six buildings surveyed, was the factory for the Dayton Motor Car Company at 15 McDonough Street (Fig. 3.3). Constructed in 1908, this six-story building was a followup to an adjacent, very similarly-designed building that was completed for the same company in 1907. Both buildings were used by the Dayton Motor Car Company, and later the Maxwell Car Company, for auto assembly until about 1928. From 1928 to the 1990s, this building was used by baking companies to produce ice cream cones. It is now vacant, and is currently owned by the City of Dayton. The building reveals its relatively early construction date through its beam and girder structural system, its facade composition, and wood windows.



Fig. 3.3 [Keppele Hall Company?], Dayton Motor Car Company, northeast corner, Dayton, OH, 1908. Photo: April 2015, by author.

The second building surveyed is Beaver Power Building #1 at 35 South Saint Clair Street (Fig. 3.4). The building was originally conceived as having three-stories, but two floors were added during construction.¹ Commissioned by local entrepreneur, Frederick P. Beaver, the building was completed in 1910. It was designed by Schenck & Williams, a local architectural firm, and built by L. P. Hazen Co. of Cincinnati. This building also features a beam and girder structural system with square columns, but is a significant step forward in visual design with a more sophisticated



Fig. 3.4 Schenck & Williams, Beaver Power Building #1, southeast corner, Dayton, OH, 1910. Photo: April 2015, by author.

1 Smith, Wm. Walter. "Through Fire and Flood at Dayton." *Concrete-Cement Age* 3.2 (1913) 65-66.

elevation that features floor-to-ceiling glazing. From the time of its construction until the 1990s, Beaver #1 retained the same use: an industrial space rented out to various manufacturing or business firms in Dayton. Some of the longer-lived tenants included the City Engineering Company, Julien Pattern Manufacturing Company, and the Dayton Carbon & Ribbon Works, Inc. Two somewhat shorter-lived, but better-known tenants were the Dayton Engineering Laboratories Company (Delco) and the Dayton Fare Recorder Company. (See Appendix A for a more complete tenant list.) The building was remodeled into apartments in the 2000s and is now known as the St. Clair Lofts. The current Philadelphia-based owner, who bought the building in 2010, has recently made updates to amenities and signage for the building.

Constructed soon after the first Beaver Power Building was Beaver Power Building #2 (Fig. 3.5), also designed by Schenck & Williams for Frederick Beaver, just a few blocks north and east at 329 East First Street. Delco, already a tenant of Beaver #1, negotiated with the owner in order to move into the building before the structure was completed in 1912. Delco soon took over the



Fig. 3.5 Schenck & Williams, Beaver Power Building #2 (Delco Plant 1), southeast corner, Dayton, OH, 1912. Photo: April 2015, by author.

entire building, and fifth and sixth floors were added to accommodate its rapid expansion. This building represents a significant step forward in the development of the daylight factory with its utilization of a flat-slab structural system with round mushroom columns, that eliminated the need for bulky beams and girders. The building remained Delco headquarters even after the company came under the ownership of General Motors in 1918. In 1981 the property was sold by GM to local businessman, Sanford Mendelson. In 2014, the building sold to a Columbus-based developer Crawford Hoying who plans to convert it to apartments.

Following the rapid growth and expansion of its first plant, Delco soon constructed Plant 2 (Fig. 3.6), the company's first purpose-built structure. Again employing the services of Schenck & Williams, Delco Plant 2 was completed in 1915, built just south of Delco Plant 1 at 340 East First Street. It is by far the largest and most modern of the six buildings examined in this



Fig. 3.6 Schenck & Williams, Delco Plant 2, northwest corner, Dayton, OH, 1915. Photo: April 2015, by author.

study, with seven stories, square footage totaling over 500,000. The 1915 portion of the building was designed with the anticipation of additions, which were built in 1929 and 1941. Both plants were sold to in 1981 and became part of Mendelson Liquidation Outlet. The first and third floors are used for the retail portion of this business with the remaining floors used for storage.

The 1916 three-story structure built for the Monarch Marking Company (Fig. 3.7) was farther removed from the downtown core of Dayton, located in the East Dayton industrial corridor at 216 South Torrence Street. The structure has undergone several expansions, first in 1921, another in 1946, and a final addition in 1960 along Torrence Street to create an overall “L” shape.



Fig. 3.7 Monarch Marking Company, northwest corner, Dayton, OH, 1916. Photo: April 2015, by author.

The original building and first two additions utilize the mushroom columns as well as square drop plates above the capitals. However, the 1960s portion of the building is steel frame construction. Monarch left the building in the 1950s at which time it was occupied by the Dayton Scale Division

of the Hobart Manufacturing Company. In the 1990s it housed some smaller companies, Crowe Industries remained for a substantial amount of time, but the building is now vacant and for sale.

Finally, the last building of the survey group was built in 1920 for the Dayton Scale Company at 448 Huffman Avenue (Fig. 3.8), in the same industrial corridor as the Monarch Marking Company. The five-story concrete frame building was an addition to the already-established Dayton Scale Company and contrasted with the one- and two-story masonry structures with sawtooth



Fig. 3.8 Frank Hill Smith, Dayton Scale Company, northwest corner, Dayton, OH, 1920. Photo: April 2015, by author.

roofs that composed the existing industrial complex. This building also features the mushroom column capital technology, which is particularly notable in this case as the design of local Dayton engineer, Frank Hill Smith. Dayton Scale became a division of the Hobart Manufacturing Company around 1940, but continued to operate in this location until the 1990s. It was then sold to Dayton Bag & Burlap. The older masonry buildings are used for Dayton Bag & Burlap offices and primary manufacturing activities, while the concrete structure serves primarily as storage for the company.

The information gained from the initial survey of these six buildings is summarized in Table 4. Although the buildings span only twelve years, they reveal significant developments in the design and construction of the daylight factory. Their differences reflect the rapid shifts in structural technology for industrial buildings, and a wide variety of aesthetic character. The three buildings chosen to be the focus of this thesis are the Dayton Motor Car Company, completed in 1908; Delco Plant 1, completed in 1912; and Delco Plant 2, the initial phase completed in 1915. As case studies, these three buildings represent the technological and aesthetic progression of the daylight factory, encompass a variety of scales that are representative of the building type, and perhaps most importantly, show the visual progression of the architectural type.







Image	1908	1910	1912	1915, 1929, 1938	1916, 1921, 1946, 1960	1920
						
Date of Construction	1908	1910	1912	1915, 1929, 1938	1916, 1921, 1946, 1960	1920
Architect	Keppeler Hall Company?	Schenck & Williams	Schenck & Williams	Schenck & Williams	Schenck & Williams	Frank Hill Smith
Structural System	Beam & girder	Beam & girder	Flat slab & mushroom columns	Flat slab & mushroom columns	Flat slab, mushroom columns, dropped panels above columns	Flat slab & mushroom columns, dropped panels above columns
Primary Tenants/Owners	Dayton Motor Car Company Maxwell Motor Company National Biscuit Company Module 21 Building Company Gosiger, Inc.	City Engineering Company Wiesman Manufacturing Company Julien Pattern Manufacturing Company O'Brien Printing Ink Company Sheffield Machine & Tool Company Dayton Carbon & Ribbon Works, Inc. St Clair Lofts	Dayton Engineering Laboratories Company (Delco) General Motors Mendelson Liquidation Outlet (storage) Crawford Hoying	Dayton Engineering Laboratories Company (Delco) General Motors Mendelson Liquidation Outlet	Monarch Marking Company Hobart Manufacturing Company Crowe Industries	Dayton Scale Company Hobart Manufacturing Company Dayton Bag & Burlap
Current Use	Largely vacant (minimal use on ground floor)	St Clair Lofts	Under development	Mendelson Liquidation Outlet	Vacant	Dayton Bag & Burlap
Building Name(s)		Beaver Power Building #1	Beaver Power Building #2 Delco Plant 1	Delco Plant 2		
Address	15 McDonough Street	35 South Saint Clair Street	329 East First Street	340 East First Street	216 South Torrence Street	448 Huffman Avenue

Table 4 Six daylight factories initially selected for study in Dayton, Ohio. For more detailed occupant information and date ranges, see Appendix A.

Case Study as Methodology

Case studies are often employed in architectural research in order to analyze how specific structures fit into the larger contexts of history and the present built environment. Because historic buildings are influenced by diverse physical, social, and cultural factors, case studies allow for detailed analyses of a limited number of examples from which generalizations can be deduced. Through case studies, specific issues of design and significance can be examined, and comparisons can be made among the limited number of cases. Case studies can often speak to larger, important themes by serving as examples of particular ideas or influences. The specific details of each building pertain to a single example, but the collection of case studies may demonstrate broader ideas and influences. Comparing multiple case studies may further clarify larger themes and issues; shortcomings of one example may be addressed through comparisons to others that offer more information. The case study method allows detailed exploration of each particular example and then uses the evidence to reach generalities.

There are objections to case studies as a research method, and theorist Bent Flyvbjerg (b. 1952) describes several of the major misconceptions about the legitimacy of case studies and their theory, reliability, and validity.² Flyvbjerg addresses whether case study research is too context dependent and therefore cannot be seen as practical or scientific knowledge. He refutes this claim stating, “in the study of human affairs, there exists only context-dependent knowledge, which thus presently rules out the possibility of epistemic theoretical construction.”³ Another major argument against case studies Flyvbjerg addresses is the idea that one cannot generalize based on information from a single case study; thus case studies cannot contribute to scientific development.⁴ Criticism against case studies for engaging this type of research fails to take into account that definitive,

2 Bent Flyvbjerg, *Making Social Science Matter: Why Social Inquiry Fails and How It Can Succeed Again*, Oxford, UK: Cambridge University Press, 2001: 67.

3 Flyvbjerg, *Making Social Science Matter*, 71.

4 Flyvbjerg, *Making Social Science Matter*, 66.

universal conclusions are not typically the end goals of case study-based research. Case studies are specifically selected to explore elements of a particular situation or theory. By researching the specific details of one instance, one can gain a greater understanding of its implications and the multiplicity of the greater context.

Preservation research lends itself particularly well to case studies because preservation, by its nature, is artifact-dominant. Preservation research and its methodology are designed to address specific, tangible objects, the future and preservation of which the researcher wishes to influence. Contemporary preservation research has evolved to go beyond the traditional examination of the discrete object, and seeks to include social, cultural and symbolic elements in scholarly analyses. In an article addressing vernacular architecture in 1991, architectural historian Thomas Hubka (b. 1946) describes how research has shifted from nineteenth century artifact- or object-oriented research to artifact-meaning-oriented research. He explained: “Although architectural scholarship has always interpreted meaning, it is the active search for the cognitive-symbolic component of building that particularly marks this new orientation to scholarship.”⁵ This study of daylight factories is designed to examine both the development and features of the artifacts themselves, but also the cultural components from which they derived, and the meaning they potentially possess.

The case studies in this thesis were selected to represent the daylight factory, its typical features, the typical differences between common examples, and the change in the type over time. Because the daylight factory is a utilitarian building type with limited defining character traits, the significance of any particular daylight factory is not determined by its originality, but rather its characterization of a pattern. As Hubka explains:

While pattern seeking is employed in all architectural scholarship, it is not just another method for vernacular scholarship but a fundamental assumption about the nature of buildings that are often closely unified and repetitive. . . . [V]ernacular architecture gains meaning and stature primarily in relation to others of its kind . . .

5 Thomas C. Hubka, “American Vernacular Architecture,” *Advanced in Environment, Behavior and Design*, Ed. Ervin H. Zube and Gary T. Moore, Vol. 3. New York: Plenum, 1991: 168.

it is in the collective that its meaning often achieves significance.⁶

For the daylight factory, as with other industrial and vernacular architecture, significance lies in a specific building's relation to the standardization of the type and the details of how it is consistent or varies from that standard. Using vernacular architecture to more deeply understand history requires a grasp of the larger body of works; case study research contributes to that knowledge as the analysis of individual examples adds to a better understanding of the type.

The three case studies featured in this thesis were selected because they typify a range of common traits found in the daylight factory, but also demonstrate various differences and reflect change in the buildings' technology and design over time. The significance of Dayton as an industrial city is reflected through the traits of its utilitarian architecture, and what it indicates about the national trend. Each case study selected for this thesis addresses local industrial development in Dayton, and consequently also the national industrial development of the daylight factory type in the early twentieth century.

Research Methodology

Research for this thesis was composed of a variety of primary and secondary sources accessed both locally and remotely. Field investigation was conducted over two visits to Dayton, the first of which occurred in August 2013 and the second in April 2015. For the purposes of this thesis, it is useful to organize the methodological process by source type in order to describe their scope, significance, and availability. For a summary of each onsite research location in Dayton and the individuals who assisted in research efforts at those locations, please refer to Appendix B.

The first and most significant element of the field investigation was visiting the daylight factories themselves. Site visits allowed for research-specific documentation, particularly photographic. The site visits also allowed for a better understanding of the physical context of each building,

⁶ Hubka, 171.

condition of building features, and the particular characteristics of the present uses. All building owners were generously accommodating in allowing complete access and in most cases providing guided tours of the buildings, with the exception of Delco Plant 2. The owner of that property was difficult to contact, so access was restricted to areas of the building already open to the public. The floors containing product storage were inaccessible, but an adequate amount of information about the building, its condition, and its present use was gleaned from access to the first and third floors and observations from the exterior.

Another significant component of the research process was finding and analyzing historic photographs. Historic photos for this thesis are largely comprised from the collections at Dayton History, Montgomery County's official historical organization, and the Dayton Metro Library. Through these visual records, changes to the buildings through time could be inferred. More importantly, historic photographs are the only visual record of the historic interiors of these daylight factories and the industries they housed. Photos of some historic interiors of the selected case studies were not available, most notably for this thesis, the Dayton Motor Car Company building. This may be due to the fact that many records and documents were lost in the Great Flood of 1913. The historic photo collections in Dayton, especially at Dayton History, are quite extensive, despite other valuable materials that have been lost.

Another important graphic resource significant to this thesis has been a variety of maps. Historic maps have helped provide an understanding of the development of the City of Dayton and its industry through the years. A particularly helpful map resource for this thesis has been the Sanborn Fire Insurance Maps of Dayton. These maps have been a crucial resource for understanding Dayton's built environment, in particular building materials, construction dates, and occupants, especially for buildings that have been demolished, or for which few other records remain.

For understanding the physical components of the specific case studies examined in this thesis, another set of significant graphic resources were architectural drawings. Some building

drawings were available through the City of Dayton's archives at the Division of Building Inspection. Dayton's building archive was also affected by the 1913 flood, and much original building documentation no longer exists. The archives at the Division of Building Inspection were primarily composed of permitted projects added to the historic buildings in question, but some complete building plans drawn after initial construction were available. The documents were archived on microfilm reels and aperture cards. Recent building drawings were available for some case studies from their current owners, particularly Crawford Hoying for Delco Plant 1 and the City of Dayton Office of Economic Development for the Dayton Motor Car Company building.

There have been a variety of textual resources used in the research of this thesis, both primary and secondary. Research for this thesis was broken into three main components: the daylight factory, the history of Dayton and the case study buildings, and the theories of historic preservation. Historic primary resources included such documents as historic building trades publications, Dayton city directories, newspaper articles, and corporate documents. Secondary sources included local histories of Dayton, historic buildings reports, National Register nomination documents, journal articles, a variety of public and private documents, and a variety of published works. Resources were accessed in a variety of ways, including libraries, online databases, public archives, and private archives. A full list of textual resources used for this thesis is available in the bibliography, the information from the Dayton city directories has been reproduced in Appendix A, and the full list of archives visited in Dayton is available in Appendix B.

Dayton maintains a variety of archives, but some corporate archives for local companies bought out by larger, national corporations were difficult to trace. The national firms that purchased the Dayton firms, and possibly acquired their corporate documents, were all headquartered outside of Dayton. Contact was attempted with some of these archives, but the success was

minimal.⁷ These sources may indeed have additional information, but pursuing them farther was outside the scope of this thesis.

The final source of research for this thesis is personal interviews conducted during field investigation in Dayton. Each case study site visit was accompanied by an interview with at least one individual representing that property in some capacity; other interviews included Dayton's Historic Preservation Planner and a Columbus-based historic preservation consultant. While not extensively quoted in the following pages, the interviews were excellent sources for general information about the current states and future plans for the case studies, as well as general attitudes in Dayton about industrial architecture and historic preservation.

7 For the three primary case studies of this thesis, contact was attempted for all corporate archives of national firms that had been associated with the buildings. The Dayton Motor Car Company was eventually owned by Maxwell Motors which was reorganized into the Chrysler Group (formerly the Chrysler Corporation), which is headquartered in Auburn Hills, Michigan and maintains its own corporate archive. The National Biscuit Company (now Nabisco) which also occupied the building for a time is headquartered in East Hanover, New Jersey and their archives are kept at Duke University in Durham, North Carolina. General Motors, the historic corporate owner of both Delco plants is headquartered in Detroit, Michigan and maintains its own archive. Contact with all archives was made, but met with minimal success. The General Motors archive sent a contact sheet of photographs relevant to this thesis, one of which is featured as Fig. 3.31.

Case Study 1: Dayton Motor Car Company

The daylight factory at 15 McDonough Street is listed in the National Register of Historic Places as a contributing building in the Dayton Motor Car Company Historic District.⁸ With its concrete frame (Fig. 3.9), the building is unique in the district in its age and construction. Most other buildings in the designated area are masonry construction, and were built at the end of the nineteenth century for the manufacturing of farming implements. This building was one of two concrete frame structures that the Dayton Motor Car Company built in the first part of the twentieth century to accommodate the growing industry of automobile manufacturing. Those two



Fig. 3.9 [Keppele Hall Company?] Dayton Motor Car Company, northeast corner, 1908. Photo: April 2015, by author.

⁸ National Register of Historic Places, Dayton Motor Car Historic District, Dayton, Montgomery County, Ohio, National Register #84003785.



Fig. 3.10 The two new concrete frame buildings of the Dayton Motor Car Company, highlighted in a c. 1908 postcard. The 1907 building with the light well is to the right, and the 1908 building that remains today is to the left. Image from the Dayton Postcard Collection at the Dayton Metro Library. (Shading added.)

concrete frame buildings were depicted on a postcard advertising the Dayton Motor Car Company, probably created directly after the completion of the second concrete frame building in 1908 (Fig. 3.10). The white concrete frames can be seen directly behind the brick buildings bearing the firm’s name, standing in contrast to the early, masonry buildings composing the rest of the complex. Today, the remaining Dayton Motor Car Company daylight factory contributes to the diversity of the historic district, enriching the district’s reflection of the evolution of industrial architecture in Dayton.⁹

The site of the Dayton Motor Car historic district is the former site of the Stoddard Manufacturing Company, founded in 1869. Dayton entrepreneur John W. Stoddard (1837-1917)

⁹ A third concrete frame building, a warehouse, was built in the area in 1913 and is also within the historic district. The National Register nomination for the district lists this warehouse as an addition to the adjacent two-story brick warehouse at 101 Bainbridge Avenue and indicates that the two buildings share the same address, even though the concrete frame building faces Fourth Street. The nomination also indicates that while neither of the two warehouses ever belonged to the Dayton Motor Car Company or the Maxwell Motor Company, they were “surely used for storage of their products” (8). The building is currently vacant with masonry infill windows, but is under consideration for incorporation into the same development plan that includes the Dayton Motor Car Company building at 15 McDonough.

partnered with John Dodds to produce farm implements for the developing agricultural industry in Dayton. Five years later, J. W. Stoddard & Company was established and in 1884, the firm acquired the name by which it was most well known: the Stoddard Manufacturing Company. Dayton historian A. W. Drury described the company's product in his 1909 book:

[T]he business was originally started to manufacture horse hay rakes. It was afterwards found desirable and profitable to undertake the manufacture of other lines of farm machinery, embracing the following: hay rakes, disc plows, disc harrows, corn planters, corn cultivators, corn drills, grain drills, broadcast seeders, hay tedders and transplanter.¹⁰

In 1903 the Stoddard Manufacturing Company sought to capitalize on the new and rapidly growing business of manufacturing automobiles. After allocating a portion of its operations and skilled workforce to this line, the new product proved so successful that the production of farm implements eventually ceased altogether.¹¹ The Dayton Motor Car Company, as it became known in 1904, was among the city's most well-known automobile companies nationally, producing the Stoddard-Dayton: a large, luxury touring model. Local historians have suggested that the company's most famous product was the source of its downfall, as the firm was not able to transition its recreational vehicle for the wealthy to a broader market. The Stoddard-Dayton did not translate well to mass-production and was driven out of the market when other automobile manufacturers began to produce affordably-priced vehicles more efficiently.

In the early 1900s, two reinforced concrete structures were built as part of the Dayton Motor Car Company's expansive manufacturing complex, just to the southeast of the downtown core. The first was a seven-story U-shaped building built in 1907 with approximately 80,000 square feet of floor space. The second building was built in 1908 with about the same footprint, but no light well, resulting in approximately 85,000 square feet of floor space. Their comparable sizes can be seen in the Dayton Sanborn Fire Insurance Map of 1918 in Fig. 3.11. While the second was built

10 A. W. Drury, *History of the City of Dayton and Montgomery County, Ohio, Vol. 1*, Chicago: S.J. Clarke Pub. Co, 1909: 665.

11 Between 1901 and 1920, fourteen different automobile manufacturing firms were operating in Dayton. Most records of these small companies have disappeared. See Michael Self, "Made in Dayton! Auto buffs can look back to a heyday of activity."

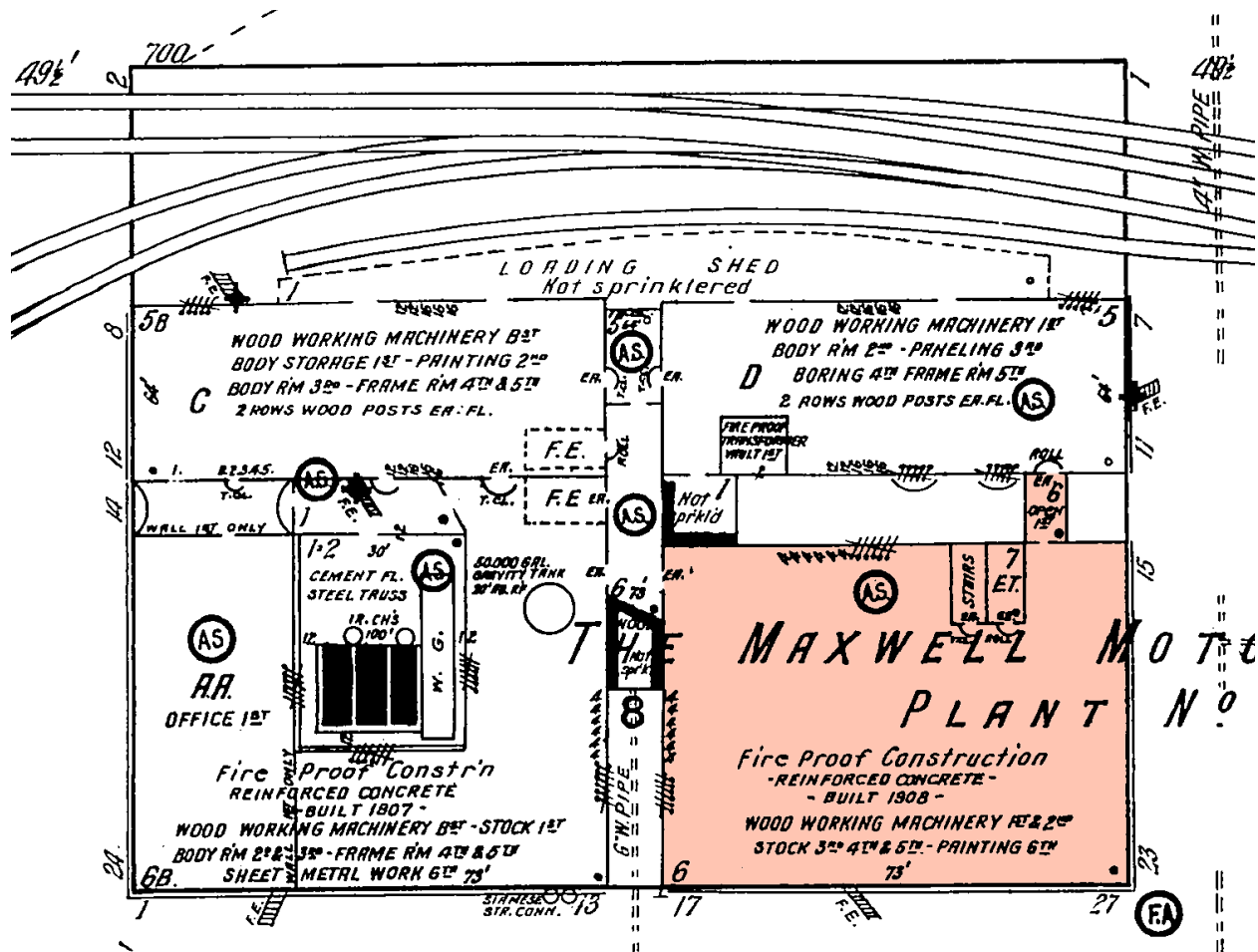


Fig. 3.11 Sanborn Fire Insurance Map from 1918 showing the 1907 (left) and 1908 (right, shaded) concrete frame buildings while under ownership of the Maxwell Motor Company. (Shading added.)

to complement the first, as evidenced by its similar design, it is unclear whether the buildings were conceived together or in sequence. According to the National Register nomination form, the buildings were used as machine shops and for automobile assembly.¹²

In 1911, the Dayton Motor Car Company and its subsidiary, the Courier Car Company, was purchased by Benjamin Briscoe and became part of the United States Motor Company.¹³ By 1913 the United States Motor Company went bankrupt and its assets were purchased by the Maxwell Motor Company, based in New York State and Detroit. Fig. 3.12 and Fig. 3.13 show the change in signage at the manufacturing that reflected the new ownership. According to the 1918 Sanborn

12 Dayton Motor Car Historic District, National Register #84003785.

13 "More Firms Join U. S. Motor Co." *New York Times*. 16 Jun. 1910. Web. 10 May 2015.



Fig. 3.12 The Dayton Motor Car Company, Dayton, OH, c. 1873 (masonry buildings) & 1907 (Keppele Hall Company, concrete frame building). Photo date sometime between 1907 and 1913, from the collections at Dayton History.



Fig. 3.13 Same view as above with the signage changed to the Maxwell Motor Company. Photo: 1916, from the collections of Dayton History.

Map, the two buildings were used for woodworking and machinery on the lower levels, and sheet metal work, body work, and painting on the upper levels (Fig. 3.11).¹⁴ The Maxwell Motor Company proved successful for several years by adjusting to the changing market and producing low-priced automobiles. During the economic depression following World War I, however, Walter Chrysler took controlling interest in the faltering company. In 1925 Maxwell was reorganized as the Chrysler Corporation, resulting in the abandonment of the Dayton properties. The two concrete frame structures remained, but would not again be used for auto manufacturing.

Even after the Maxwell Motor Company dissolved, the 1907 building continued to be listed as the “Maxwell Power Building” in both the 1918-1950 and 1918-1955 series of Sanborn maps.



Fig. 3.14 The 1907 building (foreground) shortly before it was demolished in 1994. The building clearly shared structural and visual similarities with the 1908 building (background). Image courtesy of the City of Dayton Community Development Department.

14 Sanborn Map Company. *Insurance Maps of Dayton, Ohio, 1918-1932*. Vol. 1. 1918. 40. Ohio Web Library. <opl.in.ohio.gov/content/sanborn-maps>

The building was vacant for many years, falling into serious disrepair (Fig. 3.14), and was declared a public nuisance in 1986.¹⁵ After it was further damaged by a fire in a neighboring structure, the building was demolished in 1994, despite being one of the contributing buildings in the Dayton Motor Car Company Historic District. City directories list the 1908 building as the McLaren Consolidated Cone Corporation beginning in 1928, with the National Biscuit Company listed from 1934 to the 1970s. The Consolidated Cone Corporation is listed from the 1970s to the 1980s, and Module 21 Building Company, a furniture maker, is listed as the building occupant in 2000. The City of Dayton purchased the structure and has recently been renting space on the ground floor to Gosiger Machine Company. Gosiger's corporate headquarters is located in several of the surrounding masonry buildings and the company is looking at possible opportunities to reuse and incorporate the concrete frame building into their corporate campus.¹⁶

The 1907 structure gained a small amount of notoriety for a short time in concrete trade publications. Just months after its completion, a fire broke out on the fourth floor, in February 1908. With an incomplete sprinkler system and fire doors not in place, the fire spread and greatly damaged the upper floors of the adjacent older building. The concrete frame building, however, was not affected beyond the fourth floor (Fig. 3.15). After the fire, the engineering firm that designed and built the building, the Keppele Hall Company, tested the fourth floor capacity. The floor had been designed to withstand 120 pounds per square foot and was tested to 219 pounds per square foot. New machinery was soon moved into the building and regular manufacturing resumed.

At the time, engineering and concrete trade periodicals were still seeking to popularize concrete as an efficient and preferable industrial building material, and were publishing articles touting its fireproof properties. After the fire, the Dayton Motor Car Company building was mentioned alongside the 1898 Bayonne, New Jersey fire in trade articles advertising the new material. In a 1908

15 Addison Brown, "Unsafe Building Order No. 494," Letter to Betin Reality Corporation, 27 Jan. 1986. TS. Dayton, Ohio.

16 Jim Baker. "Dayton Motor Car Company and Gosiger, Inc." Personal interview. 9 Apr. 2015.



Fig. 3.15 Fire damage at the Dayton Motor Car Company in February, 1908. Photo from *Insurance Engineering*, 1908, v. 15, p. 373.

letter, the Keppele Hall Company reported on the minimal cost of repairs to the building:

[W]e have completed all of the repairs to the building, including the relaying of the facing coat on the fourth floor, and the patching up of the columns and girders. This latter portion of the work consisted in knocking off from the corners of all beams and girders any concrete which had deteriorated under the action of the heat and repatching same so as to put the concrete in its original condition as to protection of the steel reinforcement. The entire expense of this repairing of the concrete work in the building, including the refinishing of the floor facing, amounted to less than \$500.00.¹⁷

The fire at the Dayton Motor Car Company attested to the stability and reliability of concrete as a building material. Protection from fire was a critical characteristic that made daylight factories appealing to industrialists and perpetuated their popularity in the early decades of the twentieth century.

¹⁷ J. B. Gilbert, "The fire at the Dayton Motor Car Works," *Briefs on Portland cement and concrete*, Commission for the Revision of the New York (N.Y.) Building Code: New York, 1908: 150.



Fig. 3.16 View of the southeast corner of the 1908 Dayton Motor Car Company building. Comparing its design and construction to the now demolished 1907 building as pictured in Fig. 3.13, the similarities are strong. Photo: April 2015, by author.

It is unclear if the second concrete frame structure at the Dayton Motor Car Company had been planned before the fire, or if the same firm undertook the second building's design and construction. It is likely, however, considering the second building closely followed the design and construction of the first (Fig. 3.16) and construction of the 1908 building began just months after the fire. While the 1907 building did gain broader recognition because of the fire, the two buildings built for the same company only a year apart are of equal technological significance. Both represented the same step forward in industrial architecture: an early beam and girder concrete frame and wooden sash windows. The buildings as a pair, built in close succession with such similar design, represented not only a vindication of concrete as a safe building material but the success of

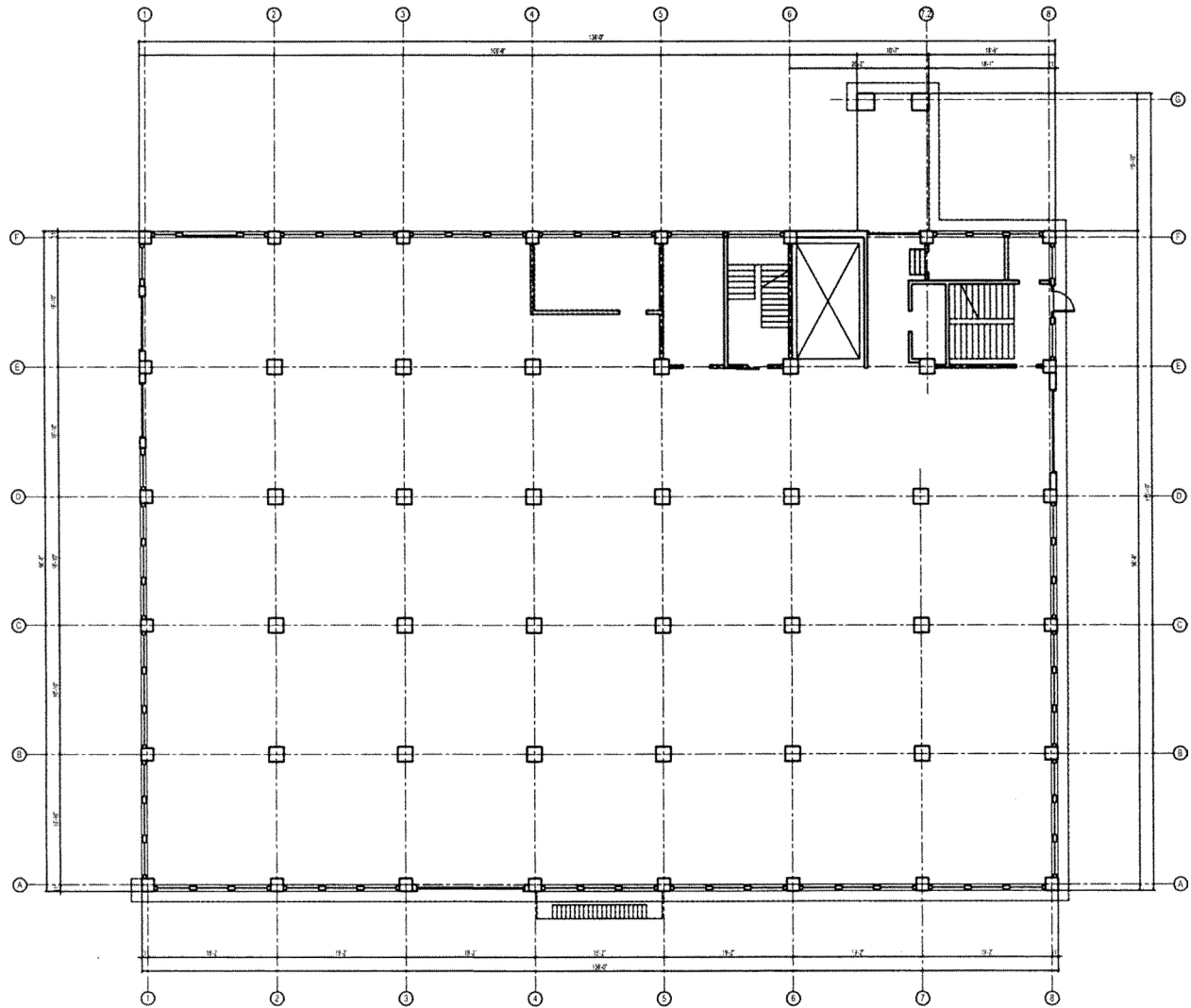


Fig. 3.17 Ground floor floor plan of the 1908 Dayton Motor Car Company building, typical of all floors, with column width substantially decreasing on upper floors. Plan from the City of Dayton Office of Economic Development.

the Dayton Motor Car Company. Unfortunately, the 1908 building is the only remaining structure of the pair. Nonetheless, it stands as a significant early example of a daylight factory in the twentieth century.

The surviving 1908 structure is six stories high with seven bays along the north and south sides of the building (Bacon Street) and five bays on the east and west sides (McDonough Street). The square bays occur in regular pattern throughout the building, as is clearly demonstrated in the building plan, and measure nineteen feet, column to column (Fig. 3.17). The ceiling height of the first floor is sixteen feet and floors two through six are eleven feet. Column widths substantially



Fig. 3.18 Typical bay on the ground floor showing column thickness. Photo: April 2015, by author.



Fig. 3.19 Sixth floor detail showing ceiling patches, wood floor, and typical column width. Photo: April 2015, by author.



Fig. 3.20 North facade showing former passage to masonry buildings, infill at the elevator location, and an irregular window pattern. Photo: April 2015, by author.

decrease in the upper floors, and the sixth floor features the only wood flooring in the building (Fig. 3.18 and Fig. 3.19).

The building was connected to other structures within the manufacturing complex. One passageway that led to the old masonry building that formerly stood to the north still stands and is accessible from floors three through six (Fig. 3.20). Another bay on the west side of the northwest corner was likely connected to the 1907 concrete frame building (Fig. 3.21). That bay now has brick infill on floors two through six, but the ground floor has some windows and also contains a freight entrance. This infill was most likely added in the late 1920s or early 1930s as the two buildings were not used for the same purpose after the McLaren Consolidated Cone Company occupied the building in 1928. The former connection between the 1907 and 1908 concrete frame buildings can be seen amidst the infill in this bay. Remnants of a lower set of floor plates that once abutted this building are visible from the exterior.



Fig. 3.21 West facade showing infill. Photo: April 2015, by author.

The main stair of the building is located adjacent to the elevator and extends to the sixth floor. A secondary staircase terminates on the second floor, and was likely designed to provide direct access to the office spaces on that floor. The building has one (currently inoperable) freight elevator, the shaft of which reaches all six floors. Each staircase and elevator opening on each floor is equipped with a fire door. Half the floors are empty, but floors one, two and five have added walls that divide the space. The first floor has a small office and the second floor still features office spaces that were likely added for the baking company that occupied the building during most of the twentieth century. The fifth floor contains a woodshop space that was used by the furniture making company, Module 21, in the early 2000s. Other changes to the building made by tenants include the addition of a round reinforced concrete slab to support floor storage and a variety of punched holes in the roof for the ventilation of the ovens which were located on the sixth floor (Fig. 3.19).¹⁸

18 Baker interview, 2015.

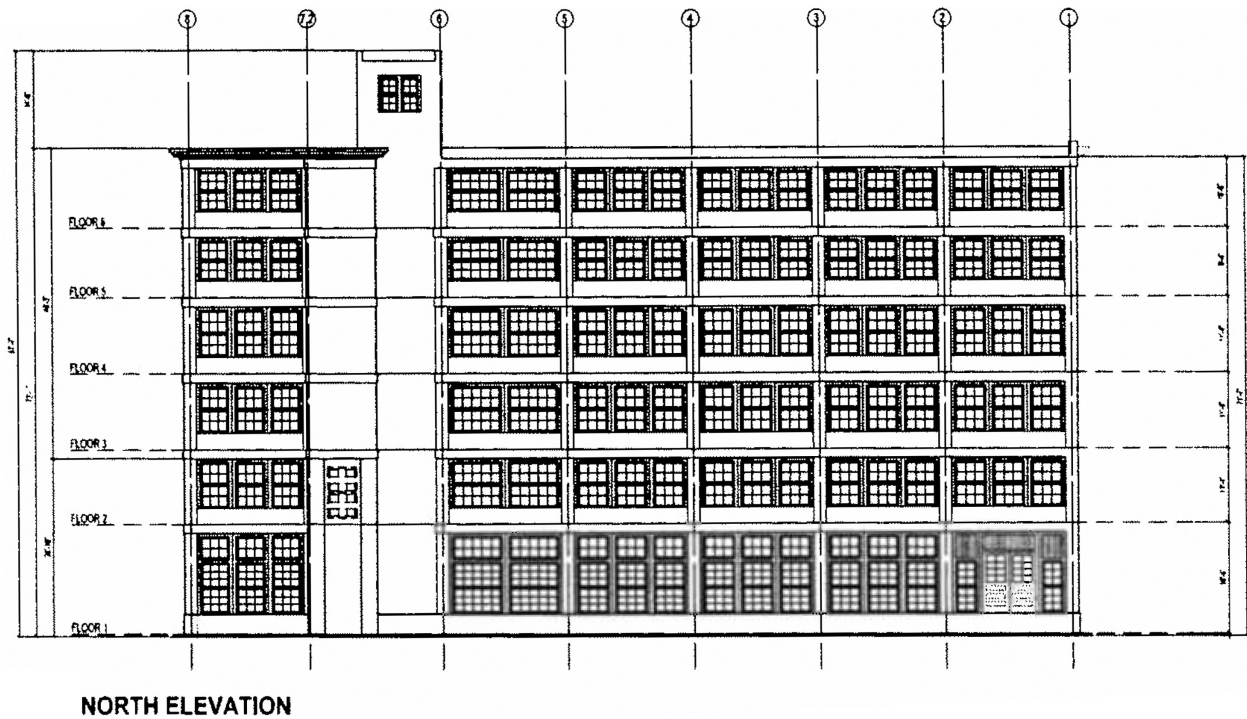


Fig. 3.22 North elevation of the 1908 Dayton Motor Car Company building showing the composition of ground floor windows. Image from the City of Dayton Office of Economic Development.

Each window bay is composed of three, six-over-six double-hung sash wood windows, with the exception of the ground floor. Windows on the ground floor level consist of three sets of three stacked window panels, the top of which is operable and the bottom two of which have nine window lights each. The bay immediately to the right of the elevator when viewing the elevation in Fig. 3.22 features two twelve-over-twelve windows with proportionally smaller panes. The left half of this bay is the location of the main stair, and some windows in the stair appear to have been changed to hopper vents. Aside from some broken panes, chipping paint, and worn hardware, the windows are in relatively good condition and many are still operable.

The Dayton Motor Car Company building can be described as a relatively small example of the daylight factory, likely due to it being only one of a system of two concrete frame buildings intended for the site when constructed. With its beam and girder structural system, the 1908 building is an early example of daylight factory structural technology. The square columns that support the system of beams and girders create what is known as a one-way structural system

(Fig. 3.23 and Fig. 3.24). In this system, the weight of the building transfers in one prescribed direction along the axes of the structure: the beams and girders both support the floor weight, but the smaller beams transfer weight to the girders, which in turn transfer the weight to the columns. Later buildings would adopt the “mushroom” column technology referred to in Chapter 1 that replaced the bulky beam and girder systems, allowing for even better natural lighting and easier placement of building systems. While cleanly executed and displaying strong, systematic regularity, the column and girder system does have a sense of



Fig. 3.23 Typical square column and connection to floor girders on third floor. Photo: April 2015, by author.



Fig. 3.24 Typical bay from third floor showing girder system and building systems. Photo: April 2015, by author.

visual heaviness that reveals the building's early date of construction.

The windows of the Dayton Motor Car Company building are also indicative of its early date of construction, as can be seen in Fig. 3.25. The character of fenestration is particularly critical to the daylight factory as they were designed specifically to take advantage of natural lighting. The windows of the Dayton Motor Car Company building are entirely made of wood, a highly flammable material that was replaced by steel as the daylight factory developed. The windows also do not extend the full height from ceiling to floor, which is indicative of earlier concrete frame buildings, such as the second phase of the Pacific Coast Borax Company in Bayonne, New Jersey by Ernest Ransome, built 1903-1904 (Fig 1.6). This feature has a major impact on the visual appearance of the building; while the bulk of the wall is made of glass, the thick bands of concrete interrupt the glazing and give a strong, horizontal orientation, making the building appear shorter than it actually is.



Fig. 3.25 North elevation of the building at 15 McDonough Street showing window condition and details as well as overall facade concrete-to-glass ratio. Photo: April 2015, by author.

In its present state, the building is in admirable condition, especially considering it has been vacant or underutilized since the last baking company left in the 1980s, and is excellently situated for a possible adaptive use. The envelope of the building has remained secure with the first floor panels protecting the still-intact first floor windows to prevent break-ins and a well-maintained roof (replaced sometime in the 2000s) that continues to protect against water damage. The windows would require restoration, but much of the original material could likely be salvaged. The building does appear to have a significant amount of lead paint that would need to be addressed, but asbestos abatement would be minimal as there is no insulation. Building systems are likely be the largest obstacle for reuse. There is some electricity in the building, but for any kind of consistent occupancy, all systems would need replacement, including plumbing and sprinklers. The elevator would need to be completely overhauled, and while there is a fire escape on the exterior of the building, more vertical circulation would be needed both for convenience and to meet present-day fire codes.

While largely vacant for several years, the building has recently become part of a discussion about redeveloping the surrounding area, including the Dayton Motor Car Historic District. A Kentucky-based development firm, City Properties Group, is interested in partnering with Gosiger and the City of Dayton to link the area to the nearby Oregon Historic District (Fig. 3.26).¹⁹ The Oregon Historic District has been quite successful in recent decades, attracting business and residents while promoting the preservation of the historic fabric of the area. Developers aim to capitalize on the Oregon District's success, as *Dayton Daily News* recently reported, creating a cultural corridor: "City Properties Group wants to create an entertainment district in that area, acting essentially as an extension of the Oregon Historic District. The McDonough project would be part of that revitalization plan."²⁰

19 Steve Bennish, "Vacant Dayton industrial site set for reuse in master plan." *Dayton Daily News*. 5 May 5, 2015.

20 Cornelius.Frolik, "Company wants to reuse downtown building for new housing." *Dayton Daily News*. 25 Mar. 2015.

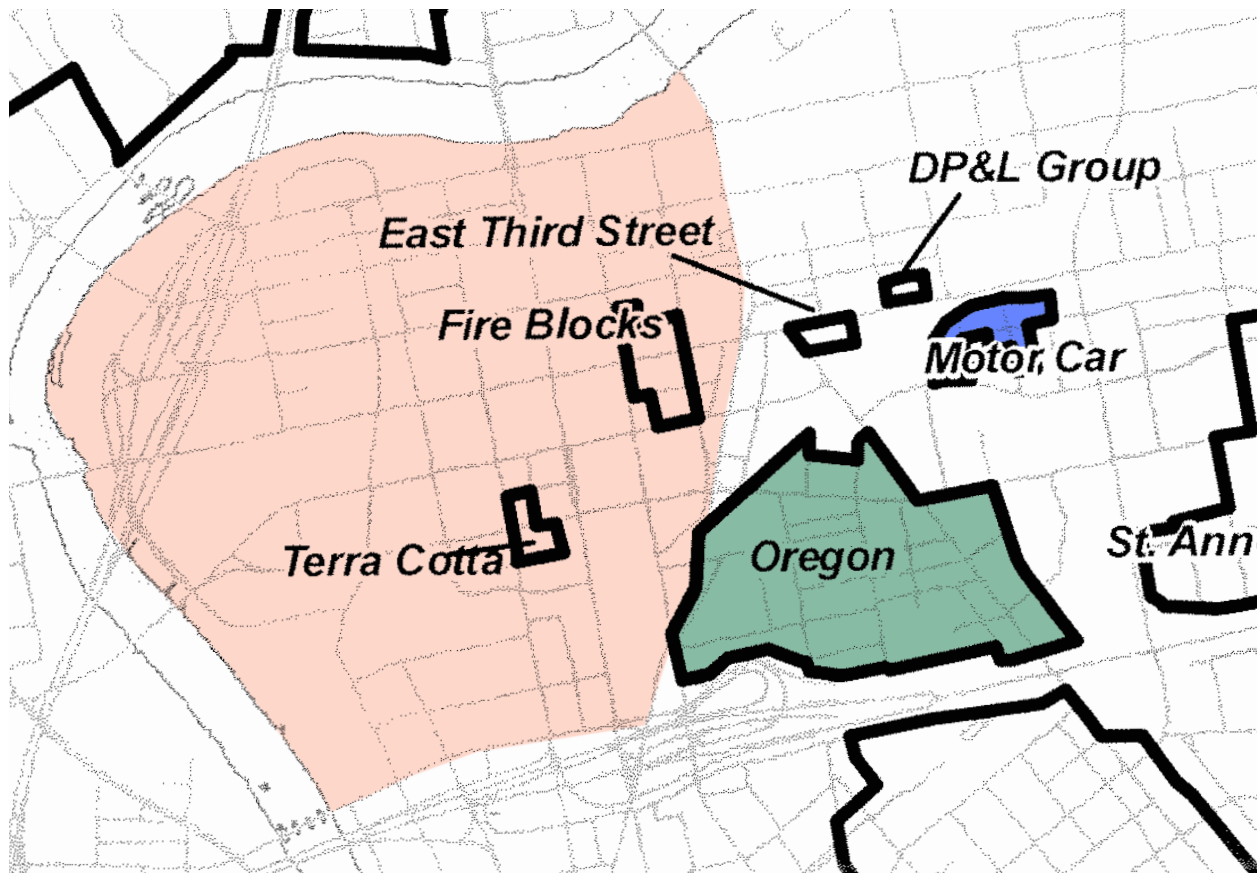


Fig. 3.26 Map of historic districts near downtown Dayton with the downtown core shaded in red, the Dayton Motor Car Historic District shaded in blue, and the Oregon Historic District shaded in green. Image from of the City of Dayton's Planning and Community Development Department. (Shading added.)

The company that currently rents the ground floor of the Dayton Motor Car Company building for storage, Gosiger Inc., is a multi-division supplier of machine tools and innovations for the metalworking industry. Established in Dayton in 1922, Gosiger has strong local ties, having been locally headquartered since its founding. They currently own the bulk of the buildings surrounding the Dayton Motor Car Company building, including several that are historic, contributing structures in the Dayton Motor Car Historic District (Fig. 3.27). In addition to their commitment to remaining a locally-based business, Gosiger has been an exemplary steward of historic buildings in the area, and is interested in making the Dayton Motor Car Historic District a more welcoming place in the city. Gosiger is looking at ways to rearrange and reorganize operations to maximize the efficiency of the space they currently own. The building at 15 McDonough is of interest to Gosiger

as they look into long-term plans for unifying their corporate campus.²¹ Unfortunately, the multi-story design of the Dayton Motor Car Company building makes it a difficult building to work with, given that they are a distributor of large, complex tooling machines. Gosiger's operations are optimized when laid out in one single, sizable floor.

In addition to considering the Dayton Motor Car Company building as a potential piece of Gosiger's corporate headquarters, developers are also looking at residential and commercial possibilities for the building. Barry Alberts, a partner with City Properties Group, explained: "We're looking at the ability to use the upper floors for housing, and the lower floors for commercial space, which Gosiger could wind up using or it could be rentable space."²² While most of the floors in the building remain vacant, it is secure and protected from the elements. Keith Klein, who is on the City of Dayton's Development Services Team in the Office of Economic Development, is optimistic about the potential of the site, but notes that it will be a long-term project.²³

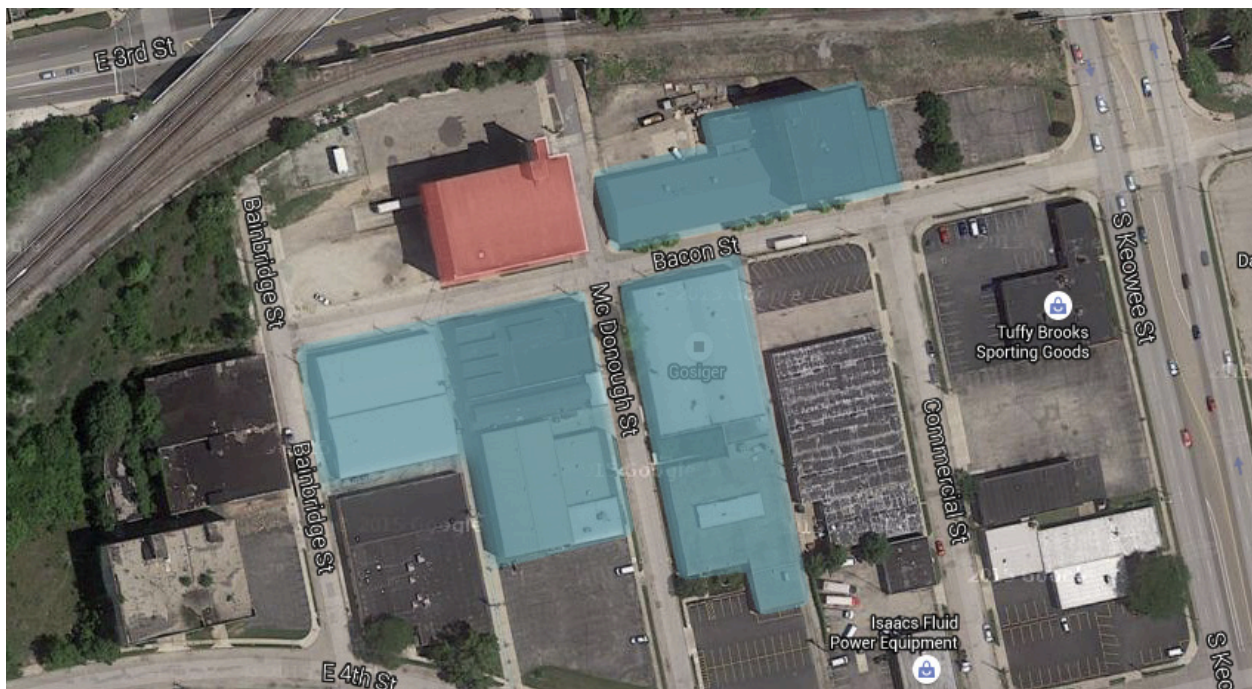


Fig. 3.27 Aerial view of buildings owned by Gosiger Inc. (in blue) near 15 McDonough Street (in red)

21 Baker interview, 2015.

22 Frolik, "Company wants to reuse downtown building for new housing," 2015.

23 Klein interview, 2015.

Case Study 2: Delco Plant 1

Completed in 1912, the second Beaver Power Building, commissioned by prominent Dayton businessman Fredrick P. Beaver, served as headquarters for the Dayton Engineering Laboratories Company (Delco), and continued to be associated with the Delco name for over 70 years (Fig. 3.28). Delco was one of Dayton's most significant manufacturing companies, not only because it provided tens of thousands of jobs throughout its long history, but because it embodied the entrepreneurial and innovative spirit for which Dayton was known at the turn of the twentieth century.

The beginnings of Delco can be traced back to 1907 with the story of Charles Kettering “tinkering” with ignition systems and Edward Deeds working on building his own car. Both were employees at the National Cash Register Company when they discovered their shared interest in automobile technology. The two men, along with several other associates from NCR, began working together in their spare time in the Deeds family barn, primarily on the development of a reliable



Fig. 3.28 Schenck & Williams, Delco Plant 1, southeast corner, Dayton, OH, 1912. Photo: April 2015, by author.

ignition system. The Delco company history, published in 1949 and entitled *Spark of Genius*, describes Kettering's invention: "Some time in 1908, 'Ket' perfected a relay to go into the electrical circuit of current from a dry batter. This generated a fat spark which made the engine take hold at a flip of the crank."²⁴ The developers shopped their new invention around, and it caught the eye of the Cadillac Automobile Company, which ordered 8,000 of the devices for their upcoming line of 1910 automobiles. Kettering and Deeds immediately incorporated and became the Dayton Engineering Laboratories Company, or Delco, in July 1909. Without any facilities or manufacturing capabilities, Delco contracted with a manufacturer in Chicago to produce the ignition systems and the Cadillac order was delivered on time.

After this initial order, Kettering began seriously developing his automatic starter, which would be the invention that launched the commercial success of the company. He quit his job at NCR to devote his efforts to the project full time and, still located in the Deeds barn, he worked to create an electric ignition switch and an accompanying generator to feed the electrical system. A later Delco-published history, *Delco Products: It's History, Its Heritage*, described Kettering's concept for his next step forward in innovation: "Kettering envisioned a compact unit combining both automobile starting motor and a generator that would generate electricity, store it away in a storage batter, crank the engine, and furnish ample current for lights."²⁵ In late 1910, Kettering finally achieved success and presented the invention to Cadillac, which ordered 12,000 of the new electric starters and accompanying interior lighting systems.²⁶ When the Chicago manufacturer with whom the men had contracted to produce the first order declined the second order due to the high risk of the new invention, the founders of Delco were unable to secure a contract with another manufacturer.

24 *The Spark of Genius*, Dayton, OH: Delco Products Division of General Motors Corp., 1949: 5.

25 Jerry T. Emrick, *Delco Products, Its History, Its Heritage*, Dayton, OH: Public Relations, Delco Products, 1983: 5.

26 Various records report differing numbers of starters for both Cadillac orders, and some also seem to confuse the two orders. Either Cadillac order is reported in various texts to have been anywhere from 5,000 to 12,000 starters, but both Delco-published histories, *Spark of Genius* and *Delco Products, Its History, Its Heritage*, report the number of the 1909 order to be 8,000 units and the 1910 order to be 12,000 units.



Fig. 3.29 Historic postcard of Beaver Power Building #1, completed 1910; Delco's first rented space was on its fourth floor. Image from the Dayton Postcard Collection of the Dayton Metro Library, date unknown.

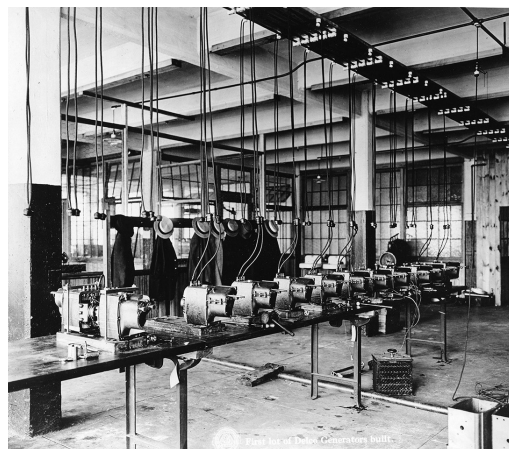


Fig. 3.30 Electric self starters from Delco's 1912 order for Cadillac being produced in Beaver Power Building #1. Photo from the collections at Dayton History.

As a result, the men decided to manufacture the starters themselves, personally investing all their savings and resources, and selling preferred stock to friends. Delco rented the fourth floor of Beaver Power Building #1 at East Fourth and Saint Clair Streets in downtown Dayton, moving what little equipment they had from the Deeds' barn into the new space (Fig. 3.29).

The Delco electric ignition and lighting system was installed in the entire line of 1912 Cadillacs, and was an enormous success (Fig. 3.29). "By 1914 practically every car at the Auto Show in New York was equipped with an electric starter. . . . Many authorities credit the self-starter with giving the automotive industry its greatest impetus."²⁷ Growth came quickly, so Delco looked to expand. Their landlord at the time, Fredrick Beaver, was already constructing another Beaver Power Building, so Delco entered negotiations for the site, even making some construction requests to better suit their manufacturing process. Delco moved into the new building at the end of 1911 before construction was complete. Renting only a portion at first, they soon took over the entire four-story building. A fifth floor was constructed, as well as a partial sixth floor that would be expanded into a full floor in the early 1920s. (Fig. 3.31, Fig. 3.32, and Fig. 3.33) The exact dates of the floor additions are unknown, as is the sale date when Delco eventually bought the building from Beaver. Despite

27 *The Spark of Genius*, 9.

damage from the Great Flood in 1913, Delco continued to grow and would eventually construct two more plants in Dayton's downtown core: Plant 2 in 1915 and Plant 3 in 1923 (Fig. 3.34 and Fig. 3.35). *Spark of Genius* describes the expansions and their sizes:

In 1915, a seven-story building, comprising part of what [became] Plant 2, was erected on the other side of First Street, adding 200,000 square feet of floor space to the 300,000 previously occupied by the company. . . . Additions to Plant 2 and the construction of Plant 3 during the following years, brought the total floor space to 1,344,500 square feet. If this floor area were laid out in a single-story building, it would cover twelve city blocks.²⁸

The next major product after the self-starter was the Delco-Light, a gasoline powered lighting system designed for isolated farms, schools, or other buildings too far from cities to utilize the local power grid.²⁹ Originally this product was produced in Delco Plant 2, but later became its own company. In 1916, Delco affiliated with United Motors which was purchased by General Motors

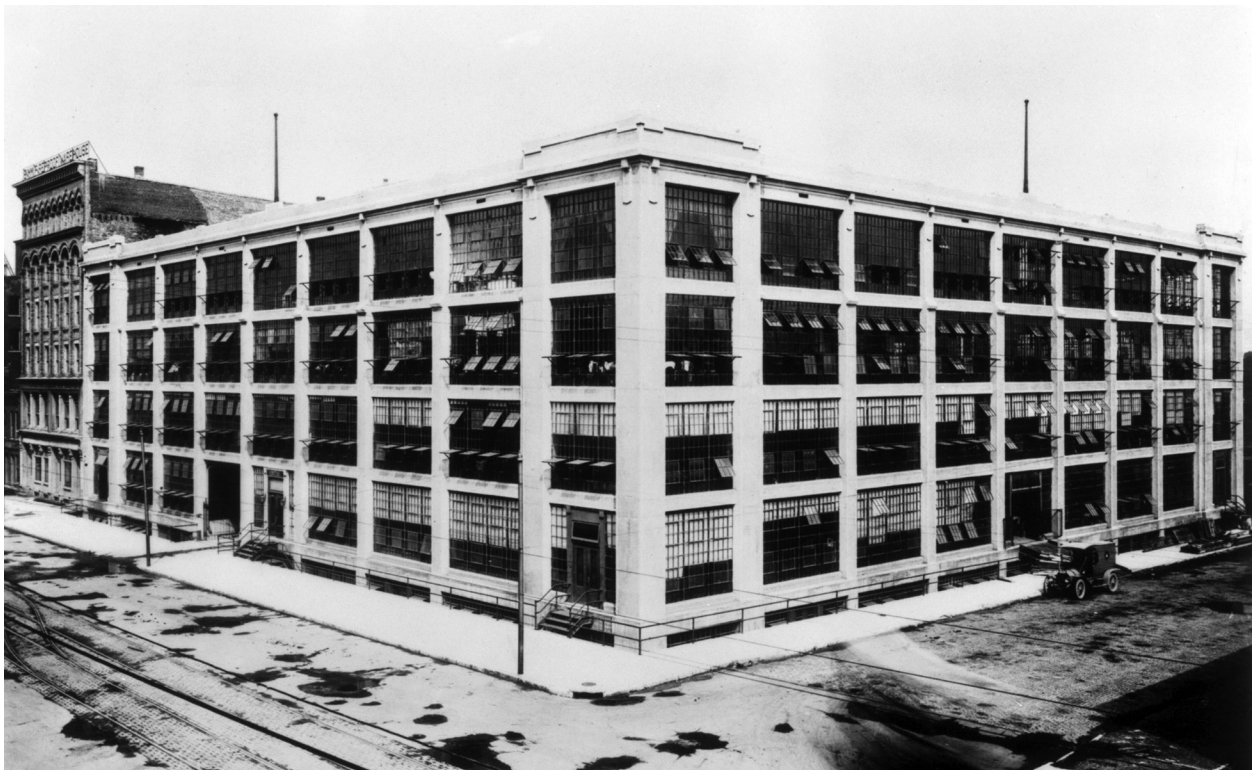


Fig. 3.31 Beaver Power Building #2 directly after completion in 1912 with its original four floors. Photo from the General Motors Media Archives.

28 *The Spark of Genius*, 9-10.

29 "Delco-Light" was the colloquial term for the product. The official name was the Delco Farm Lighting System, which was the basis for the founding of the later Delco Engineering Company.



Fig. 3.32 Delco headquarters at 329 East First Street in 1921 after two floors were added. Photo from the collections at Dayton History.



Fig. 3.33 Delco headquarters at 329 East First Street during the Delco Day Parade in 1941, showing the sixth floor expanded. Photo from the collections at Dayton History.



Fig. 3.34 First phase of Delco Plant 2, 1915. Photo: 1921, from the collections at Dayton History.



Fig. 3.35 Delco Plant 3 was built in 1923 and demolished in 1981. Photo: 1948, from the collections at Dayton History.

(GM) in 1918. After being devoted to aviation ignition systems during World War I, the Delco Products Division of GM in Dayton became known for producing shock absorbers, electric motors (mainly for household appliances), and generators. GM had also purchased the Detroit-based Frigidaire Corporation, and in 1920 moved it to Dayton, combined it with Delco-Light, and opened a large plant on Taylor Street.

With increasing demand of these Delco products came several phases of plant expansion in downtown Dayton. Plant 2 underwent a significant expansion in 1929 and another in 1941. The final major downtown expansion took place at Plant 3 starting in 1946, completed in 1947. (Fig. 3.36 and Fig. 3.37) In 1952, Delco entered a new era and began expanding to single-story production shed complexes in the suburbs, most notably in Kettering and Moraine.³⁰ As GM continued to grow, it began to pursue production in international markets; the Delco Division's first international plant was established in Juarez, Mexico in 1979.³¹ Throughout the decades after Delco became the property of GM, it was reorganized several times within different divisions.³² Eventually, the original Dayton Engineering Laboratories Company entity was completely dissolved, but the trade name of "Delco" carried on through various product names and in various GM departments. The name of Delco even survives within GM today through a division named AC Delco, although GM no longer has any assets or active presence in Dayton.

Today, two of the four major downtown sites associated with Delco survive (Fig. 3.38). Plants 1 and 2 are intact, but Plant 3 was demolished in 1981 and the site is now Fifth Third Field, home of the Dayton Dragons. Early plans for a development called Tech Town made allowance for the renovation of at least one daylight factory at the complex on Taylor Street, but between 2005

30 Emrick, *Delco Products, Its History, Its Heritage*, 39.

31 Emrick, *Delco Products, Its History, Its Heritage*, 49.

32 The first major reorganization and restructuring of Delco was in 1926 after Kettering resigned as president of the Dayton Engineering Laboratories Company division of GM in 1923 to become the head of GM's Research Laboratories in Detroit. (*Delco Products: Its History, Its Heritage*, 11)



Fig. 3.36 Aerial view of the three downtown Delco plants; Plant 2 on the left, Plant 1 center, and Plant 3 to the right. The photo was taken some time after 1923 when the first phase of Plant 3 was completed, but before 1929 when Plant 2 underwent its first major addition. Photo from the collections at Dayton History.



Fig. 3.37 Aerial view of the three downtown Delco plants in 1947 after all major downtown expansions were complete. Photo from the collections at Dayton History.

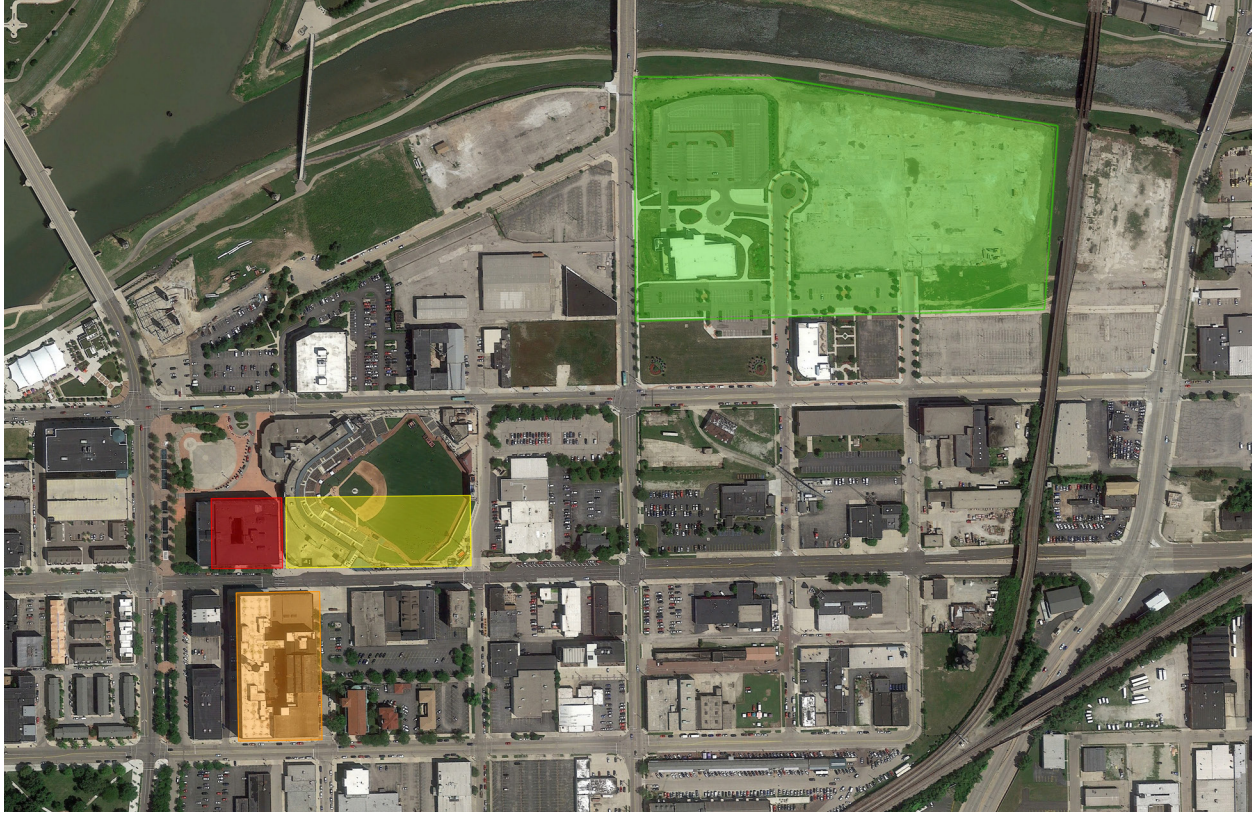


Fig. 3.38 Current conditions of downtown Delco locations: Plant 1 in red, Plant 2 in orange, the former site of Plant 3 in yellow, and the former site of the Delco-Light and Frigidaire complex in green.

and 2009 the entire site was gradually demolished.³³ The two tallest concrete frame buildings were the last to come down in July 2009. As of 2015, the Tech Town development is still moving forward, but in newly built structures.

While Delco Plant 1 was the smallest of the downtown plants, it was perhaps the most integral to the development Delco. The first major order of 12,000 electric starters for Cadillac were built in Beaver Power Building #1, but the company was headquartered during its most crucial years in Delco Plant 1. It was in this building that the company successfully weathered the Great Flood of 1913 that led to be the demise of many other downtown Dayton businesses.³⁴ Throughout decades of expansion, Delco Plant 1 remained the headquarters of the brand. Plant 1 was the center of one

33 Joanne Huist Smith. "Construction of first TechTown building to begin in March." *Dayton Daily News*. 31 Jan. 2008; John Wilfong "Demolition under way at Tech Town site." *Dayton Business Journal*. 9 May. 2005.

34 Delco was aided during the flood by Ahrens-Fox Fire Engine company of Cincinnati, an early Delco customer who rushed a pumper to Dayton to help pump water out of Delco Plant 1 after the flood. (*Delco Products, Its History, Its Heritage*, 8.)



Fig. 3.39 Delco Plant 1. Photo: c. 1970 from Wright State University.



Fig. 3.40 Delco Plant 1 (329 East First Street). Photo: April 2015, by author.



Fig. 3.41 North facade of Delco Plant 1 with one corner of paneling removed. Panels were temporarily removed in March 2015 to include current photos of the originals in the application for the Ohio State Historic Tax Credit. Photo: March 2015, Nathalie Wright.

of Dayton's most important companies, and the building remains a focal point of the downtown area today.

In 1981, the building was purchased from GM by a local businessman, Sanford Mendelson, who used the building for product storage for his liquidation and salvage business, the Mendelson Liquidation Outlet (Fig. 3.39). Around 1997, Mendelson put up corrugated metal panels on the exterior of the building, presumably to protect both the building envelope and his merchandise inside (Fig. 3.40). The original windows survive behind the metal paneling as can be seen in Fig. 3.41, although they are in poor condition.

In October 2014, Mendelson sold the building to Crawford Hoying, a development company based in Columbus, Ohio. The building is slated to become part of the Water Street District, a residential, office and retail development currently under construction along the Mad River, just a few blocks directly north of Plant 1. According to Matt Starr, Director of Development at

Crawford Hoying, a restaurant and parking will be on the ground floor while the upper floors will be residential.³⁵ Crawford Hoying is partnering with local developer Jason Woodard and has been working with the City of Dayton to design new buildings for the Water Street District that will be sympathetic to the surrounding historic fabric, but still designed with a modern vocabulary.³⁶ Delco Plant 1 is separated from the new construction by about two city blocks, so the design of the new development will not specifically reference the architectural features of Delco Plant 1 (Fig. 3.42).

Starr readily admits that renovations of historic buildings are not Crawford Hoying's typical approach to development. Rather, the firm chose to use Delco Plant 1 as an opportunity to expand their portfolio and further contribute to the urban area surrounding the Water Street District Development.³⁷ The Delco Plant 1 project is utilizing the relatively new Ohio State Historic



Fig. 3.42 A rendering from 2013 showing the proximity of the Water Street District to Delco Plant 1. The three numbers indicate building phases for the new construction, and Delco Plant 1 is circled. Drawing from Crawford Hoying.

35 Matt Starr, "Delco Plant 1," Personal interview, 11 Apr. 2015.

36 Gower interview, 2015.

37 Starr interview, 2015.

Preservation Tax Credit that became law in 2008, which provides a tax credit of up to 25 percent of qualified rehabilitation expenditures incurred during a rehabilitation project.³⁸ The credit is awarded on a competitive basis through a rating system, and Crawford Hoying submitted their application for the Delco Plant 1 development project in March 2015. Starr has stated that the project cannot be completed without the aid of the tax credit program which a crucial factor contributing to the feasibility of the redevelopment project.³⁹

Starr also cited the building's regularity of form as one of the key feasibility factors of the project. In addition to the structural integrity of the robust concrete frame, Delco Plant 1 exhibits predictable and regular propor-

tions. The building is a square, composed of nine bays along each of its sides with the columns spaced approximately 20 feet, center-to-center (Fig. 3.43). The structural system, while built only four years after the Dayton Motor Car Company building and two years after Beaver #1, made a significant step forward with its flat slab construction and mushroom columns that create a

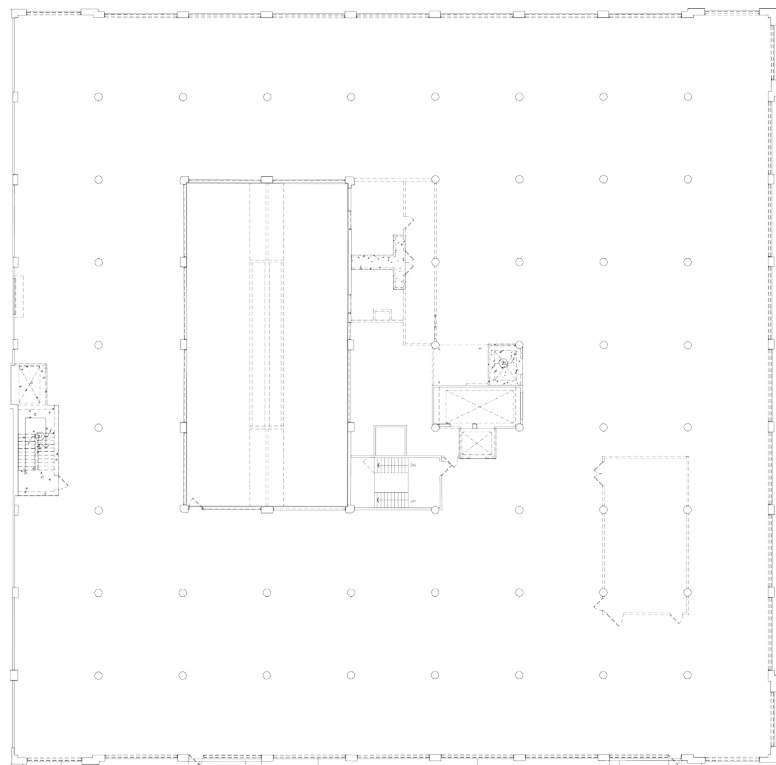


Fig. 3.43 Second floor plan for Delco Plant 1. Drawing: March 2015, from Crawford Hoying.

38 According to information on the Ohio Development Services Agency website, applicants are eligible for no more than \$5 million in tax credits unless approved as a catalytic project. In spring 2015, the Ohio Development Services Agency and their partners at the State Historic Preservation Office were reviewing 54 applications for 97 historic buildings in the 2015 round of funding. Funding requests total \$73.9 million, and the funds available total \$27.5 million; approved applications will be announced no later than June 30, 2015. As stated on the Ohio Development Services Agency website: "Over the thirteen completed funding rounds, tax credits have been approved for 244 projects to rehabilitate 320 historic buildings in 49 different Ohio communities. The program is projected to leverage more \$3.4 billion in private redevelopment funding and federal tax credits directly through the rehabilitation projects."

39 Starr interview, 2015.



Fig. 3.44 Typical interior mushroom column from the third floor demonstrating the flat slab two-way structural system. Photo: April 2015, by author.

two-way structural system (Fig. 3.44). Instead of the weight of the building traveling along a defined path from the smallest structural elements to the largest, the slab is internally reinforced and its weight transfers directly to the top of each column from all directions within the tributary area. Working with these features, Crawford Hoying has developed straightforward floor plans for the apartment units. Additionally, the eighteen feet of distance between columns allows uncomplicated designs for additional circulation and efficient parking.

The fifth floor was added immediately after completion of the first four floors, as the interior columns on the fifth floor are identical to those in lower floors. The fifth floor fenestration is slightly different, however, as there is a short wall below the windows which reduces their height. This does not occur on the lower floors, and was likely the former parapet of the four-story version of building. It is unclear if the sixth floor was added at the same time as the fifth in 1912, but it was added at least by 1913 and can be seen in photographs from the flood. The sixth floor



Fig. 3.45 View of windows in lightwell showing sixth floor masonry construction April 2015. Photo by author.

differs dramatically from the others in that it has wood flooring; thin, square, steel columns; and the exterior walls are all brick with no concrete frame. The wall in the lightwell is clearly all brick (Fig. 3.45), but the perimeter wall seems to be covered in plaster to match the concrete frame of the first five floors (Fig. 3.46). Like the fifth floor, the sixth floor also has shorter windows and a short wall below, which was likely the parapet of the fifth story before the sixth floor was extended to the edge of the building some time between 1921 and 1923.

With its overall square plan, wider corner concrete piers and corner bays that project slightly from the building, the design of Delco Plant 1 reflects its predecessor, the first Beaver Power Building. Delco Plant 1 has a centrally-located lightwell that originally went to ground level, but a skylight now encloses the first floor. Because the building abuts (but does not share a wall with) the adjacent building, the western wall of the concrete frame is completely brick infill. The north, east, and south walls, however, are completely glazed between the frame. The lightwell is almost



Fig. 3.46 Interior of perimeter wall on sixth floor showing concealed masonry construction. Photo: April 2015, by author.

completely glazed with the exception of some infilled bays on the east wall where hallways and bathrooms are located. The heights of the floors vary from 12'-5" in the basement, floors two through four alternating between 12'-7.5" and 12'-9", with the two tallest floors being the fifth (13'-5") and sixth (14'-1") floors. Reports vary, but the building has approximately 200,000 square feet of space including the basement.

Delco Plant 1 has an expansive amount of steel sash windows on each floor, with the exception of masonry infill on much of the ground level, likely added some time in the 1980s,6 and some glass block windows on the sixth floor. Each typical corner bay of windows is divided vertically into three sections, and each inner bay into four. A typical section is five lights wide and eight lights tall with two, two-by-two operable awning window vents stacked vertically, as demonstrated in the lightwell windows in Fig. 3.47. On the fifth and sixth floors, the windows are shorter, but still divided vertically into five-pane-wide sections. These are six panes tall with one two-by-three awning



Fig. 3.47 View of windows in lightwell showing typical layout. Photo: April 2015, by author.



Fig. 3.48 A view of the upper floors of Delco Plant 1 during the 1913 flood. The variation in windows on the fifth and sixth floors can be easily seen. Photo from the collections of Dayton History.



Fig. 3.49 Detail of windows showing damage, April 2015. In addition to rust and surface deterioration, many windows frames are failing. Photo by author.

window vents in each panel (Fig. 3.48). Despite the metal coverings on the exterior of the building, the windows are generally in poor condition. Many of the steel frames are rusted and deteriorating, as seen in Fig. 3.49, and panes of glass are broken throughout the building. Some window frames are bent so much they are beginning to detach from the concrete frame.

The building has two non-operating elevators, one located along the west wall and the other located centrally. There is a centrally located staircase that connects from the basement to the sixth floor, a staircase along the west wall that runs from the basement to the third floor, and a staircase in the southeast part of the building from the basement to the first floor. Although the building has been used mainly for storage for over thirty years, some office and work space partitions remain on various floors. An office space with wood panel walls and marble bathroom areas remains at the northeast corner of the sixth floor and is rumored to have been the office of Delco co-founder Charles Kettering. Hazardous material abatement will be relatively minimal and consist primarily of lead paint and some asbestos tile from former office spaces on the sixth floor. The roof is estimated to be about ten or fifteen years old and is generally in good condition, but there has been some water leakage problems in certain areas of the roof in the last year.

In order to qualify for the historic tax credit, Crawford Hoying has designed their renovation for the building to reflect the industrial building's character.⁴⁰ In March 2015, as part of their application for tax credit, the developer submitted working design plans and a work description detailing their plans for the building. The report describes the concrete frame as needing only minor patches and repairs, but on floors two through six a layer of light gypsum cement will be laid to create an even floor surface. Carpeting, vinyl/wood, and ceramic tile will be installed as flooring in the apartment spaces. The plan for the apartments is detailed in the report:

The unit plans place living areas and bedrooms at the windows, allowing the original ceilings to remain full height to view. Where bedrooms are located away from windows, the ceiling will also be full height and the dividing partition will stop

40 Starr interview, 2015.



Fig. 3.50 Typical design for floors two through six. Plan from Crawford Hoying.

below the existing ceiling with a glass partition that allows natural light from the windows to reach the bedroom. Smooth gypsum board ceilings will be lowered to 9 feet at bathrooms, closets, and utility rooms only. HVAC ductwork will be routed from individual furnace rooms in each apartment and will be exposed ductwork, painted to blend with the painted concrete ceiling. . . . All drywall partitions will meet the outer walls between windows. Partitions will align with the concrete mushroom columns, which will remain exposed.^{41,42} (Fig. 3.50)

The office space on the sixth floor that is believed to have been Kettering’s will be restored as is and “is intended to function as a gathering place for the building.”⁴³

41 Crawford Hoying. *Ohio Historic Preservation Tax Credit Application: Delco Building*. 31 Mar. 2015. Microsoft Word document.

42 The steel columns on the sixth floor, which are not indicative of the structural significance of the building, will be encased in drywall.

43 Crawford Hoying. *Tax Credit Application*, 2015.

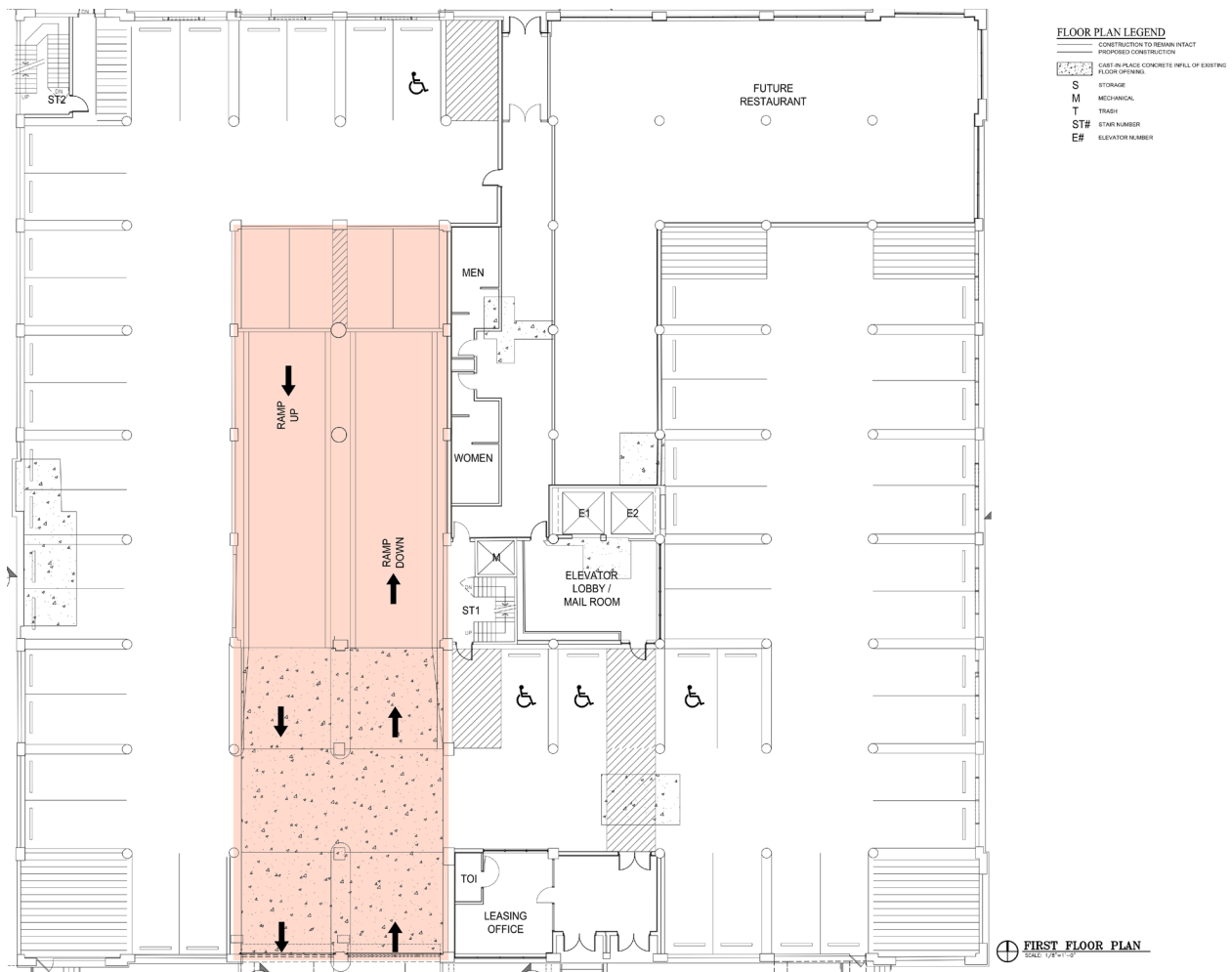


Fig. 3.51 Design for first floor showing area for new ramps, parking, and future restaurant site. The area shaded in red is where the first floor slab will be removed to allow for parking access ramps. Plan from Crawford Hoying. (Shading added.)

The proposed reuse will also reconfigure a loading bay on the south side of the first floor to create ramps to and from the basement for access to parking. These ramps will require the removal of fourteen square bays of concrete slab floor on the first floor (Fig. 3.51). The central freight elevator will be replaced by two small modern elevators, and the central staircase will remain. The second elevator on the west wall and the two partial stairs (one on the west wall and one in the southeast quadrant) will be removed and the slabs filled in. A staircase from the basement to the sixth floor will be added in the northwest corner of the building to meet exit requirements. The existing roof and skylight at the bottom of the lightwell will be removed and replaced with a concrete slab to offer a usable courtyard space for tenants.

Crawford Hoying estimates a total project cost of about \$25 million and is aiming for completion in the spring of 2017. One of the largest expenses of the project will be the complete replacement of all original windows with aluminum. The document states: “New metal windows will be installed to match the existing profiles and configurations as closely as possible in appearance. These windows will fit the openings exactly, with framing that matches the historic framing.”

The preliminary window budget estimates that the 210 windows totaling 30,499 square feet to be replaced (Table 5). Crawford Hoying received an estimate from a window distributor for \$50 per square foot, putting the total cost of the window replacement at about \$1.5 million.

	Typical Window	Corner Window	Lightwell Window
Window width (ft)	17.67	14.00	17.67
Window height (ft)	8.17	8.17	9.67
Individual window area (sq ft)	144.31	114.34	170.82
Window quantity 1st floor	21	6	0
Window quantity 2nd floor	21	6	0
Window quantity 3rd floor	21	6	12
Window quantity 4th floor	21	6	12
Window quantity 5th floor	21	6	12
Window quantity 6th floor	21	6	12
Total window quantity	126	36	48
Total window area (sq ft)	18,183	4,116	8,199
Total window square footage:			30,499

Table 5 Table showing window dimensions, quantity, area, and total window area. Information from Crawford Hoying.

Case Study 3: Delco Plant 2

Delco Plant 2 was Delco’s first purpose-built factory and demonstrates the continued evolution of the daylight factory. Situated south across East First Street from Plant 1 and connected via an underground tunnel, Delco Plant 2 was built only six years after the founding of Delco. Sanborn maps report that the building was used primarily for machining with some drafting on the seventh floor.⁴⁴ Completed at the end of 1915, the building was dedicated as part of an enormous industrial exposition held in Dayton January 14-22, 1916 (Fig. 3.52).⁴⁵ The event was organized by the Greater

44 Sanborn Map 1918

45 *Spark of Genius*, the 1918 Sanborn Map, and the Ohio Historic Inventory sheet (published by the Ohio Historic Preservation Office) all list the building as completed in 1915. However, *Delco Products: Its history, its heritage* lists the completion date as 1916. This discrepancy might be due to the building dedication exposition happening in 1916.

Dayton Association and hosted by Delco. According to a magazine article detailing the event, the exposition was designed to “[furnish] abundant evidence that Dayton [had] risen triumphant from the ruins into which the flood of 1913 plunged the city.” The article also states the event was intended to “bring into one composite whole all the diversified industries and products of the city in order to satisfy the captains of industry of the stability and diversity of Dayton’s institutions.”⁴⁶ Plans for the exhibition had actually begun in June 1915, before ground had even been broken for Delco Plant 2. Local reports at the time noted that exhibits were being installed on the lower floors while bricks were still being laid on the seventh.⁴⁷ The exhibits occupied all seven floors of the new



Fig. 3.52 Delco Plant 2 decorated and lighted for the 1916 Dayton Industrial Exposition. Photo from the collections at Dayton History.

46 M.L. Beard, “An Industrial Exposition,” *The American City* Feb. 1916: 174.

47 “Dayton’s Industrial Exhibition: Ten Big Shows Under One Roof Made Big Profit for Greater Dayton Association and is Said to Have Been Biggest Event to Take Place in Dayton Since the Flood,” *Town Development* Mar. 1916: 15.

building and were divided into ten separate exhibitions; the reported value of the exhibits exceeded \$3 million.^{48, 49} To ensure the Exposition's success, a significant sum of money was spent on advertising (Fig. 3.53), booths, and decoration; in total, 110,578 visitors attended over seven days. By the time of the Exhibition in 1916, Delco had already established itself as a strong and growing industry in Dayton's economy. Not only had the company experienced spectacular commercial success in a few short years, it also represented innovation by pioneering new inventions. The construction of

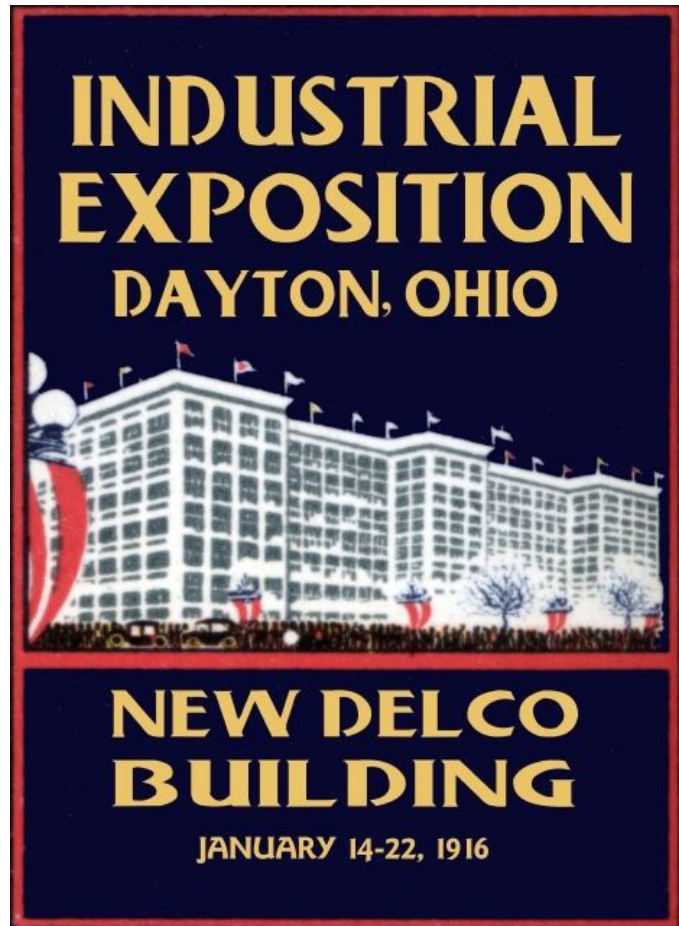


Fig. 3.53 Advertising poster for the 1916 Industrial Exposition, prominently featuring the new Delco Building.

Delco Plant 2 was in itself an exhibition, a display of Delco's proven capability and further potential.

The construction of Delco Plant 2 consisted of several major building periods, but records are unclear about the exact dates of additions after the second building phase in 1929. The first phase, completed in 1915, was nineteen bays long, four bays wide for a four bay section at either end, and three bays wide for the center eleven bays (see red shaded area in Fig. 3.54). An article in *Engineering News* listed Schenck & Williams as architects, Nelson J. Bell as the structural engineer for the architects, and the A. Bentley & Sons Company as contractor.⁵⁰ The article detailed what it

48 The ten exhibits included the Automobile Show, Pure Food Show, Mercantile Style Show, Business Appliance Show, Flower Show, Electrical Show, Municipal Exhibit, the Advertising Exhibit, and Machinery Hall.

49 Beard, "An Industrial Exposition," 174-175.

50 "Reinforcing Details of Delco Building, Dayton, Ohio," *Engineering News* 74.21 (1915): 274.

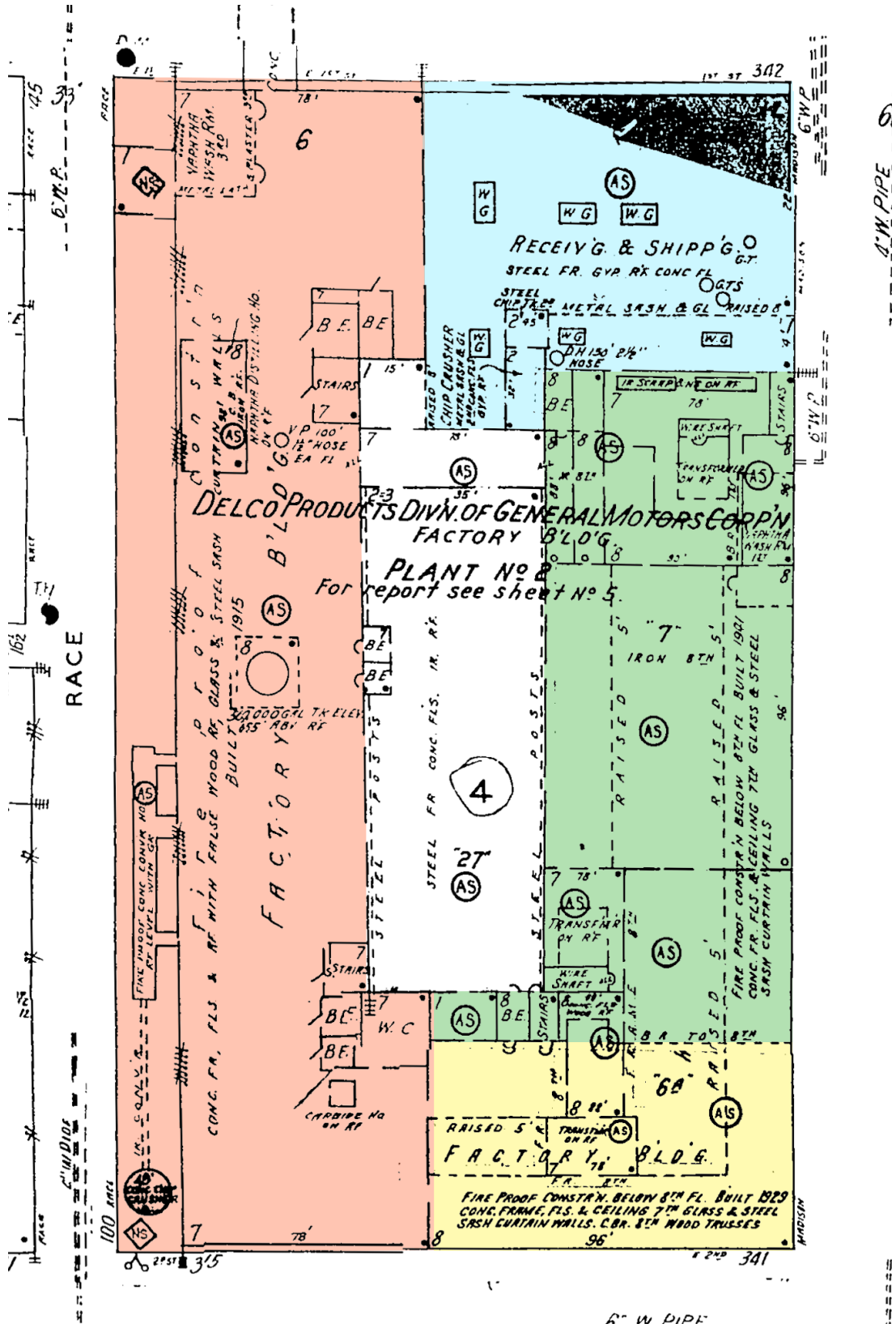


Fig. 3.54 Sanborn map labeled to show the progression of Delco Plant 2: the original 1915 building is in red, the 1929 addition in yellow, the third concrete frame addition in green, and the single floor steel addition in blue (Shading added.)

described as “interesting reinforcement details” featured in the building, and also noted that the building was intended to have a duplicate future expansion as portrayed in Fig. 3.55. Another interesting feature described in the article was the encasement of the ductwork between the concrete structural members and the brick cladding of the exterior piers.

An addition in 1929 extended the building along the Second Avenue to the south (yellow shading in Fig. 3.54). The remainder of the building is in two parts: a seven story concrete frame building along Madison Street (green shading in Fig. 3.54) and a single-story steel frame structure at the corner of Madison and First Avenue (blue shading in Fig. 3.54). According to the 1950 Sanborn map shown in Fig. 3.54, the third concrete frame structure (shaded green) was added in 1941. No date is given for the steel frame portion (shaded blue), so it is unclear whether both sections were built together.⁵¹ All additions mimic the distinct brick pier design of the original as

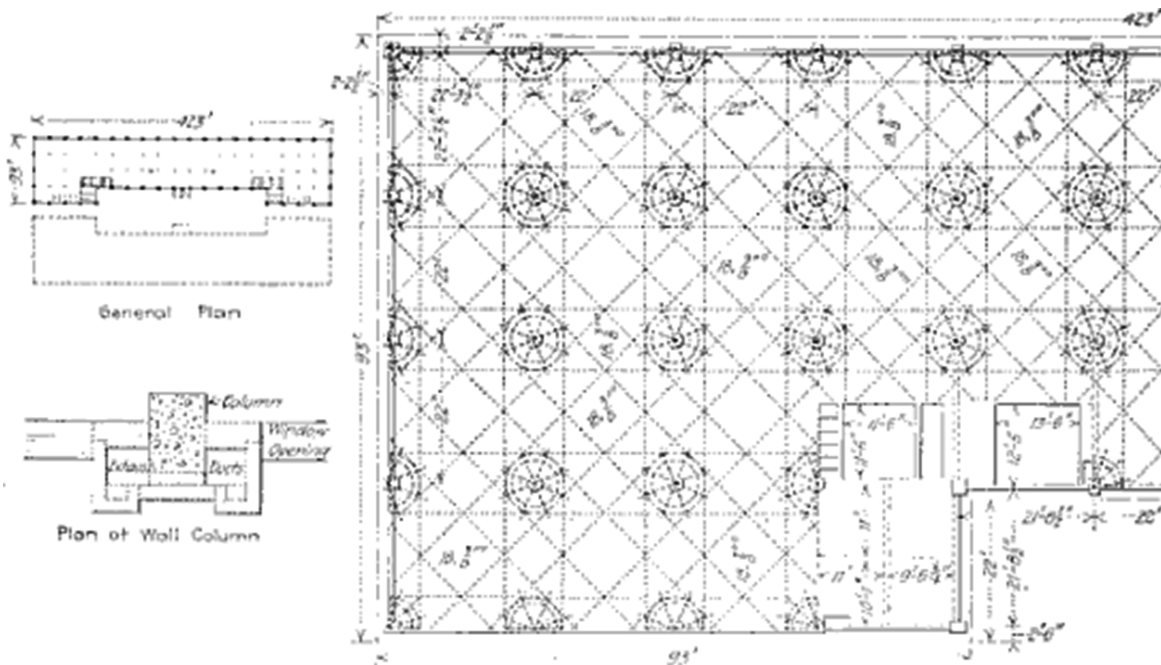


FIG. 1. FLOOR ARRANGEMENT AND FLAT-SLAB REINFORCEMENT OF NEW DELCO FACTORY BUILDING, DAYTON

Fig. 3.55 Drawing from “Reinforcing Details of Delco Building, Dayton, Ohio” in *Engineering News* that shows the intended future expansion of the building at top left and a section of the exterior piers to the bottom left.

51 The historic building report for this structure lists the dates of construction as “1915, 1929, 1938” and describes the concrete frame structure along Madison and the steel frame corner structure at Madison and First as both having been built in 1938 (no reference is given on the document). Neither of the official Delco-written company histories go into detail about the dates of the additions.



Fig. 3.56 Northwest corner of Delco Plant 2, built 1915. Taken from the roof of Delco Plant 1, April 2015. The one story portion to the left was part of a later addition, probably added in 1941. Photo by author.

well as its detailing (Fig. 3.56). All the concrete frame portions of the building are seven stories tall whereas the steel frame section at the corner of Madison and First is a single story. The center of the building contains a lightwell in which is a three-story steel frame structure with concrete floors. It is unclear which year this structure was built or if all three floors were built at the same time. The Sanborn map indicates that it existed in 1950, but does not give details of its building date or height. Structures were also built on the roof of the building, but no drawings indicate any dates for those buildings either. They can be seen in Fig. 3.37, the aerial photo of the downtown Delco complex, and are also indicated on the Sanborn map. Today they survive in part with alterations.

Although the structure of the building is concrete, each vertical concrete pier is encased in red brick, making the piers appear nearly three times as wide and thick as the actual structural element (Fig. 3.55 and Fig. 3.57). When viewing the piers from the interior, the embedded concrete frame is visible (Fig. 3.58). Because the concrete frame is a defining physical feature of the daylight

factory, this treatment of the frame is uncharacteristic. The typology of the daylight factory derived explicitly from the development and exploitation of concrete frame technology. The foundational examples of the type do not employ ornamentation; instead they allow the concrete frame to define the visual character of the building. In this particular case, however, architects Schenck & Williams no doubt were tasked with designing a building that embodied both industry and commerce. The success of Delco propelled the company into a dual role within the community as a leading manufacturer of practical goods and as a representative of a thriving city. The design of Delco Plant 2 reflected the company's complex situation by blending modern and traditional design ideas of the time. The use of brick in and thickness of the piers hearkens to traditional notions of stability,



Fig. 3.57 The thickness of the masonry piers of Plant 2 can be seen through the windows of the Delco Electrical Development department. Photo from the collections of Dayton History, date unknown.



Fig. 3.58 The Delco drafting department, housed in Plant 2. Concrete columns can be seen embedded in the masonry piers on the exterior of the building. Photo from the collections of Dayton History, date unknown.

while still achieving a sense of modernity with clean, strong, vertical lines. The contrast of the dark brick with the other building elements, particularly the visible concrete floors on the exterior of the building, achieves an impressive sense of verticality, despite the building being very long. The design of Delco Plant 2 displays a large sense of mass while still maintaining a sense of upward motion.

Distinct from the exterior, the interior of Delco Plant 2 is completely unadorned and displays the qualities of a typical daylight factory with a flat-slab structural system. Interior columns are round, utilizing the same two-way structural technology seen in Delco Plant 1 (Fig. 3.59). As indicated by plans shown in Fig. 3.60, there are some irregularities in column shapes throughout the building. These irregularities in column patterns occur mainly at intersections between additions.



Fig. 3.59 Typical interior column on third floor. Photo: April 2015, by author.

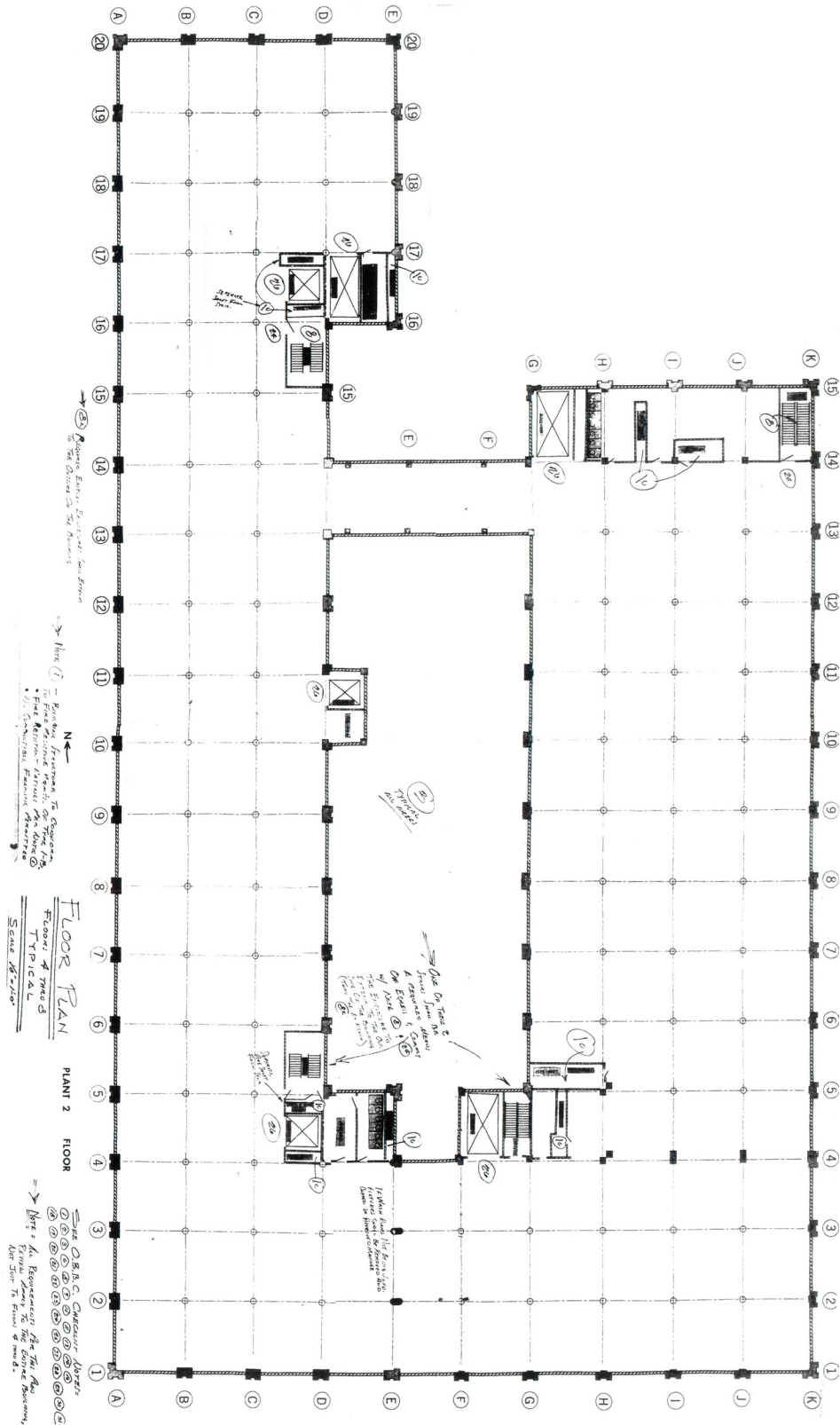


Fig. 3.60 Plans drafted in 1982 and submitted to the City of Dayton for approval of the change of use to storage. Irregularities in column patterns occur mainly at intersections between additions and the round exterior columns on the easternmost side of the 1915 portion of the building indicate that expansion was planned from the conception of the building. Plan from the City of Dayton's Division of Building Inspection.

For instance, round exterior columns used for the easternmost columns of the 1915 building indicate that expansion was planned from the conception of the building.

The design of Delco Plant 2 is a departure from its predecessor, Delco Plant 1, with its enormous scale and strongly articulated brick-clad concrete frame. Delco Plant 2 is mammoth in scale by comparison, over twice the size at just over 500,000 square feet in area and stretching the entire length of one city block and about half the width.⁵² Instead of heavy piers at the corners like Plant 1, the piers of Plant 2 are uniform throughout the entire perimeter of the structure. The piers of Delco Plant 2 give the structure a much stronger sense of verticality than the other two case studies. Unlike the Dayton Motor Car Company building that has a horizontal emphasis and Delco Plant 1 that has two sets of horizontal courses on its upper floors, the vertical piers of Delco Plant 2 are uninterrupted. While the building and its oversized elements do have considerable presence, it can



Fig. 3.61 Window detail of the third and fourth floors on the south side of the southwest corner of the 1915 portion of Delco Plant 2. Photo: April 2015. by author

52 The area was roughly calculated by the author based on a 22 foot column distance. The estimate was 502,392 square feet which includes the three-story lightwell infill structure, but not the structures on the roof. Areas calculated per floor were 91,960 square feet on the ground level, 78,408 square feet on the second and third levels, and 63,404 square feet on floors four through seven.

be argued that the visual effect is not inappropriately sized for the surrounding urban context.

With column centers twenty-two feet apart, the six-foot wide piers of Plant 2 leave sixteen feet of window space. The windows are divided into three sections with three panes each, resulting in a pane width of approximately twenty inches. The twelve foot height of the floors is comparable with Delco Plant 1, but with only three vertical divisions the typical window pane height for Delco Plant 2 is about 36 inches. By comparison, a typical pane in Plant 1 is ten inches by sixteen inches for a total of 160 square inches, but the Plant 2 typical panes are over 700 square inches each (Fig. 3.61). The two, three-pane sashes in each bay are double-hung.

Today, the building serves as retail and storage for Mendelson's Liquidation Outlet. With over one million feet of warehouse and storage space in Dayton, the company is able to handle the purchase and retail resale of assets from large-scale liquidations. Floors one and three are open for browsing (Fig. 3.62), but floors two, and four through seven are used only for storage. In its current state, some window bays on the east facade have been completely covered, likely to protect the



Fig. 3.62 The extensive amount Mendelson retail items span the entire first and third floors. Photo: April 2015, by author.



Fig. 3.63 Spray insulation can be seen covering windows on the second and third floors from the exterior. Photo: April 2015, by author.



Fig. 3.64 Detail of spray insulation on a third floor window in the northeast part of the 1915 building, April 2015. Original window elements appear to be in good condition. Photo by author.

building from water damage caused by broken windows. But overall, the building and its elements appear in good condition. The interior walls on the second and third floors have been covered with spray insulation, obscuring the view all structural elements on the external walls as well as a good portion of the window area (Fig. 3.63 and Fig. 3.64).⁵³ From what little of the window hardware and frames are visible through the insulation, these window elements look to be in reasonable condition, but in need of restoration.

As of June 2015, there are no apparent plans for any other form of adaptive use for the building. The owner of Delco Plant 2, Sanford Mendelson, has recently sold other downtown properties for redevelopment, such as the former Delco Plant 1 to Crawford Hoying. It is likely that Delco Plant 2 will be assessed for other potential reuse schemes some time in the future. Critical evaluation of the building before potential schemes are considered are especially necessary for Delco Plant 2 as its size makes it a particularly difficult case for reuse. Proper evaluation of the building before any potential new development plans begin is essential to accurately assess its historic and architectural value.

⁵³ Spray insulation on the second floor was visible from the exterior only. Exterior observation indicates that the upper four floors do not have spray insulation covering the windows.

4. Preservation of Versatility in the Adaptive Use of the Daylight Factory

Historic preservation practice in America is based largely on criteria put forth by the National Park Service for the National Register of Historic Places and the Secretary of the Interior's Standards for the Treatment of Historic Properties. Historic sites are judged based on their significance in connection with historic events and persons, the distinctive characteristics of a type, or more broadly, their potential to yield important information about prehistory or history.¹ The spread of the preservation movement nationally has prompted states and localities to adopt their own preservation laws. But, as de Teel Patterson Tiller noted in a 2007 article in *Forum Journal*, local methodologies are widely based upon national standards:

The popular power of the Secretary's Rehabilitation Standards cannot be overestimated. They have become nothing short of ubiquitous in the United States . . . in literally thousands of cities, towns, counties, and parishes nationwide. Often quoted directly or cited, referenced, or interpolated for local needs, the standards serve as the legal judgment basis for local architectural review boards, planning commissions, historic district commissions, and zoning boards.²

When determining priorities for preservation of any given site, it is imperative to examine and understand the local history and events that shaped the current situation of that place. In both local and national historic designation, local significance is paramount. Most properties protected by local ordinances are protected for their local significance. Because listing on the National Register of Historic Places does not require national significance, most properties in the National Register are also recognized on the basis of their local significance.³ A built work is the product of a distinctive historical narrative; these diversity of available historical narratives reflects the complexity of the social experience. Architectural historian Daniel Bluestone argues for the need for a

1 "Secretary of the Interior's Standards." *National Park Service*. Web. 10 Jun. 2015. <nps.gov/tps/standards.htm>

2 de Teel Patterson Tiller, "Obey the Imperatives of Our Own Moment: A Call for Quality Contemporary Design in Historic Districts," *Forum Journal* 21.4 (2007): 10.

3 Protection under local preservation laws and listing on the National Register are two means by which to recognize significance that merits preservation, but they are not equivalent recognitions. Local entities have the power to enforce local preservation practices, but the National Register is an honorary status only for any properties not owned by the federal government.

broader range of narratives and multiple voices. He cautioned the preservation community writing: “In valuing certain buildings, preservationists devalue others. Carried to its extreme, this process of devaluation leads to destruction and fosters a historic landscape that increasingly conforms to and confirms the privileged narrative.”⁴

The story of industrial Dayton provides a particular example of a city facing preservation issues relating to architectural resources from a less-privileged narrative. The situation of the industrial narrative in Dayton is somewhat paradoxical in that the narrative is known and valued, but the built environment that reflects it is not. Industrial buildings, especially daylight factories, are difficult historic resources to preserve because of their unique disadvantages which will be presented in this chapter. Preserving the built works that reflect Dayton’s industrial heritage will require creative preservation and reuse strategies that allow the buildings to reflect their industrial past while continuing to be relevant to the changing identity of the city.

Industrial Open Space as a Character-Defining Trait

The daylight factory was fundamentally a utilitarian structure, built for the optimization of manufacturing. However, the design of the daylight factory was intended to reach beyond simple utility. Industry in the early twentieth century saw enormous change, including the rapid evolution of production technologies, the improvement of machinery, and the growth and expansion of manufacturing firms into national corporations. All of these changes were sustained by the daylight factory. Just as mechanical and technological innovation was essential for manufacturing firms to compete, corresponding architectural innovation resulted in a building type that could accommodate these advancements.

From its very conception, the daylight factory was designed to accommodate industrial advancement. Save for the enclosing windows, the only substance of the daylight factory is the

4 Daniel Bluestone, “Preservation and Renewal in Post-World War II Chicago,” *Journal of Architectural Education* 47.4 (1994): 210.

structure of the building itself. It was conceived in simplicity because simplicity generates efficiency. The concrete frames of daylight factories were regular and repetitive, creating an open space that was ideal for the planning and arranging mechanical processes. Further, the concrete frame made the space robust, and ideal for replanning and rearranging when technology or industrial processes changed. In addition to providing a robust space, concrete also possessed both flexibility and structural strength. The unique material properties of concrete made it completely customizable for construction while still accommodating the specifications of constructing a precise structural frame. Concrete, with its reinforcement technology, was also incredibly strong. A building with immense strength was versatile, allowing for changes and a wide range of potential uses. This potential not only immediately benefited the owner of the daylight factory, but also proved advantageous for building reuse and resale.

As an architectural type, the daylight factory was conceived and designed to keep pace with industrial advancement by accommodating unforeseen change. In the field of historic preservation, this trait obviously gives the daylight factory an advantage. A structure specifically designed to be both robust and accommodate a variety of uses is ideal for adaptive use. The strength of the concrete frame that once accommodated heavy industry has the potential to support virtually any contemporary use today. The regular frame and open space also positively contribute to high potential for adaptive use.

Based on current preservation practice in the United States, the daylight factory has the potential to be evaluated on a wide range of National Register criteria, depending on its level of historic significance based on the local history. As presented in earlier chapters, the daylight factory possesses elements of both national and local significance. The recognition of the daylight factory as historically significant architecture worth preserving, however, relies upon the recognition that the American industrial historical narrative is one of significance that merits preservation. As the preservation movement continues to develop in America, less-privileged or less-known historical

narratives are being brought into the collective American consciousness. In order for this trend to continue, is important to continually be questioning, as Bluestone phrased it, which histories are being devalued for the sake of valuing the privileged narratives.⁵

If a daylight factory is deemed historically significant for preservation, there is still the question of which elements of the building should receive protection. As addressed in the previous chapter, preservation is an artifact-dominant field, and the material elements of the daylight factory present a rather unusual set of circumstances for a preservation discussion. Due to its simplicity, the daylight factory can be reduced to two main material components: the concrete frame and the glazing. These elements are identifiable as historic in relation to the development of the daylight factory as described in Chapter 1, but are slightly more difficult to categorize as historic based on the National Register criteria and the Secretary of Interior's Standards. Because the daylight factory is a utilitarian building, it was generally designed to be devoid of style. But even when daylight factories were designed with a small amount of ornamentation or cladding, such is the case with Delco Plant 2, they were not designed toward any particular identifiable style or type of craftsmanship.

This thesis proposes that successful preservation of the daylight factory requires an approach that goes beyond the material elements of the building. As described earlier, the daylight factory type was conceived and designed to accommodate industrial advancement. Both of the two main material elements, the concrete frame and the windows, were designed for and evolved expressly to enhance the interior space. The concrete frame and its reinforcement were developed to allow for larger floor areas with fewer column obstructions to maximize the potential of the space and its versatility. The frame was also designed to be robust enough to withstand years of heavy industrial machinery operation. This gives the spaces in daylight factory remarkable longevity, especially if adapted for a less rigorous contemporary use. A building designed expressly to last is a building with inherent versatility: the use of the space can change repeatedly over many years,

5 Bluestone, "Preservation and Renewal in Post-World War II Chicago," 210.

and the frame will support it. The frame also contributed to the quality of the interior space by eliminating the need for windows to bear any building weight. This allowed for considerably larger window spans which contributed to the attractiveness but especially the utility of the interior space.

It was this open space that made the daylight factory valuable and useful to the industries that occupied them. In particular, its versatility accommodated change and industrial advancement. In addition to having practical significance for both the historic user and the potential contemporary user, the openness of the space also has historical value. The open floor plans are the physical manifestation of the process of mass production, intruded upon only minimally by the fewest and smallest size columns that technology would allow. The expansive floor plans are a significant factor of the daylight factory's historicity in terms of representation of the development of industry in the early twentieth century. The scale and sparseness of the space evoke an immediate understanding of the manufacturing purpose for which the buildings were built. More than any other feature, the expansive, versatile floor plans represent what is most significant about the daylight factory.

The task of attempting to preserve the significance of a space is more challenging than traditional approaches to material preservation. The Dayton case studies present three daylight factories in various states of reuse. Analyzing the relative successes or failures of each situation will broaden the understanding about effective reuse of the daylight factory. The case studies also demonstrate that there are other challenges particular to the daylight factory type such as location or sheer size, that further complicate the preservation of the type. The present uses of the case studies in Dayton may be organized in three categories: formal, as in the case with the future use of Delco Plant 1; informal, as in the case of Delco Plant 2; or none, in the case of the Dayton Motor Car Company building. Each use, or impending use, embodies a different treatment for the interior industrial space. The impending formal use of Delco Plant 1 will remove the open industrial space, replacing it with residential units. The informal use of Delco Plant 2 has preserved the industrial space through the lack of permanent intervention, but the openness is somewhat obstructed by the layout

of retail product. The lack of use at the Dayton Motor Car Company building has inadvertently preserved the open industrial space, but the building and its space are not contributing in a meaningful way to the community.

Case Study 1: Dayton Motor Car Company

The Dayton Motor Car Company building is currently vacant with no immediate plans for adaptive use. It is the smallest and oldest of the three case studies, and located farthest from the center of downtown Dayton. Less than a mile from the core of the city in the East Dayton industrial area, it is separated from downtown by train tracks. Fortunately, many of the surrounding structures are still occupied with industrial uses, but the area still suffers from vacancies. As previously described in Chapter 3, the City of Dayton, City Properties Group, and Gosiger Inc. are in conversation to find a suitable reuse for the site. It will be a long-term project, but the City of Dayton is very interested in seeing the building preserved.⁶

The building is in remarkably good condition overall with essential historic elements still intact. A few interior walls have been added on some floors, but could be easily removed. The roof was replaced in the 2000s and continues to protect the structure. Restoring the approximately 440 existing



Fig. 4.1 View of windows on the west wall of the southwest corner of the Dayton Motor Car Company building showing window conditions, mullion thickness, and frame thickness. Photo: April 2015, by author.

6 Kevin Klein interview, 2015.

wood windows would require a significant investment, but they appear to be in good enough condition that original materials could be retained. The windows are inefficient as they all have single-pane glass. Some sort of interior window panel system might be a possibility for decreasing heat loss in winter months.⁷ Unlike the thin mullions of steel windows in later daylight factories, the thickness of the wood frames and mullions may allow for a wider variety of retrofitting options while preserving original materials (Fig. 4.1).

Sheer size is often a barrier to the reuse of industrial buildings, both because of higher project costs and more complex reuse strategies. The building's relatively small floors are more manageable in scope than the other two larger case studies, which may eventually lend to a simpler, more feasible reuse plan. Despite the small size, the beam and girder system, the relatively shorter windows, and lack of lightwell, light permeates the entire space the significance of its openness is not diminished (Fig. 4.2). Periods of vacancy and underuse have so far preserved its open floor plan, accentuated by the absence of the machinery and product from its manufacturing days.

Dayton Motor Car Company building will likely remain vacant for the immediate future, aside from Gosiger's minimal use of the first floor. Although conversations were taking place in 2014 and 2015 between the City of Dayton and the two interested parties regarding its potential for reuse, there was no specific plan and ideas were not more than speculative. The options that seemed to be preferred by the interested parties were either industrial reuse as an addition to Gosiger's corporate campus, an adaptive use with commercial or retail use on the ground floor and rentable space above, or some combination of the two. An industrial reuse would seem to be ideal for the daylight factory, allowing it to maintain open interiors and a stronger connection to industrial history, but this building is not well-suited for Gosiger's specific industrial needs. As a distribution entity that handles the selling and maintenance of large tooling machines, Gosiger can more easily

⁷ An example of this technique can be seen in a prominent Seattle building, the Pioneer Building in Pioneer Square. Its owners were awarded Historic Seattle's Exemplary Stewardship Award in 2013 for the installation of interior window panels, also sometimes referred to as interior storm windows. <historicseattle.org/events/2013-awards>



Fig. 4.2 Third floor of the Dayton Motor Car Company building showing its open floor plan. Photo: April 2015, by author.

reuse large, single-story spaces, which allow for easier movement of their machines.⁸ Nearly a century after the multistory industrial building first lost its advantage, manufacturing processes have changed little enough that the multistory daylight factories continue to present severe disadvantages for industrial reuse. Efficiency will always be a prime concern for business and industry, and multiple stories are no longer advantageous for many heavy industrial use. An industrial option for this building would likely only viable for much smaller-scale industries such as Module 21, a furniture maker who occupied the space in the 2000s.

The development groups interested in the Dayton Motor Car Company are also considering plans involving commercial and residential options. Because the building is part of the Dayton

8 Dayton Bag & Burlap Company, the current tenant of the former Dayton Scale Company building at 448 Huffman Avenue, also encounters this problem. Although their products are much smaller than the machines Gosiger uses, they also prefer the efficiency and mobility provided by the single-story spaces they occupy. Their product can be quickly moved via forklift and truck on a daily basis. The building is underutilized and is mainly storage.

Motor Car Historic District and not far from the neighboring Oregon Historic District, the City of Dayton and City Properties Group are interested in the possibility of informally connecting these two districts. By encouraging similar types of businesses between the two districts, the idea is to create a “cultural corridor” that would draw more consumers and visitors.⁹ The combination has the potential not only to convey a more holistic picture of Dayton’s history, but also offer a wider variety of business and retail options to occupants and visitors. The most logical use for the Dayton Motor Car Company building in this kind of reuse strategy would be something similar to what has proven successful in the commercial area of the Oregon District: locally-owned shops and restaurants on the ground floor with office or residential space on the upper floors. Residential use may prove particularly economically advantageous for developers, but it is perhaps the most detrimental to the preservation of industrial open space. Residential plans require the subdivision of interior space, which results in a lack of preservation of the versatility of the open space. In contrast, a use that kept the interior space open would allow the building to continue to manifest its industrial roots.

Case Study 2: Delco Plant 1

Dayton has seen several conversions of industrial buildings to residential in the last twenty years, as mentioned in Chapter 2. The St. Clair Lofts, originally built as the first Beaver Power Building, was converted to apartments in 2001. The Cannery Lofts, a large-scale project encompassing several commercial and industrial masonry structures along East Third Street opened in 2002. Another factory-to-residential conversion is underway for Delco Plant 1, the second case study in this thesis. Delco Plant 1 is currently vacant, but will be renovated as apartments over the next two years by the Columbus-based development company, Crawford Hoying. The firm is rehabilitating the building in tandem with a new construction project along the waterfront called the Water Street

9 Frolik, 2015.

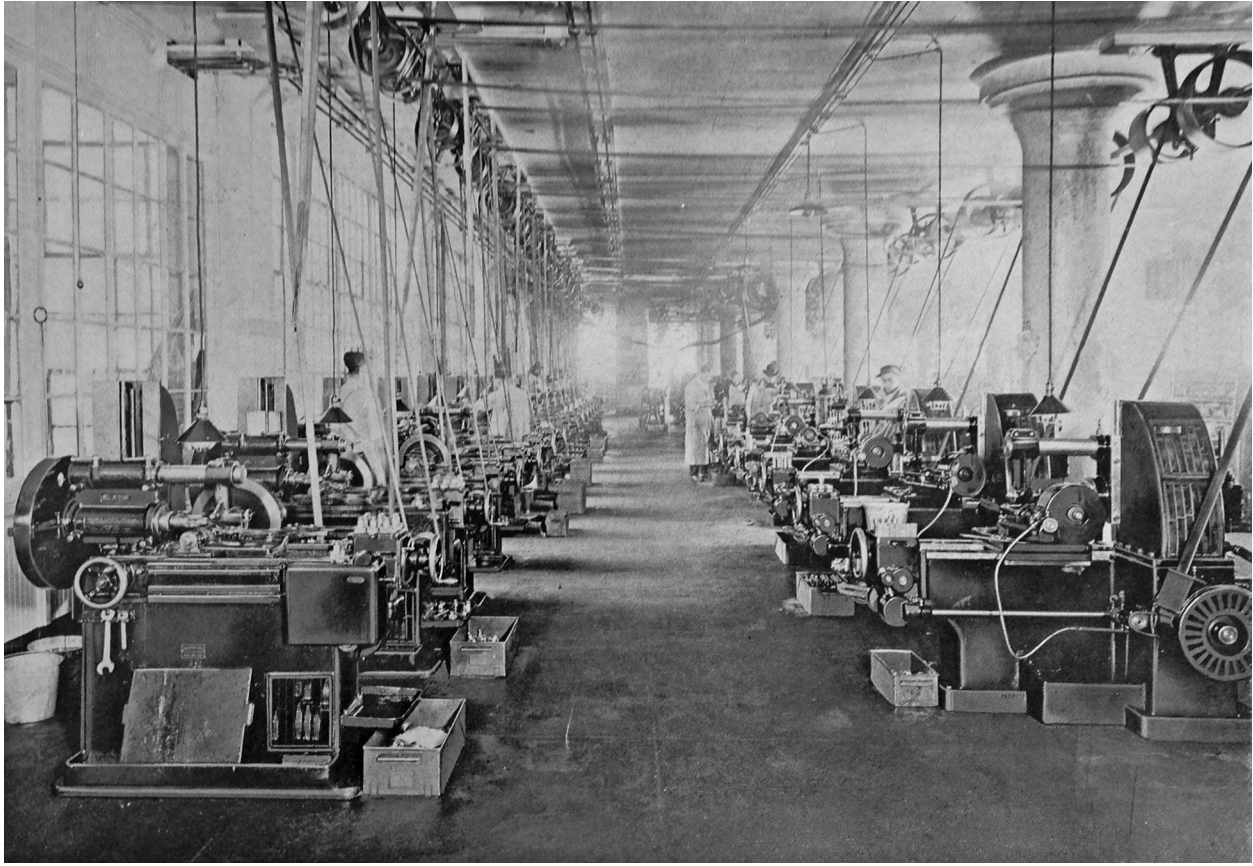


Fig. 4.3 Historic open industrial space and its impressive daylighting in Delco Plant 1, c. 1915, filled with rows of automatic gear cutters. Photo from *The Book of the Delco*.

District. According to preliminary plans the building will have 134 units.¹⁰

Crawford Hoying has stated that they would not be able to complete the project without financial support from the Ohio State Historic Tax Credit program, which was established in 2008. To qualify for tax credit eligibility and receive a high score in the competitive ranking system, the firm is basing their design decisions for the project around the historic character of the building. As described in Chapter 4, all new wall partitions will meet the exterior walls at columns to preserve the continuity of the window expanses from the street; elements of the concrete frame, particularly columns and ceilings, will be left exposed wherever possible; windows will be replaced with new, more efficient windows as identical as possible in appearance to the originals; and the sixth floor Kettering office will be preserved in its current state as a community space. The unit layout is

¹⁰ Crawford Hoying, *Tax Credit Application*, 2015.

well-designed with each unit bordering either on a perimeter wall or a lightwell wall for access to natural lighting and ventilation. Each unit will include some exposed historical structural elements.

From a practical and economic standpoint, conversion to residential units makes sense in that they generally allow developers to recover investments in a relatively reasonable amount of time and ensure the building will be well maintained (Fig. 4.4). Crawford Hoying's design for Delco Plant 1 is respectful of the historic materials and exemplary for a rehabilitation of this type, but it will eliminate the historic character of the open industrial space and its versatility (Fig. 4.3). The renovation of the building is essentially designed to be permanent, so returning the interiors of the building back to open space at a later time would be costly and difficult. Permanence of a reuse plan is perhaps the most detrimental quality relative to the preservation of the versatility of daylight



Fig. 4.4 An interior at the St. Clair Lofts, housed in the former Beaver Power Building #1. The building has similar fenestration to Delco Plant 1. Photo: April 2015, by author.



Fig. 4.5 Third floor of Delco Plant 1 showing concrete frame and expansive space. Photo: April 2015, by author.

factories. The amount of permanence is affected both by the amount of materials added to a space and the difficulty of removing added material. Residential conversion requires both: a large amount of permanently built partitions.

Although the planned reuse of Delco Plant 1 into apartments will disrupt the open interior space and prevent it from being experienced by its occupants, the concrete frame will remain intact. The preservation of the material building elements inadvertently preserves the potential restoration of the historic open space and its potential versatility (Fig. 4.5). Because the interior space of the daylight factory is not a material element, it will only be destroyed when the concrete frame is gone. Regardless of the building's impending division into smaller spaces, the concrete frame will remain intact, thus allowing for the possibility of the restoration of the open space at some time in the future.

Case Study 3: Delco Plant 2

The third case study, Delco Plant 2 is currently being reused as Mendelson's Liquidation Outlet, with no immediate plans for future development. With over 500,000 square feet of space, the building is the largest of the three case studies and a mammoth structure in downtown Dayton. Daylight factories in city centers possess valuable proximity to downtown resources, but they are often located on valuable sites with high redevelopment potential for new construction. Although all three case studies are located in or near Dayton's downtown, this issue is the most acute for Delco Plant 2 because of its enormous size. Despite the higher possibility of being considered expendable, downtown daylight factories have significant potential for preservation and active reuse. Their locations allow for a wider variety of potential reuses and higher probability of economic success than the factories located outside city centers. Daylight factories in downtown cores also often have the advantage of being related to major industries with significant ties to a city's history. With such a connection, for example to a company like Delco, the general public is more likely to agree with an argument for historic significance.

There has been very little permanent intervention in the building since Mendelson has owned it, with the only exception being some office spaces partitioned off on the ground floor. The bulk of the building has remained open and unaltered since General Motors sold it to Mendelson in 1981.¹¹ Two earlier interventions, however, have had a significant effect on the lower floors: the addition of a three-story steel-frame structure in the lightwell and the infill of the ground level windows. It is unclear when these interventions occurred, but the lightwell structure is listed on maps in the 1940s, so it is likely that it was added at the same time as the last building phase circa 1941. These two changes have resulted in complete reliance on artificial lighting on the first floor. The structure in the lightwell also blocks light on the third floor, the only other floor open to the public. The third floor does have some perimeter windows that let in daylight, but many of these

¹¹ John Gower interview, 2015.



Fig. 4.6 Windows on the third floor of Delco Plant 2 showing the effect of spray insulation. Photo: April 2015, by author.

are covered with spray-on insulation. (Fig. 4.6) With no daylighting from the lightwell on this floor either, the bulk of the interior light is also artificial. It is likely that artificial light is used much less on the upper floors of the building as from the exterior, they do not appear to have as much covering the windows and have access to light from the lightwell.

Restoring the function of the lightwell for the lower three floors and the bottom row of windows along the perimeter of the building would greatly enhance the experience of the space. While lessening the overall floor area of the building, the lightwell is necessary. Daylighting from the perimeter windows is not sufficient to illuminate the center of a building of such width. The lightwell also offers increased flexibility for potential adaptive use should the space need to be thoughtfully divided. In addition to the practical need for lighting, the expansive windows of daylight factories produce a particular spatial effect not even closely simulated with artificial lighting. Reinforcing this sense of space is the fact that daylight factory windows often stretch from floor to ceiling, creating

very strong directional lighting from the side for the entire height of the floor.

The historic open space of Delco Plant 2 is relatively well preserved through its current use as Mendelson's Liquidation Outlet. The use is well-suited for the space, if only because the large amount of product storage fits the enormous scale of the structure. Although the product storage in the building is not particularly well-arranged, the amount of product adds to a sense of the building's size. The building's adaptive use as a storage and retail facility achieves an unintentionally impressive preservation of the building's versatility. The extensive shelving units, for example, are completely impermanent and easily removed. In essence, this kind of informal activity preserves the building's versatility, even if the informal layout is somewhat detrimental to the space. Shelves block an observer's view of the expanse of the space from most vantage points, but there is some visibility of the length of the space along some aisles. (Fig. 4.7) Although the shelving does not extend to the ceilings, the shelf units are tall enough and solid enough that they block the view of the interior



Fig. 4.7 Current third floor conditions in Delco Plant 2, Mendelson's Liquidation Outlet. Photo: April 2015, by author.



Fig. 4.8 The experimental machine room of Delco Plant 2, showing the extensive length of the historic industrial space. Image from Dayton History, date unknown.

space more than at least one historic industrial use did as seen in Fig. 4.8. It is likely that the character of the interior space was not a priority when Delco Plant 2 was converted into retail and storage use, but behind the expanse of shelving and the spray insulation, the experience of the open industrial space can be uncovered.

Challenges for the Daylight Factory

Adding to the specific challenge of preserving the daylight factory are several other characteristics that make the reuse of this type particularly difficult. The most obviously difficult characteristic for a daylight factory is its sheer size. While daylight factories vary in size depending on their locations and industries, as a type they are often very large in total square footage, as demonstrated

by Delco Plant 1 and especially Plant 2. The sheer size often requires reuse strategies to be multi-use, which may require space division. The size of daylight factories also contributes to prohibitively high overall project costs as rehabilitation costs are often calculated on the scale of hundreds of thousands of square feet. The owners of Delco Plant 1, as an example, would not be able to complete the residential conversion project in the building without added financial support from the Ohio State Historic Tax Credit. Even with the credit, the project expenses are such that the budget is breaking about even.¹²

Another obstacle toward the reuse of daylight factories is that they were built to house manufacturing operations, not human habitation. With single-pane glass composing much of the uninsulated wall area, interior temperatures likely fluctuated drastically during the day. In part, the type developed from the effort to make industrial production more comfortable for workers with more lighting, air circulation, and space, but the conditions for workers were still subject to the shortcomings of the building technology of the time. All three Dayton examples have single-pane glass and no building insulation. The windows of Delco Plant 1 will be replaced because they are deteriorating, but also because the owners wish to install more energy efficient windows. With such a large amount of window space, the efficiency of the glass will greatly affect the future residents. The owner of Delco Plant 2 has also addressed heat loss problems in a less tactful way. The spray-on insulation that blocks so much of the light likely does regulate interior temperatures during extreme weather months.

Additionally, daylight factories have relatively few building systems. Daylight factories typically are found with minimal electrical systems for machinery and supplemental lighting, as well as minimal plumbing systems for bathrooms and fire protection. Almost universally, systems found in daylight factories today are outdated and in need of complete replacement. Whether or not the systems are original, replacement is often necessary for adaptive use projects to meet current

¹² Matt Starr interview, 2015.

building codes and the specific needs of new uses. The Dayton Motor Car Company building systems will need complete replacement if a building reuse is realized and all systems of Delco Plant 1 will be replaced for conversion to residential.¹³ The status of the building systems in Delco Plant 2 is unclear, but the first and third floors are completely illuminated with electric lighting. Not having undergone any major redevelopment since mid century, it is likely that the buildings systems, while functional, are outdated.

Hazardous material abatement is sometimes a serious barrier to the reuse of industrial buildings, and this is not an issue that has affected the three Dayton case studies in a serious way. None of the buildings produced significant environmental pollution when they were operational as factories. Lead paint is the most serious issue, particularly in the Dayton Motor Car Company building, but there are also some asbestos tiles that will need to be removed from Delco Plant 1.¹⁴

Observations on Versatility

The daylight factory's versatility allowed the type to accommodate local changes in manufacturing and broader industrial progress. The expansive, versatile floor plans represent what is most significant about the daylight factory, and they should be incorporated into contemporary reuse strategies to the extent feasible, to retain that character defining trait. Incorporating a large, open space or a flexible floor plan into modern preservation strategy, no matter the building type, can be a significant challenge. Creative reuse strategies, however, may have the potential to retain the industrial open space while accommodating for some division of space and a variety of contemporary uses. Incorporating versatility or flexibility into contemporary preservation strategies will allow the daylight factory to retain the versatility that it was designed to embody.

The most basic method of preserving the versatility and openness of the interior space

13 Starr and Klein interviews, 2015.

14 With no interview of the owner of Delco Plant 2, it proved impossible to assess the hazardous material situation for the building.

of the daylight factory would be to find a use would require the fewest partitions or walls to be constructed, or none at all. Avoiding partitions of any kind would allow the full effect of the open floor plan to be visible to its users evoking its manufacturing class. If partitions are unavoidable, designing interventions that are reversible is the simplest and best way to preserve versatility as a trait of the daylight factory while allowing for the immediate division of space. Interventions that are reversible might be built of lightweight materials, feature partitions that are not attached to the original structure, or consist of mobile units. In addition to reversibility, partitions or walls built with transparency would be preferred, whether they are completely made of glass or feature the use of relights. Transparent walls can effectively divide space while maintaining the visual expanse of the larger, open space.

The three case studies in Dayton achieve varying success in their incorporation of versatility as an active component of the building. The Dayton Motor Car Company building achieves versatility not through reuse, but lack of use. While it remains empty, it possesses a sort of theoretically infinite potential for reuse and versatility, but has no current practical utility. This author would argue that a historic building with only theoretical value is not an example of good preservation practice. In contrast, the impending reuse of Delco Plant 1 is a very practical and economical approach. The the historic exterior will be preserved with replacement windows that mimic the original as closely as possible, and the building will fulfill the need for more housing in the downtown area. However, this use does not take versatility into account, and is not related in any way to the building that houses it. Delco Plant 2 presents an interesting middle ground strategy between the other two situations. With no permanent interventions, the versatility of the industrial space essentially remains intact. The current use is not directly related to the building's historic use, but it is able to take advantage of the particular size of this daylight factory, which is unique. It also allows for some interaction with the public, although the quality of which is debatable. This use is not a practical solution to the preservation of daylight factories, however, as it would be very difficult to duplicate.

The versatility that was such a significant driver behind the development and popularity of the daylight factory in the past also makes this building type, well-suited to continue to possess versatility in the future. The preservation of versatility in the daylight factory does not favor any particular use over any other. Rather, versatility is a means by which the daylight factory can return to its most optimal state of utility and purpose. Allowing for the interior space potentially to return to the open and expansive character that reflects the daylight factory's historic significance gives precedence to the building itself, rather than the reuse.

5. Openness and Incompleteness

The process of historic preservation is by its nature reciprocal because it lends legitimacy to both the historic and contemporary lives of a built work: the historic through preservation of the past, and the contemporary through the act of recognizing that which is valuable and should be preserved. By placing the historic industrial space and the versatility of the daylight factory as the priority within a preservation strategy, the industrial buildings will be able to more actively contribute to the built environment in a way that better reflects their historic significance. Additionally, if the daylight factory is allowed to change and accommodate a variety of uses through time, the building will possess and produce a richer and more complex historic record.

In “The Contemporary Stamp of Incompleteness,” published in *Future Anterior* in 2004, preservationist and theorist Jorge Otero-Pailos describes what he calls a “contemporary” approach to preservation. He writes that preservationists have liberated themselves from the old notion that historiography is linear and “that ideas precede buildings and are inserted into them as ‘intentions,’ only to be later discovered by historians.”¹ He argues that buildings acquire new meaning through those who encounter them and that contemporary preservation recognizes preservation and interpretation as circular processes:

Contemporary historic preservation is based on feedback circular thinking (i.e. there is a building, therefore I deduce ideas about it so I can act upon it, and begin the process anew considering the changed building). In other words, critical historiography involves both doing while thinking, confronting and changing things while reflecting on the process, practicing while theorizing. . . . Methodologically this suggests that cutting edge historic preservation is the process of keeping the old “open” for interpretation, and of holding out the possibility that its work is never finished; indeed cannot finish.²

The concept that the meanings of buildings can change from what may have originally been intended by the designer and that new meanings also merit the attention and interpretation of

1 Otero-Pailos, Jorge. “The Contemporary Stamp of Incompleteness.” *Future Anterior*. 1.2 (2004), iii-vi.

2 Otero-Pailos, Jorge. “The Contemporary Stamp of Incompleteness.” *Future Anterior*. 1.2 (2004), iii-vi.

historic preservationists allows for a much more nuanced understanding of the built environment and its changes over time. To allow a historic building to be affected by and have new significance because of new meanings is a process through which all historic buildings can maintain relevance in a contemporary society. An approach that encourages open interpretation and allows for changes in meaning are much more achievable concepts for successful preservation of daylight factories.

As has been demonstrated in this thesis, the daylight factory has a specific and important historic context from which a more traditional value of significance may be derived. However, the type would benefit greatly from preservation attitudes that actively encourage interpretation and reinterpretation rather than a single, static narrative. Designed to accommodate a range of industrial processes, the flexibility inherent in the daylight factory can now accommodate a range of uses and ideas. As new uses continue to take advantage of the daylight factory's versatility, the historic context need not be forgotten, but can be recovered. As contemporary attitudes of preservation allow for openness and incompleteness that encourage continued reevaluation, the type can never be considered obsolete because its meaning will transform as the society around it also transforms. Versatility is not just an essential historic characteristic of the daylight factory, it is also essential for its future.

Dayton, along with many other cities in the Midwest, requires this kind of innovative preservation approach as the city works both to preserve its industrial past and to move toward a healthy economic future. Dayton's daylight factories accommodated change during the early twentieth century, and with thoughtful designs and new interpretations that incorporate less permanent intervention and creative uses, these buildings can serve the needs of present-day Dayton as well. Through their versatility, Dayton's daylight factories can continue to reflect the significant elements of their historic industrial character as key parts of the city's urban fabric. Innovative and open ideas of preservation that include continuing reinterpretation will encourage the daylight factory's continuing utility, what the daylight factory was originally designed and built to embody.

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Appendix A: City Directory Information for Case Study Properties in Dayton

Prior to 1915, the Williams City Directories for Dayton only contained listings by individual or company names. After 1915, the directories included a second section organized by address. The following data is primarily taken from the second portion of the directory. Some pre-1915 occupancy information was available by looking up the companies known to have been associated with the case study building addresses in the name-based directory. Detailed information about the businesses occupying Beaver Power Building #1 was not readily available until after 1915, other than Delco's occupancy, which was information gathered in the course of research for this thesis.

The Dayton Motor Car Company building, Delco Plant 2, and the Dayton Scale Company building were all at one point not the main addresses for the company that housed them. In those cases, the data listed is a combination of information from the name-based directory from companies known to have owned the buildings and information from alternate but related addresses near the primary address. Alternate addresses referenced include other buildings near the case study buildings owned by the same company and presumed former/alternate addresses of the buildings themselves based on available directory information. Various changes in building addresses and street numbering occurred in Dayton during the twentieth century; this data attempts to reflect the information listed for the built structures as accurately as possible given those changes and inconsistencies.

This appendix lists information for each case study address every year from the date of the construction until 1935, every fifth year from 1935 to 1960, and every tenth year from 1960 to 2010. From [1900]-1919 the directories were published as representing two years in each volume with the years overlapping from volume to volume (i.e. 1098-1909, 1909-1910, 1910-1911, etc.). After 1921, each directory volume was published representing a single year, with the exception of 1934-1935 and 1955-1956 which were only combined years, not overlapping years. Directory information was not available (and presumably directories were not published) for the years 1920, 1933, and 1945.

Dayton Motor Car Company

15 McDonough St

<i>Year</i>	<i>Company</i>	<i>Notes</i>
1908-1913	Dayton Motor Car Co. (The)	Company address listed as: "northeast corner of Bacon and Bainbridge"
1913-1924	Maxwell Motor Co (Inc) automobile mfrs	Company address listed as: "northeast corner of Bacon and Bainbridge"
1925-1927	(no listing)	
1928-1932	McLaren Consolodated Cone Corp ice cream cone mfrs	Company address listed as: "northwest corner of Bacon and Third"
1934-1935	National Biscuit Co (cone bakery)	Company address listed as: "northwest corner of Bacon and Third"
1940-1970	National Biscuit Co (cone div)	Address listed as "15 McDonough"
1980-1990	Consolidate Cone Corp	
2000	Module 21 Building Company fixtures store	
2010	(not listed)	

Beaver Power Building #1**35 S St Clair St**

<i>Year</i>	<i>Companies</i>	<i>Notes</i>
1911-1912	D E L CO. (The)	Address in name directory listed as "4th floor Beaver Power Block, northwest corner of 4th and St. Clair"
1912-1914	(no information available)	
1914-1916	Auto Repair Shop Brelsford Printing Co (The) City Engineering Co (The) Gross Harry A Michael H P Sales Co Vaile-Kimes Co (The) (2d floor) Dayton Fare Recorder Co (The) (2d floor) Dayton Sure Opener Co (The) (2d floor) Foote Mfg Co (The) hardware specialty mfrs (2d floor) Recording and Computing Machines Co (The) (4th floor) Ball Chas S candy mfr (4th floor) Thomson The S H Manufacturing Co ornamental iron (rear) Kuhs R W & Co parcel delivery	
1916-1917	City Engineering Co (The) Michael H P Sales Co Vaile-Kimes Co (The) (2d floor) Dayton Fare Recorder Co (The) (2d floor) Foote Mfg Co (The) hardware specialty mfrs (2d floor) Miami Mfg Co acetylene generators (4th floor) Ball Chas S candy mfr (4th floor) Thomson The S H Manufacturing Co ornamental iron (5th floor) Computing Appliances Co (The) lard dispensing machines (5th floor) International Engineering Co (The) hardware specialties (5th floor) Sheffield Machine & Tool Co (The)	
1917-1918	City Engineering Co (The) Michael H P Sales Co Vaile-Kimes Co (The) (2d floor) Dayton Fare Recorder Co (The) (4th floor) Thomson The S H Manufacturing Co ornamental iron (5th floor) Computing Appliances Co (The) lard dispensing machines (5th floor) Sheffield Machine & Tool Co (The)	

1918-1919	<p>City Engineering Co (The)</p> <p>Vaile-Kimes Co (The) water motor pumps</p> <p>(2d floor) Dayton Fare Recorder Co (The)</p> <p>(4th floor) Electrolitic Oxy-Hydrogen Laboratories</p> <p>(4th floor) Thomson The S H Manufacturing Co ornamental iron</p> <p>(5th floor) Computing Appliances Co (The) lard dispensing machines</p> <p>(5th floor) Sheffield Machine & Tool Co (The)</p>
<hr/>	
1921	<p>City Engineering Co (The)</p> <p>Vaile-Kimes Co (The) water motor pumps</p> <p>(2d floor) Dayton Fare Recorder Co (The)</p> <p>(4th floor) Eureka Tool & Die Co (The)</p> <p>(5th floor) Sheffield Machine & Tool Co (The)</p> <p>(5th floor) Dayton Machine Products Co (The)</p> <p>(5th floor) O'Brien Printing Ink Co (The)</p>
<hr/>	
1922	<p>City Engineering Co (The)</p> <p>Vaile-Kimes Co (The) water motor pumps</p> <p>(4th floor) Thomson The S H Manufacturing Co ornamental iron</p> <p>(4th floor) Eureka Tool & Die Co (The)</p> <p>(4th floor) Julien Pattern Mfg Co (The)</p> <p>(5th floor) Sheffield Machine & Tool Co (The)</p> <p>(5th floor) Dayton Machine Products Co (The)</p> <p>(5th floor) O'Brien Printing Ink Co (The)</p>
<hr/>	
1923	<p>City Engineering Co (The)</p> <p>Vaile-Kimes Co (The) water motor pumps</p> <p>(4th floor) Thomson The S H Manufacturing Co ornamental iron</p> <p>(4th floor) Eureka Tool & Die Co (The)</p> <p>(4th floor) Julien Pattern Mfg Co (The)</p> <p>(5th floor) Sheffield Machine & Tool Co (The)</p> <p>(5th floor) Dayton Appliances Co (The) screw machine products</p> <p>(5th floor) O'Brien Printing Ink Co (The)</p>
<hr/>	
1924	<p>City Engineering Co (The)</p> <p>Vaile-Kimes Co (The) water motor pumps</p> <p>(2d floor) Dayton Fare Recorder Co (The)</p> <p>(2nd floor) Recording & Computing Machines Co</p> <p>(2nd floor) Wiesman Mfg Co (The) safety devices</p> <p>214 Beringer Printing Co</p> <p>214 Daily Court Reporter</p> <p>(4th floor) Thomson The S H Manufacturing Co ornamental iron</p> <p>(4th floor) Eureka Tool & Die Co (The)</p> <p>(4th floor) Julien Pattern Mfg Co (The)</p> <p>(5th floor) Sheffield Machine & Tool Co (The)</p> <p>(5th floor) O'Brien Printing Ink Co (The)</p>

1925	(2nd floor) City Engineering Co (The) (2nd floor) Dayton Fare Recorder Co (The) (2nd floor) Recording & Computing Machines Co (2nd floor) Wiesman Mfg Co (The) safety devices 214 Beringer Printing Co 214 Daily Court Reporter 214 Rotograph Printing Co (4th floor) Vaile-Kimes Co (The) pumps (4th floor) Eureka Tool & Die Co (The) (4th floor) Julien Pattern Mfg Co (The) (5th floor) Sheffield Machine & Tool Co (The) (5th floor) O'Brien Printing Ink Co (The)
1926-1927	(2nd floor) City Engineering Co (The) (2nd floor) Wiesman Mfg Co (The) safety devices (3rd floor) Thomson The S H Mfg Co ornamental iron (4th floor) Vaile-Kimes Co (The) pumps (4th floor) Julien Pattern Mfg Co (The) (5th floor) Sheffield Machine & Tool Co (The) (5th floor) O'Brien Printing Ink Co (The)
1928-1929	(2nd floor) City Engineering Co (The) (2nd floor) Wiesman Mfg Co (The) safety devices (3rd floor) Thomson The S H Mfg Co ornamental iron (4th floor) Julien Pattern Mfg Co (The) (5th floor) Sheffield Machine & Tool Co (The) (5th floor) O'Brien Printing Ink Co (The)
1930	(2nd floor) City Engineering Co (The) (2nd floor) Wiesman Mfg Co (The) safety devices (3rd floor) Thomson The S H Mfg Co ornamental iron (3rd floor) Turnner The E T Co water softener mfrs (4th floor) Julien Pattern Mfg Co (The) (5th floor) Sheffield Machine & Tool Co (The) (5th floor) O'Brien Printing Ink Co (The)
1931-1932	(2nd floor) City Engineering Co (The) (2nd floor) Wiesman Mfg Co (The) safety devices (3rd floor) Turnner The E T Co water softener mfrs (4th floor) Julien Pattern Mfg Co (The) (5th floor) O'Brien Printing Ink Co (The) (5th floor) Sheffield Machine & Tool Co (The)
1934-1935	2nd fl City Engineering Co (The) 2nd fl Wiesman Mfg Co (The) safety devices 3d fl Nash J H Mfg Co water softeners 3d fl Thomson The S H Mfg Co ornamental iron 4th fl Julien Pattern Mfg Co (The) 5th fl O'Brien Printing Ink Co (The)

1940	<p>2d fl Baumbach E A Mfg Co dies mkrs equip Drake Chas F mfrs agt Weisman Mfg Co</p> <p>3d fl Nash J H Mfg Co water softeners Thomson S H Mfg Co</p> <p>4th fl Dayton Carbon & Ribbon Works Johnaon Richd M Co Julien Patter Mfg Co</p> <p>5th fl O'Brien Printing Ink Co (The)</p>
<hr/>	
1946	<p>2d fl Weisman Mfg Co safety devices</p> <p>3d fl Thompson S H Mfg Co founders Elder & Johnston Co (storage)</p> <p>4th fl Dayton Carbon & Ribbon Works Inc Dayton Chenille Co felt lettering Juliaen Pattern Mfg Co Garman Printing Co In Laughter Corp (drftg rm)</p> <p>5th fl Standard Thomson Corp (fndry)</p>
<hr/>	
1950	<p>2d fl Weisman Mfg Co Alan's Silk Screen Prntg Co Garman Printing Co In Dayton United Metal Spinners Inc Dayton Chenille Co felt lettering</p> <p>3d fl Standard Thomson Corp (Plant No 2) West Side Furn Co (stge)</p> <p>4th fl Dayton Carbon & Ribbon Works Inc Julien Pattern Mfg Co</p> <p>5th fl Standard Thomson Corp (plant No 2)</p>
<hr/>	
1955-1956	<p>2d fl Weisman Mfg Co safety devices Dayton United Metal Spinners Inc Trout Cabinet & Fixture Co</p> <p>3d fl Wac Engineering Co electronic equip</p> <p>4th fl Dayton Carbon & Ribbon Works Inc Julien Pattern Mfg Co Montgomery Tool Co</p> <p>4th fl Superior Designers Inc</p> <p>5th fl Dayton Poert Ligh Co (eng dept)</p>
<hr/>	
1960	<p>2d fl Weisman Mfg Co safety devices Dayton United Metal Spinners Inc</p> <p>3d fl Wac Engineering Co electronic equip</p> <p>4th fl Dayton Carbon & Ribbon Works Inc Montgomery Tool Co Columbia Carbon Co The</p> <p>5th fl Dayton Poert Ligh Co (eng dept)</p>

1970	2nd fl Central Statels Tooling Service Inc tool rental 2d Fl Dayton United Metal Spinners Inc 2d Fl Wiesman Manufacturing Co safety device 3d Fl Wac Line Inc (Plant) 4th Fl Dayton Carbon & Ribbon Works Inc mfrs 4th Fl Columbia Great Lakes Corp carbon paper-ribbon mfrs 5th Fl W A C Line (Addl space) 5th Fl Wacline Inc
1980	Detec Inc mach shop 2nd fl Central Statels Tooling Service Inc mfgs 3d Fl Vacant 4th Fl Dayton Carbon & Ribbon Works Inc mfrs 4th Fl Columbia Great Lakes Corp carbon paper-ribbon mfrs 5th Fl Vacant
1990	2dfl Salem Ink 2dfl Central Statels Tooling Service Inc mfgs 3d Fl Vacant 4th Fl Mid City Columbia 5th Fl Vacant
2000	D & G Pression Machine mach shop jobbing'repr
2010	St Clair Lofts

Delco Plant 1

329 E 1st St

<i>Year</i>	<i>Company</i>	<i>Notes</i>
1912-1914	D E L CO. (The)	
1914-1915	D E L CO. (The)	Address in name directory listed as: "329 E 1st, northwest corner Foundry"
1914-1918	Dayton Engineering Laboratories Company	Address listed as "northwest corner of First and Foundry"
1918-1919	Dayton Engineering Laboratories Company Hardman Fred J patent atty Hayward J B patent atty MacNab Forrest B patent atty	
1919-1921	Dayton Engineering Laboratories Company Hardman Fred J patent atty MacNab Forrest B patent atty	
1922	Dayton Engineering Laboratories Company Hardman Fred J patent atty	
1923	Dayton Engineering Laboratories Company Hardman Fred J patent atty Dayton Ignition Co (The) spark plugs	

1924-1925	Dayton Engineering Laboratories Company	
1926	Dayton Engineering Laboratories Company Moraine Products Co (The) bushing mfrs	
1927	Delco-Remy Corp ignition apparatus Moraine Products Co (The) bushing mfrs n e c Delco-Light Co Plant No 3	"Dayton Engineering Laboratories Company" no longer listed in name directory
1928	Delco-Remy Corp ignition apparatus Moraine Products Co (The) bushing mfrs	
1929-1930	Delco-Remy Corp ignition apparatus Moraine Products Co (The) bushing mfrs	
1931	Delco Aviation Corp aviation ignition Delco Products Corp auto parts mfrs Moraine Products Co (The) bushing mfrs	
1932	Delco Aviation Corp aviation ignition Delco Products Corp auto parts mfrs General Motors Corp Moraine Products Co (The) bushing mfrs	
1934-1935	Delco Products Corp auto parts mfrs General Motors Corp Moraine Products Co (The) bushing mfrs Spencer, Hardman & Fehr patent lawyers	
1940	Delco Products Div, General Motors Corp motors Spencer, Hardman & Fehr pat lawyers	
1946-1950	Delco Products Div GMC auto part mfrs Delco Doings publ n	
1955-1956	Delco Products Div GMC auto part mfrs Delco Doings publ n 393-99 Delco Products Div (plant)	
1960	Delco Products Div GMC auto part mfrs Delco Doings publ n 393-99 Delco Products Div (plant) 401-99 Delco Products Div Plant No 3	
1970	314 Delco Plant Division (Plant 2) 329 Delco Products (Plant 1) 401 Delco Plant Division (Plant 3)	
1980	314 Delco Plant Division (Plant No 2) 329 Delco Products (Plant No 1)	
1990	Mendelson Electronics (Whse)	
2000-2010	(not listed)	

Delco Plant 2**340 E 1st St**

<i>Year</i>	<i>Company</i>	<i>Notes</i>
1915-1955	(not listed)	
1955-1960	Delco Products Div (plant)	Address listed as "393-99 E 1st"
1970-1980	Delco Plant Division (Plant 2)	Address listed as "314 E 1st"
1990	Mendelson Electronics electronic equip	Address listed as "340 E 1st"
2000	Mendelson Reality Parts Express electronic parts'equip Parts Express International electronic parts	
2010	Mendelson Electronics Co wholrs Mendelsons Liquidation Outlet liquidators	

Monarch Marking Company**216 S Torrence St**

<i>Year</i>	<i>Companies</i>	<i>Notes</i>
1916-1920	Monarch Tag Co (The)	
1921-1940	Monarch Marking System Co. (The)	
1946	Monarch Marking System Co tag mfrs	
1950-1960	Monarch Marking System Co tag mfrs Mosysco Federal Credit Union	
1970	Hobart Manufacturing Co (Dayton Scale Div)	
1980	Hobart Corporation (Dayton Scale Div)	
1990	Roth Office Products Inf ofc machinery & supplies	
2000	Crowe Industries machine'other job shop King of the Road mtr veh sup=new parts	
2010	Crowe Industries Inc mach shop	

Dayton Scale Company**448 Huffman Ave**

<i>Year</i>	<i>Company</i>	<i>Notes</i>
1920	(not listed)	"Computing Scale Co. (The)" at 436, "Tabulating Maching Co. (The)" at 468
1921	(not listed)	"The Tabulating Machine Company" is listed at 468 Huffman
1922	Computing Scale Co (The) Dayton Automatic Scale Co Dayton Moneyweight Scale Co Dayton Scale Co International Scale Co	Listed as "436-468 E Huffman Ave" in name directory, but "448 E Huffman Ave" in address directory All names list "see Dayton Scale Company" in name directory
1923	Computing Scale Co (The) Dayton Automatic Scale Co Dayton Moneyweight Scale Co Dayton Scale Co International Scale Co	"Detroit Automatic Scale" listed at "436-468 Huffman Ave" in address directory, but not listed in name directory

1924	Computing Scale Co (The) Dayton Automatic Scale Co Dayton Moneyweight Scale Co Dayton Scale Co	"Detroit Automatic Scale" listed at 436-468 Huffman Ave in address directory, "Detroit Automatic Scale" listed at 448 Huffman Ave in name directory
1925	Computing Scale Co (The) Dayton Automatic Scale Co Dayton Moneyweight Scale Co Dayton Scale Co International Scale Co International Time Recording Co of NY	"Detroit Automatic Scale" listed at "436-468 Huffman Ave" in address directory, "Detroit Automatic Scale" listed at "468 Huffman Ave" in name directory
1926-1928	Dayton Scale Co	"Detroit Automatic Scale Co" still listed at "448 Huffman" in name directory
1929-1932	Dayton Scale Co International Business Machines Corp	"Detroit Automatic Scale Co" still listed at "448 Huffman" in name directory
1934-1935	Dayton Scale Division International Business Machines Corp Detroit Automatic Scale Co	
1940	Dayton Scale Division of the Hobart Mfg Co	
1946	Dayton Scale Division of the Hobart Mfg Co	Listed as "436-38 Huffman Ave," 448 not listed in address directory
1950	Hobart Mfg Co (whse)	Listed as "480 Huffman Ave"
1955-1960	Hobart Mfg Co Dayton Scale Div	Listed as "436-38 Huffman Ave"
1970-1980	Hobart Manufacturing Co (Dayton Scale Div) plant	Listed as "448 Huffman Ave"
1990	Hobart Corp (Dayton Scale Div) plant	
2000-2010	Dayton Bag & Burlap Company	

Appendix B: Summary of Fieldwork Locations and Personnel

Daylight Factories

Dayton Motor Car Company

15 McDonough Street

- Kevin Klein, City of Dayton, Office of Economic Development
- Jim Baker, Gosiger Inc.

Beaver Power Building #1

35 South St. Clair Street

- Tanya Sarris, Property Manager, St. Clair Lofts

Delco Plant 1

329 East First Street

- Matt Starr, Director of Development, Crawford Hoying
- Jason Woodard, Woodard Real Estate Resources
- Judy Williams, Historic Preservation Consultant

Delco Plant 2

340 East First Street

- John Gower, CityWide Development

Monarch Marking Company

216 South Torrence Avenue

- Jim Wellman

Dayton Scale Company

448 Huffman Avenue

- Sam Lumby, Dayton Bag & Burlap

Archives

City of Dayton Planning and Community Development Department

- Rachel Bankowitz, Historic Preservation Planner

City of Dayton Division of Building Inspection

- Andy Switzer, Residential Construction Specialist

Dayton History

- Curt Dalton, Visual Resources Manager
- Gwen Haney, Community Collections Manager
- Jeff Opt, NCR Archive

Dayton Metro Library Special Collections

- Jamie McQuinn, Manager

Wright State University Special Collections

- Gino Pasi, Archivist and Collections Manager

Carillon Historical Park and the Heritage Center of Dayton Manufacturing

& Entrepreneurship (history museums of Montgomery County)

Appendix C: Transcript of Thesis Presentation

Jeffrey Ochsner (JO): Our jury is four member, officially. First, Professor Emeritus Grant Hildebrand a long time faculty member here who is an expert in utilitarian architecture, founded the course in utilitarian architecture which Louisa Iarocci now teachers, published a book on the work of Albert Kahn, and a friend to the department and to many of us, and well-known for his many books as well . . .

Grant Hildebrand (GH): I think Guttenberg was the one who did the book on Albert Kahn. It was quite some time ago.

[laughter]

JO: Next is a Assistant Professor Tyler Sprague who is a structural engineer as well as a faculty member in the Department of Architecture who is pursuing research on, among other things, concrete in architecture in the twentieth century and the early history of concrete frame buildings. So, as you're going to be seeing concrete frame buildings, it seems appropriate. Michael Sullivan who comes to us from Tacoma heads the firm in Tacoma called Artifacts, which is a consulting firm in historic preservation, and he is also an affiliate faculty member at the University of Washington Tacoma. Although the firm is based in Tacoma he has done significant preservation work as well in the City of Seattle. Really has a statewide, at least, reputation in historic preservation and significant work in a variety of places. And, Jennifer Meisner who is our graduate from the Master of Architecture program and is currently the King County Historic Preservation Officer and a long-time career in historic preservation, worked at the city then was the executive director of the Washington Trust for Historic Preservation for many years, has been a consultant in private practice, and is now the King County Historic Preservation Officer. She is also a UW affiliate assistant professor in the Department of Urban Planning and Design. So very distinguished jury, and our presenter, Jennifer Mortensen, has been working on this topic, as you will see and has done significant field work, and I think I should let her tell her story rather than going on and on.

Jennifer Mortensen (JLM): Thank you, Jeffrey.

JO: We also, I should point out Alex Anderson, associate professor and associate chair of the department, and also the person who has coordinated all the thesis reviews which is a huge task, is here with us. Thanks for coming.

JLM: And a particular thanks to Jeffrey and Louisa who are my thesis committee. And of course a thank you to my friends and family, and especially to Chris for his support and patience, and to Brian McLaren, actually, who just walked in, who knew just what to say to get me back on track with my thesis. So, I'll just dig right in.

Industrial architecture is underrepresented in scholarly fields and not widely accepted as an essential piece of significant American architectural history; it is even less well represented in historic preservation discourse. As America becomes more distanced from its industrial past, however, these buildings have begun to take on new societal meanings.

The existing body of scholarly work and published books about American industrial architecture is limited, but already contains several excellent resources. The literature about the daylight factory specifically is even more limited, and is usually secondary or supportive material toward larger topics such as industrial architectural histories, social histories, biographies, or histories of concrete as a building material. The one major exception is Reyner Banham's *A Concrete Atlantis*, which was the primary inspiration for my thesis topic. Banham sought to lend scholarly legitimacy to these structures, a task inherently difficult due to their utilitarian type. Using this text as a starting point, I wanted to further explore the historic significance of the daylight factory on its own merit as an architectural type, and address the challenges of preservation and adaptive use they face.

A daylight factory is defined as a multi-story reinforced concrete frame industrial building with floor slabs extending to the exterior of the building that support large window spans, which results in a clearly articulated concrete frame on the exterior. The designs of these buildings were geared toward increasing the efficiency and utility of the factory by creating the maximum amount of open space and natural lighting that concrete frame technology could provide. The era of the daylight factory represents a relatively small period of time, from about 1900 to 1930, emerging from the mill buildings of the nineteenth century and replaced by the single-story production-shed style factories of the suburbs that dominated in the mid-twentieth century.

The architecture of the daylight factory represents a unique moment when American industry first achieved a type of reciprocal relationship with the scientific process. Early industrial buildings were designed more empirically rather than rationally, but the daylight factory emerged as efficiency became a dominating component of industrial building design and the roles of trained experts, architects and engineers, were beginning to be employed by industrial firms.

The "rediscovery" of concrete as a building material took place largely in Britain and France, but in the 1880s, Americans began to study the material, experiment with it, and better understand how to use it. Ernest Ransome is universally cited as the pivotal American figure in early concrete innovation not only for the buildings he designed, but his patented twisting treatment for reinforcement rods. When Ransome first began using concrete as a construction material, he utilized it the same way builders had been utilizing brick: a poured concrete outer wall with wooden floors, beams, and columns on the interior.

Ransome's first building for the Pacific Coast Borax Company in New Jersey was a transitional structure, which Ransome said marked "the closing of the old-time construction of reinforced concrete buildings, constructed more or less in imitation of brick or stone." The exterior walls, while made of concrete, were still "conceived as self-supporting masonry walls." The first phase of the Pacific Coast Borax Refinery became even more historically significant in 1902 when it suffered an "exceptionally hot fire." All interiors and machinery were destroyed, including items made of steel and iron; the concrete, however, was hardly damaged. Banham described the fire as the "triumph and vindication of Ransome's professional life" and went further to say that because of the fire, the building "may be the most important structure in reinforced concrete in North America."

In 1902 Ransome patented a building system where the floor slabs extended out beyond the thickness of the walls to support the wall panels and window spans, which produced a strong visual frame on the exterior of the building. This system had already been in use in Europe, but Ransome

secured the US patent and popularized the practice here. Several of his early buildings show the beginnings of this technique, but it is the United Shoe Machinery Company complex in Beverly, Massachusetts, that Ransome called “chief” among the examples of this technique. The complex was groundbreaking in its advancement and standardization of the daylight factory with an impressive glazing system that covered ninety percent of the wall area.

Other contemporary American engineers were innovating in concrete construction and technology at this time, including C. A. P. Turner who experimented with and proved the reliability of the flat slab floor system. This system included additional reinforcement in the floor slab and distributed weight from the floor directly to the columns through widened “mushroom” column capitals, as opposed to a beam and girder system. Albert and Julius Kahn were two other successful innovators at this time who developed and patented the Trussed Concrete reinforcement system.

It was the Packard Plant in Detroit through which Albert Kahn became a major figure of industrial architecture, and would secure his later commissions with the Ford Company. Building 10 was famously built with the “Kahn bar” and garnered Albert and Julius Kahn a significant amount of attention and praise, but it would ultimately be Ransome’s reinforcing techniques that would become the foundation of future concrete reinforcement design. Albert Kahn also innovated in the design of factory layout, as seen in the George N. Pearce Plant which was an early single-story design. It is Kahn’s Highland Park Plant for Ford that became arguably the most iconic daylight factory built.

The Highland Park Plant, where Ford expanded his mass production of the Model T, featured an advanced aesthetic with windows of maximum span not interrupted by smaller mullion subdivisions resulting in a remarkably continuous surface of windows. Highland Park influenced industrial architecture the world over, but only for a short time. While concrete met literally every major facility need manufacturers were facing during the early part of the century including strength, low cost, fire resistance, light and ventilation, absorption of machinery movement and vibration, large floor plans with minimal structural interruptions, and flexibility of space, it was steel that eventually became the material of choice for industrial structures. The particular benefits of concrete were only significantly advantageous for the multi-story form. As industrial architecture evolved toward the single-story, steel provided a much lighter option and the development of trussed roof systems even eliminated the need for mid-span supports.

At a time when the principles of scientific management were reshaping American industry, the daylight factory was a physical and visual response. The structure and spaces were designed to maximize efficiency and the exterior effect of the concrete frame and windows presented uniformity and visual organization. These buildings were consciously designed representations of a confident and competent public image for the industries that built them.

The daylight factory was ubiquitous in the midwest during the early part of the twentieth century, and in order to understand its particular influence, it is necessary to examine and understand the industrial history and development of a particular place. Dayton, Ohio is an ideal case study because its history embodies the innovation, change, and modernization that the daylight factory was built to accommodate.

Dayton was settled in 1796 and quickly developed industrial roots, building a canal for the exportation of goods in 1825 and establishing rail in 1851. In the 1860s through the 1880s, several city-shaping industries were founded including the Barney & Smith Company in 1854 and the National Cash Register Company in 1884. By the early 1900s, Dayton had become a leading mid-size industrial city in the United States with a diverse range of products reaching regional, national, and even international markets, and was a prime economic environment for the construction of the daylight factory. Manufacturing remained strong in Dayton for decades, but in the 1950s Dayton followed the pattern of many U.S. cities as the popularity of the automobile drew people to the suburbs and downtown growth slowed dramatically. Dayton's economy saw steady decline with devastating job loss as local and national firms closed plants. Unsuccessful efforts to revitalize downtown with office towers in the 1970s and 80s have left the city severely overbuilt, but today Dayton is implementing new citywide urban planning strategies to help bring businesses and residents back to the downtown core. Understanding Dayton's industrial and economic history is essential for interpreting its built environment in a meaningful way: the most significant period of growth in Dayton's history coincided with that of the daylight factory.

In addition to an in-depth examination of the daylight factory as a type, I chose to pursue case study research in order to be able to address challenges for preservation and adaptive use of the daylight factory in a specific setting with a particular historic context. There are fewer than ten daylight factories remaining in Dayton, and during my two trips to the city I was able to tour six. Additionally, I visited a variety of archives, collections, libraries, and museums and I am indebted to the hospitality and generosity of all the Daytonians who have helped me. Exploring Dayton and being able to tour and photograph the physical buildings myself, majorly influenced the conclusions presented in this thesis.

Of the six buildings I visited, I selected three case studies that typify the daylight factory. Even though construction between the three spans a mere seven years, these buildings demonstrate a distinct progression in technology, design, and architectural aesthetic. Additionally, their current situations represent an interesting variety of contemporary uses that achieve varying success.

The first is 15 McDonough Street, which was actually the second of two concrete frame buildings that were constructed on this site in the early part of the twentieth century for the Dayton Motor Car Company. The Dayton Motor Car Company was derived out of the 1869 Stoddard Manufacturing Company, that originally produced farm implements but changed to automobiles in 1904. It was during the Dayton Motor Car Company's peak years that two reinforced concrete structures were built as part of its manufacturing complex southeast of downtown. The first was a seven-story U-shaped building built in 1907 by the Keppele Hall Company with approximately 80,000 square feet of floor space. The second, 15 McDonough, was built in 1908, probably also by the Keppele Hall Company, with about the same footprint but no light well, resulting in approximately 85,000 square feet.

In 1911, the Dayton Motor Car Company became part of the United States Motor Company which was purchased the Maxwell Motor Company in 1913. During the economic depression following WWI, Maxwell Motor Company faltered, and reorganized in 1925 as the Chrysler Corporation. As Chrysler consolidated, the Dayton properties and the Maxwell brand were discarded. The 1907 building was torn down in 1986, after having been vacant for quite some time, but the building at 15 McDonough Street still remains.

The building became an ice cream cone bakery in 1928 and remained so until 1994 when it was sold to the owner of Module 21 Building Company, a furniture maker. The City of Dayton purchased the building in 2001 and rents out the ground floor to Gosiger Inc. for storage. The building at 15 McDonough is six stories with square bays measuring nineteen feet, column to column and the structural system reveals the building's early date of construction. The columns are square with a system of beams and girders that while cleanly executed and displaying strong, systematic regularity, does have a sense of visual heaviness indicative of the building's early concrete frame technology. The window system also expresses the building's early date of construction. Made completely out of wood and in relatively good condition, each window bay is composed of three six-over-six double-hung sash windows which do not extend the full height from ceiling to floor. The envelope of the building has remained secure with a roof replacement in the 2000s and panels covering still-intact ground floor windows. Building systems will likely be the largest obstacle for building reuse, all of which are outdated and in need of replacement. The single freight elevator is inoperable and more circulation will need to be added.

The next case study, at 329 East First Street, was built in 1912 as Beaver Power Building number two, by Schenck & Williams architects for prominent Dayton businessman Fredrick P. Beaver. It served as headquarters for the Dayton Engineering Laboratories Company, known as Delco, and continued to be associated with the name for over 70 years. The beginnings of Delco trace back to 1907 when Charles Kettering and Edward Deeds were experimenting with electric ignition systems. After successfully developing a prototype and selling it to Cadillac, Delco was founded. Delco worked with Fredrick Beaver as he built the building, making design requests and even moving in before construction was complete.

Due to Delco's rapid growth, the building was quickly expanded with a fifth floor and partial sixth floor, and the sixth floor would be filled out to the street line by the 1940s. Despite damage from the Great Flood in 1913, Delco continued to grow, and would eventually construct two more plants in Dayton's downtown core: Plant 2 in 1915 and Plant 3 in 1923. Delco was acquired by General Motors in 1918, who built yet a fourth manufacturing complex downtown. After World War I, the Delco Products Division of General Motors became known for producing shock absorbers, electric motors, and generators.

Plants 2 and 3 can be seen as built in the top photo on either side of Plant one, and with increasing demand came several phases of plant expansion in downtown Dayton. Plant 2, on the bottom, was expanded in both 1929 and 1938, and the final major down expansion was Plant 3 in 1947. Eventually, General Motors sold its Dayton assets in 1981 and no longer has an active presence in in the city. Today, Delco Plants 1 and 2 survive, but Plant 3 was demolished in 1981 and the fourth complex, the Delco-Light and Frigidaire Plant, was demolished in the 2000s.

Delco Plant 1 is a square building with corner bays projecting slightly with wider concrete piers, a design that reflects Kahn's Highland Park Plant. The building features a sizable lightwell and including the basement, is over 200,000 square feet. Plant 1 represents a significant step forward in its structural system with the use of flat slab construction technology and mushroom columns, which are spaced 20 feet apart. As with all daylight factories, the windows are a defining visual feature of the structure. The steel windows stretch from floor to ceiling and are composed of bays divided into three vertical sections.

Each section features two operable awning window vents stacked vertically, although the fifth and sixth floor window configurations are slightly different, as they were added after the building's initial construction. When General Motors sold the building in 1981, it was purchased by Sanford Mendelson who installed metal sheeting on the exterior and used the building as storage for the Mendelson Liquidation Outlet. Also in the 1980s, the ground level windows were removed and replaced with concrete masonry infill. The windows are still intact underneath the metal sheeting, but are in poor condition. In 2014, the Cincinnati-based development firm, Crawford Hoying, bought the building and is making plans to convert the structure into residential units.

The third case study, Delco Plant 2, was the first purpose-built structure for Delco. Also designed by Schenck & Williams, it is situated south across East First Street from Plant 1. The building is seven stories high, with the exception of the northeastern corner, which is one story. Delco Plant 2 is a distinct departure visually from Plant 1 with its enormous scale and bold masonry piers. It is composed of three major building periods. The first phase in 1915 was nineteen bays long, the 1929 addition extended the building south along Second Avenue, with the 1938 edition running along Madison Street and back around along First to complete the rectangle. The center portion of the building functions as a lightwell, but the first three stories have been filled in with a steel-frame addition.

All three additions mimic the distinct brick pier design of the original. The brick piers are six feet wide, a design choice that helps better incorporate the vast building into the scale of the streetscape. With column centers twenty-two feet apart, a sixteen by twelve foot space remains for windows. The individual panes are massive and the top two, three-pane sashes in each bay are double-hung which provided maximum ventilation and air circulation. Although the structural elements of the building are concrete, each vertical concrete pier on the perimeter is encased in red brick, making them about three times as wide and thick as the actual structural element. When viewing the piers from the interior seen here in a historic photograph, the embedded concrete frame is visible within the brick. Interior columns are round and utilized the same flat-slab structural technology seen in Delco Plant 1. General Motors also sold this property in 1981 to Sanford Mendelson and today, the building is used for retail and storage for Mendelson's Liquidation Outlet. Floors one and three are open for browsing but floors two, and four through seven are used only for storage. Overall the building and its elements appear in good condition, including the windows and hardware.

Historic preservation practice in the United States is based firmly around criteria put forth by the National Register of Historic Places and the Secretary of the Interior's Standards for Rehabilitation. Historic sites are judged based on their qualities of significance and their degree of integrity. Traditionally, preservation tends to prioritize material elements of historic buildings, and the standards clearly reflect this. There are, however, other elements of historic structures that are able to possess significance and integrity.

Dayton was an archetypal, mid-sized industrial city that competed economically with cities much larger in size. Its identity revolved around manufacturing and innovation and as the concepts of mobility, technology, and mass production were taking hold in America. Dayton's built environment reflected this. These daylight factories represent the incredible rates of growth and change the city experienced in the early twentieth century, the eruption of mass production and its incalculable effect on society; and an enormous step forward in industrial building technology. While

the material elements of these case studies and other daylight factories are significant, it is not the structure itself that most completely embodies the historic significance of change and innovation, but rather the space that it creates.

The open floor plans of the daylight factory are the physical manifestation of the process of mass production. Intruded upon only minimally by the fewest amount and smallest size columns that technology would allow, the visual experience of the expansive floor plans is a significant factor of the building's historicity. The scale and utilitarian character of the space evoke an immediate sense of the manufacturing purpose for which the buildings were built. More than any other feature, the expansive open floor plans represent what is most significant about the daylight factory.

On its most fundamental level the daylight factory is a utilitarian structure, built for the optimization of manufacturing, but the design of the daylight factory was conceived to go beyond just utility. In the early twentieth century, technologies rapidly evolved, machinery continued to be improved upon, firms grew and expanded, and the daylight factory sustained it all. These buildings, in particular their expansive interior spaces, embody versatility as a fundamental historically significant trait.

The two major significant material elements of the daylight factory, the concrete frame and the window spans, were designed for and evolved expressly to enhance the interior space and the versatility of the buildings. The concrete frame and its reinforcement technology was developed to allow for larger floor areas and to be robust enough to withstand heavy machinery, which gives the daylight factory remarkable longevity and versatility. The frame also supported the considerable window spans which directly contributed to the efficiency of the manufacturing process by improving the quality, attractiveness, and utility of the interior space.

Preserving the character or the significance of a space is a more conceptually complex task than the traditional approach of material preservation and the complexity is even more compounded when trying to incorporate an adaptive use. I propose that the most effective way to preserve the character of the daylight factory is to preserve their versatility. In other words, specifically incorporate new uses that will allow for flexibility and changes in the space.

The most obvious method of preserving the versatility and openness of the interior space of a daylight factory would be to find a use that requires the fewest partitions or walls to be built, or none at all. Furniture and equipment could certainly be brought into the building as they would not impede the view of the expanse of the interior space, much like the industrial machines and equipment that originally occupied the buildings. If partitions are unavoidable, optimum designs would be easily reversible, transparent, and would contrast the existing structure. Walls constructed of heavy, more permanent materials not only cut off the expanse of space, but greatly restrict versatility.

Incorporating an open or flexible floor plan into a modern preservation strategy, no matter the building type, is a significant challenge. There are also several other contributing factors that make the reuse of daylight factories difficult, and these can be explored by examining the case studies.

The Dayton Motor Car Company building at 15 McDonough is the smallest and oldest of the three, and located farthest from the center of downtown Dayton. While less than a mile from the core of

the city, it is separated by train tracks and is located in an area that is composed primarily of industrial structures, disconnected from urban resources. The building's relatively small floorplate may lend itself to a more straightforward reuse plan than other larger daylight factories, but the significance of its openness is not diminished. Even with the beam and girder system, the relatively shorter windows, and no lightwell, light permeates the entire space and the effect is unmistakable. Even though the space is devoid of the machinery and product it would have possessed during its manufacturing days, the space is allowed to reflect that absence. Partitioning off the interior would completely remove that special connection to the building's manufacturing history.

Although conversations are taking place regarding the building's reuse, those plans are still in early, speculative stages. The option preferred by interested parties is industrial or office reuse as an addition to the Gosiger corporate campus. Gosiger owns several neighboring buildings and is currently using space on the ground floor for minimal storage. While the concept of industrial use may seem ideal for preserving open space, the building is not well-suited for Gosigers' industrial needs, specifically because it is multi-story. Nearly a century after the multi-story industrial building lost its advantage, industrial processes have changed little enough that the daylight factories continue to present severe disadvantages for reuse as industrial structures.

One of the most popular methods of reuse for industrial structures is conversion into residential, and Delco Plant 1 is set to be renovated as apartments within the next eighteen months. According to preliminary plans from May of 2015, the building will have approximately 134 units. The project is taking advantage of the relatively new Ohio State Historic Tax Credit and designers are being conscientious and respectful of the historic character of the building: all wall partitions will meet the exterior of the building at columns; elements of the concrete frame, particularly columns and ceilings, will be left exposed where possible, windows will be replaced with new, more efficient ones as identical as possible in appearance to the originals; and the sixth floor office, rumored to have belonged to Delco co-founder Charles Kettering, will be preserved in its current state as a community space.

Crawford Hoying's design for Delco Plant 1 is respectful and exemplary for a rehabilitation of this type, but it will eliminate the historic open industrial space of the building and its versatility. Any sort of reversal of the building back to open space at a later time will be costly and intensive. Although the historic open floor plans will not be actively experienced by building occupants while it is in use as apartments, the concrete frame will remain intact and the preservation of the material building elements inadvertently preserves the potential restoration of the historic open space and its versatility.

The third case study, Delco Plant 2, is by far the largest of the three, perhaps making it the most difficult space for which to find an adaptive use. Interestingly, the historic open space is relatively well preserved with its current use as Mendelson's Liquidation Outlet. Shelves block an observer's view of the expanse of the space and even though the extensive retail product in the building is not particularly well-arranged, the sheer amount of product does add to a sense of the building's size and scope. Another issue that detracts from the interior space is the limited daylighting. The majority of the first floor is situated below ground level. Historically, a row of windows along the bottom of the building illuminated this space, but those ground level bays have been filled in as has been the lightwell up to the third floor, resulting in complete reliance on artificial lighting on the first floor.

The third floor, the only other floor open to the public, does have some perimeter windows that let in daylight, but many of them are covered with spray-on insulation. The effect of daylighting windows is not even closely simulated with artificial lighting, especially considering that these windows stretch from floor to ceiling, and would create very strong directional lighting from the side for the entire height of the floor.

The architectural or spacial experience was clearly not a priority when Delco Plant 2 was converted into retail and storage use, but behind the expanse of shelving and the spray insulation, the experience of the space could be restored with perhaps more conscious interior organization. Removing insulation, moving shelving away from windows, restoring the lightwell on the lower three floors, and replacing the bottom row of windows along the perimeter of the building would greatly enhance the original character of the interior space.

Successful retention of daylight factories will require a complex and innovative approach to the principles of historic preservation. By making the character of the interior space and the versatility of the daylight factory top priorities within a preservation strategy, the buildings will be able to more actively and accurately reflect their historic manufacturing past. If new uses incorporate change and accommodation, the daylight factory can avoid obsolescence, and it will possess a richer, more complex historic record. Openness and change are much more achievable concepts for the successful preservation of daylight factories, and will help retain the historically significant element of versatility.

Dayton is exceptionally well suited for this kind of innovative thinking in preservation as the city works to both preserve its industrial past and restore a healthy economic future. Dayton built its daylight factories to accommodate change, and with thoughtful designs that incorporate less permanent intervention, creative uses, and perhaps even shared space, these buildings can serve the needs of present-day Dayton and continue to reflect the most significant elements of their historic industrial character.

Innovative and open ideas of preservation will foster the daylight factory's continued utility, which is what the daylight factory was originally designed and built to embody. Thank you.

GH: Jennifer, several things. First of all, it should be at least a footnote in your thesis that the Beverly United Shoe Machine Company was owned majority share by Faguswerk in Germany. And that that building and the Ford Highland Park Plant Reyner Banham maintained were on Gropius' desk when he did the Faguswerk. So they have a real connection to the origins of European Modernism that deserves at least a lengthy footnote or mention in your work, I think. It's probably wrong to pass that by, it's an important issue.

JLM: Absolutely.

GH: My other puzzlement is in the daylight term that you're using throughout. These buildings, many of them, including some of Kahn's work were detailed so that the glass could ascend as high into the structure as possible. The edge beam was often done away with and other features, but I don't think of them as daylight buildings and you're argument that the daylight penetrates into the inner reaches, to me, isn't convincing. Your own images show that the light falls off very sharply as

you move away from the windows. And this is what led to the classic long and thin type, penetration from both sides, and led, in Kahn's case, to the General Motor's Office Building which was a series of long narrow office blocks for daylighting. But when you deal with a plan that's extended in both directions, it seems to me the daylight term isn't the right one. I think, furthermore, that it's a term I would have applied and I think did apply to the family of buildings that begin with the George Pierce plan and become the Ford Rouge and that kind of thing. They seem to me to be more convincingly owners of the word "daylight" and I wonder if there's some other term, I really do feel that it's substantially misleading here. I appreciate your research and your effort and I would add I appreciate very much your interest in this building type. You commented early on that it's been a neglected piece of architectural history and I tried in the book on Kahn to bring it into the family of architectural inquiry without, I think, very much success and it's nice to see you tackling it. But I really am, I think, puzzled by the word "daylight," to me it's not the right one for this type. Unless, you modified your argument considerably, which with daylight buildings you can't do, because they do have a considerable breadth. I'll be quiet.

JLM: No, no, no, that's a perfectly reasonable comment. I based my definition of the daylight factory on Reyner Banham's definitions.

GH: Yeah, I argued with him in his lifetime about that. He and I had a number of discussions including the one about the connection to Fagus, but, well, you have a powerful citation there, no doubt about that. I do disagree with it.

[laughter]

JLM: Which is perfectly reasonable. There's this image in his book which I should have maybe listed on the page with his cover, of the Larkin Building in Buffalo with the light shining in from the brick and the concrete. So, that was kind of the starting point for defining which structures I was going to look at.

GH: I'm so glad you used him as a resource. He was a wonderful man and a wonderful scholar, and one who was prepared to move laterally in his work.

Michael Sullivan (MS): You know, the term, though, prompts an interesting line of thinking about adaptive reuse because you wonder about how, if you were able to get data on the performance of these buildings in measurements that we use about solar gain and all the things we measure building performance by today, is there a way to develop some equivalent data and look at that, because I think it might inform the adaptive reuse of the buildings. We might discover that they, and I've never been to Dayton so I don't know how these buildings are oriented to sun and prevailing weather patterns, but whether you know, if the windows or the outside envelope, the clear parts of the outside envelope, are going to be analyzed and looked at and maybe even something new put there, a higher performance element put there, what does that then give us in terms of how they might be reused whether it's residential or some other reuse.

JLM: I think that that's an excellent way to examine these buildings, considering that they were optimized for ventilation and air and light. The problem I think we would run into, especially in the specific case of Dayton, is that I don't think that the community is really thinking that far ahead,

necessarily. It's more like, "We've got a building, what do we do with it? What can we put in it?" And it's not necessarily an issue of analyzing the building's sustainability issues or efficiency issues, beyond just, kind of, preliminary design. So, I think it's definitely a good way to analyze them, I'm just not sure in the settings where you find daylight buildings, that that would be very compelling for the communities there. Just because, I don't know that they're thinking quite that far ahead.

GH: Did you visit Ford Highland Park?

JLM: I have not, unfortunately.

GH: It has these magnificent, majestic four-story volumes that are just crying out for a Spielberg movie. I wonder are there spaces like that, here? These seem mostly to be the stratum space. Are there any real powerful vertical volumes?

JLM: Not very much. Delco Plant 2, the one with the brick piers is the tallest. It's seven stories.

GH: But they're essentially just layers.

JLM: Yes. So there are no sort of wide, expansive . . .

GH: If you're ever around Detroit you really should go to those buildings. They deserve the attention that you're giving this and they are majestic.

JLM: I've visited them on Google Maps many times.

GH: Their spaces are quite remarkable.

Tyler Sprague (TS): Well, I really appreciate the way you brought in structure into the whole discussion of use and space. I think it's often overlooked, that synergy between the structural form and those spaces that are created. And I think this building type offers an interesting lens for structural engineers practicing today, about how it's not about just, used efficiency of production, but the structures themselves are so robust and the concrete is such a durable material. I mean, the longevity of the building speaks to how strong and long-lasting they are. I've seen advertisements from the time that talk about concrete for permanence. And so that's a different way for engineers to think about designing a building. It's not about the efficient section, the least amount of structure, it's about designing for permanence. So I think there's a lesson in these building and how they could be adaptively reused for engineers who are practicing today.

JLM: Absolutely, yeah. That was definitely a piece of these designs that was conscious. In the sense that they wanted, as I mentioned, for these buildings to be able to accommodate new uses as industries developed.

Jennifer Meisner (JM): Well Jennifer, I just really appreciate this in-depth exploration of the history of Dayton, the development of the building type, and especially the challenges of preserving this type of building lies, as you said, in the open space, much more so in the actual physical structure. And, it was interesting to me that you noted one of the case studies is undergoing a rehabilitation

project and it's able to utilize tax credits. Which I was wondering if you could tell us a little more about that process. I know it's difficult to be able to use tax credits, I know Michael can speak to this as well. The [National] Park Service very much relies on the Secretary of Interior Standards in making sure that the character defining features of the buildings are preserved and reused and not compromised. And in the case of this building type, I can see how that could be a major challenge. So, if you have any more thoughts about how financially these projects could work and any types of uses that wouldn't necessarily compromise what's really important about them, I'd love to hear more about that.

JLM: Yeah, I think it's certainly a fair question and one of the things Jeffrey has mentioned throughout the process is that, you know, preserving the building is good. If it's being converted into apartments, yes, it's maybe not ideal compared to what I think is the most optimum use, but, in the specific case of the Ohio Historic Tax Credit, they are looking at the concrete frame and the windows as the significant elements. And that was also the case for Beaver Power Building number one, which looks very similar to the second case study that I presented, it was built by the same architects for the same businessman, and it is also apartments right now, the St. Clair Lofts. So, the major points of the application for the tax credits, which have not been awarded yet—but the designer said “If we them we will apply next year because this project is not happening without them”—is that, sort of not, interrupting the windows on the exterior. So, all of the windows will be going into apartment spaces, and the walls will be meeting the columns. So those are the Ohio State Historic Preservation Office has deemed significant based on the standards. As for other ways to use these buildings that are economically feasible? That's sort of the tricky part. I don't know of anything offhand other than, when I was in classes I wrote actually a paper for Jeffrey's class about the “authenticity of use” and I argued that these buildings should be preserved with a use related to production. And that's not necessarily possible with industry in the way for what they were built, but something like, you know, there are lots of sort of craft, like I guess Etsy, and different things where people are producing, small scale, but maybe need a production space. Or, even photography studios or something like that.

JM: Design studios.

JLM: Design studios, and maybe even office spaces if it were well-designed with maybe some glass. But, those uses are probably not going to get you a quick economic return. I think the Delco 1 is a \$25 million project. So, it's pretty substantial, and I don't know that you're going to get that return from renting to artists.

GH: You're probably familiar with one case of that in the Amoskeag Mills in Manchester New Hampshire, do you know that story?

JLM: I think so, yeah.

GH: It's beautiful buildings, and the University of New Hampshire was at one point considering them for a campus, and Louisa may remember, I think I was arguing for that in that course I though. I thought it would be a beautiful usage, but it never came off and they are now spot-rented out to occasional this-and-that and the buildings as a whole have not been a successful enterprise. The other is the Ford Highland Park, that I've mentioned now twice. Fantastic buildings, and of

course Detroit is the real problem there, but essentially they're just raw storage. Nothing is going on with them that's of the slightest interest. So, those two case studies suggest that it's uphill work.

JLM: Definitely. Yes, that is true. And I didn't set out on this thesis to present a practical solution, necessarily.

GM: No, no, I appreciate that and it's very difficult to do; I understand.

JLM: Yeah, well, and that was kind of the point of pursuing this topic in this setting was to be able to speak to the theory of preservation rather than . . .

GH: And good for you for trying it out.

TS: You picked a building type that's strong and resilient and it's always neat to see preservation projects that have strong bones where you can sort of adapt [unintelligible].

MS: Plus they don't have earthquakes there.

JLM: That's true.

Alex Anderson (AA): I wanted to raise again the point that Grant raised at the beginning, and that is the idea of daylighting. Maybe "sunlighting" is the better term for it in a way because, you had one image in particular where there was just direct sunlight coming in on the desks and on the workspaces, which is of course exactly what you don't want in a production space like that. There's a lot of heat gain, you know in the summer in Dayton, it's going to be brutally hot in those kinds of spaces. And I'm curious about a.) the orientation of the buildings, and maybe you talk about that in the document but you didn't really talk about it much here. It seems like they aren't really oriented specifically to the cardinal directions, they're just put on the street. And they're the same pattern all the way around. So, you know, a contemporary day-lit building would be very careful about orientation. And in an adaptive reuse, where you're saying the tax credits come for the preservation of the windows, that would seem like a pretty significant limitation to making use of real daylighting science in making these buildings work. Because you've got to preserve the area and the texture of the windows and that sort of thing, I presume. And the second point I want to make is that these are pretty interesting case studies because they all present different attempts to generate some airflow in these buildings. You've got the double-hung windows, the sash windows, and then the triple-layer, double-hung at the top. So, three really different mechanisms, all of which are trying to get some air moving through here, and I suspect, more-or-less unsuccessfully, which is probably one of the reasons it was a building type that lasted for a short time. You know, I think the windows are beautiful, but they're a real problem. So that's, I would imagine is an impediment to making good use of these buildings. You can see in the storage building the first thing they did was slapped something over the windows, and that's obviously a real shame. That treatment is incredibly ugly and you see it all over the place.

MS: The one sort of unique characteristic of daylight buildings that were built for manufacturing were that, they're largely a daytime building, too. They're not designed to be in twenty-four hours a day and so now you're [unintelligible] a reuse that has residential use or a nighttime entertainment

use and it creates a whole new set of issues. But if you've seen the warehouse buildings at University of Washington Tacoma, you know that a relatively slender atrium, vertical cut down into the center of the [unintelligible] really has a big payoff if there's a lens skylight on top. And you can get down in the middle, that withering light that comes in from the outside can really be amplified by really just a relatively small vertical opening down through the building. And I don't think that creates a problem from a tax credit, National Park Service, Secretary of Interior Standards.

JLM: I wouldn't think so either.

GH: There's also the issue germane to what Alex raises that our attitude toward the people in these interiors has changed a lot. He speaks to the comfort of the heat build up. The people who built these buildings didn't give a damn about that. Their workers could fry for all they cared and we can't do that these days; our social attitudes have changed. Ford at Highland Park could care less. He was paying five dollars a day and if he burned someone out in a year, to hell with it. But we don't do that these days. So, that whole criterion comes into play now that did not then.

JLM: Which is actually interesting because a lot of the windows in the trade literature I've read through are advertised to increase worker comfort through the lighting and the ventilation and that sort of thing.

AA: Sounds like lip-service.

JO: So, could you go back to a historical interior of come kind?

JLM: Certainly.

JO: So, one of the things that you don't notice at first is, there's a lot of stuff attached to the ceilings and hanging down. Because, when you look at the buildings today, particularly the vacant floors, they are really stripped back to the structure. But historically, since everything had to be surface-mounted, it doesn't look like there was any embedded conduit anywhere, there must have been a lot of things just hanging off these ceilings and on the columns. There's not cords running over the floors or people would trip, so probably everything was supplied from the ceilings.

GH: And utter filth. Absolute filth.

AA: Well these are all belt [running? 50:57] too, so there's some powerplant somewhere, I don't know where.

JLM: The Delco 1 actually had coal-burning in its basement. So it had it's own.

AA: Oh yeah, there was a stack running up the middle.

JO: So they weren't as visually open or as uncluttered as the appearance that we get today.

JLM: Correct. And that is something that I had considered. I tried to word my presentation and my document in such a way that talked about the, kind of, the character of the space evoking mass

production and these different sorts of ideas as opposed to the literal materials or equipment that would have been in there. So it was more of a, I don't want to say, well, I guess "theoretical" is maybe the right word. So, that is definitely an issue, though, and Grant mentioned the dirtiness as well.

GH: But you have to transcend that. If you're going to speak to modern uses you're quite right to move past as you, you have no option. You have to.

JLM: For sure, and when I was speaking about the Delco 2 plant, the storage building, I don't think that that's actually a terrible use. It's maybe poorly executed and could be better designed, but I mean, that gentleman who owns that building has like, over a million square feet of storage space in downtown Dayton. The one that's being converted into apartments actually was filled with his storage until just recently, a couple months ago. So, it's actually, even though it is full of stuff, you still can sense the size of the building, you can see down the aisles, and that's actually kind of ideal in a sense. I don't know how long that business is going to last, particularly.

TS: I think these comments speak to that redundancy of structure. I mean it's structural frame is there to provide for a variety of uses, right? You can drill into the floor, you can hang from it, you can [post stuff?], you can do all these things and the basic structural concrete is there to accommodate whatever might come. And so you have a big flexibility of use that could stay in the spirit of the space.

JLM: For sure, yes.

MS: And all the adaptive reuses are likely to be lighter loads on the structure than what they once had.

TS: Yes.

AA: Except for server farms, I know some of them get used as server farms and that's a pretty big load. And you know, there the challenge is definitely heat dissipation some how or another.

GH: Jeffrey's about to move onto the stage here before I does, I was going to . . .

JO: No I was going to ask for closing comments. I was going to say we have only a few minutes left and if the jurors want to make closing comments or general statements, we should begin to do that.

GH: Mine is applause for your taking on the subject. Good for you.

JLM: Thank you.

TS: Again, I appreciate the depth to which you investigated the structure. I think your discussions about brick transitioning to concrete, there's also wood language that's sort of phased out. I love how you've made that integral to the sort of concepts of the building.

JLM: Thank you.

GH: I would try to find a term other than daylight I think.

[laughter]

JLM: Yes, I will look into that. I will do that, thank you.

MS: Well I just think this kind of groundwork, and this sort of expressed appreciation for the buildings and character, really is the beginnings of actually getting these buildings reused. It's the kind of document you can actually give to a community development person or you know, a developer and, "Look," you know, "here's the blank canvas. Here's the beginnings of a tax credit application or an engineering study for an adaptive reuse." So, I congratulate you, it's very well done.

JLM: Thank you.

JM: Well Jennifer, again, I just think that your exploration into the challenges of preserving a building, that its significance may not lie in its actual architectural expression, but the volume of space, the use of the space, the social history, really speaks to our need to start looking at traditional preservation regulation and processes and tools because we're losing buildings like this every day that don't fall into that neat category of, you know, a building that's architecturally significant. So, I really appreciate the work that you did and I think it's really going to spark more conversation, so thank you.

JLM: Thank you.

MS: Yeah, I'd just go back, you know, I've never been to Dayton but I feel like somehow I have a better understanding of the city itself, and you know, for that community. One thing they made need to discover is that they're not just individual buildings that they're finding an economic reuse for, it's the story of the city that is being continued in these kind of buildings, and there's that layer of meaning.

JLM: Yeah, definitely. There's actually a gentleman I toured around with who works for an entity of the city who did speak more to that. He actually suggested making the entire city, like trying to argue that the entire city was a historic district in some way that showed the progression, which I'm not sure if that's a useful way to approach it. But his concept was very much holistic in the sense of incorporating all elements of the city in a larger story. There's actually quite a bit of development going on, there are a couple of new developments going on along the waterfront, one by the same company that's doing Delco 1, the apartment building, so there's kind of a lot happening and I'm really curious to see what the city looks like in about five or ten years.

GH: How close are you to Columbus?

JLM: About an hour.

GH: So it isn't really a potential commute. Maybe.

JLM: It could. It's not too bad. I don't know what the traffic is like.

GH: There's at least one town in Ohio, I've forgotten the name of the town, a Frank Lloyd Wright house there that they took the whole town that was a potential communing, a bedroom community to Columbus and they made it work.

JLM: Oh, interesting, Okay.

GH: But this is a little far. An hour's a bit far.

JLM: Yeah, it's about an hour between Cincinnati and Columbus. I mean an hour either direction. In the document I talk about one of the major employers of Dayton-area residents is the Kroger Company which is based in Cincinnati, so some people do it. Or at least they live part way in between.

GH: Alright, well thank you Jennifer.

JO: Thank you to the jurors for making time in the day and coming to the presentation. We very much appreciate it.