

THE PROCEEDINGS PART IV



Author

Fig. 1. Hiram Walker distillery office, Walkerville, Windsor, Ontario, 1894.

Albert Kahn and Canadian industrial architecture 1908 - 1938

by Gerald T. Bloomfield

Albert Kahn (1869-1942) was one of the great industrial architects of the early twentieth century. From the mid 1890s until his death, Kahn was very active in all facets of architecture, designing not only industrial structures (which ranged from open-hearth steel plants to cosmetics factories) but also offices, stores, hospitals and houses.¹ His name is most closely associated with the buildings of the new automotive industry, which was a major force in transforming the North American urban economy, society and landscape through mass production and mass marketing. Industrial architects and engineers probably regarded the automobile industry as the best client they ever had.

Albert Kahn was born in Rhaunen, near Mainz, Germany and migrated with his family to Detroit in 1880. He joined the firm of Mason and Rice in 1885 as an office boy, then became a draughtsman and studied in Europe on a scholarship 1891-1893. Kahn joined the partnership of Nettleton, Kahn and Trowbridge in 1896 and briefly rejoined Mason in 1900. Within a year or so he was independent.²

Kahn's three brothers were also active in the firm. Julius, trained as an engineer, joined as an associate in 1903 and also established his own firm, the Trussed Concrete Steel Company, for the making of patented reinforcing bars—the "Kahn System". Louis (1886-1945) entered the firm in 1910 and became a key executive, second only to Albert Kahn. Moritz (1881-1939) worked with Julius from 1906 to 1923, when he joined Albert as an associate.

The firm of Albert Kahn Associates was one of the earliest specialists in industrial buildings. In close association with the burgeoning automotive industry, and developing from a base in Detroit, Kahn's firm

grew very quickly, designing a remarkable volume and variety of factories, not only across North America but worldwide, including the Soviet Union. From a small staff in 1902, the firm employed 200 in 1920 and grew to 400 by 1929.³ The firm was an innovator in office integration, linking architecture and engineering which was especially important in reinforced concrete construction. Albert Kahn Associates was also active in the promotion and advertising of its distinctive techniques and building work.⁴ The firm designed over 2,000 factory buildings which ranged in size from a few thousand square feet in floor area to several million square feet. Directly and indirectly Albert Kahn had an important influence on the shaping of the twentieth century factory as an artefact, a production machine and a workplace.

THE TRANSFORMATION OF THE FACTORY

Albert Kahn began his industrial work, with his first factory commission in 1901, at a critical time of very profound change in manufacturing. This period of change involved several interlocking elements—enormous absolute growth of production, new manufacturing methods, ideals of model factories, the technology of reinforced concrete, and the rise of a new generation of large industrial corporations which had a closer relationship with the consumer.

The dramatic rise of manufacturing output between 1900 and 1929 created a huge demand for industrial plants in virtually every sector of the economy. Growth statistics for motor vehicle production illustrate the general trends:

Motor vehicle production, selected years 1903-1929

	000 units	
	United States	Canada
1903	11	—
1909	127	1
1913	485	15
1916	1,618	41
1920	2,227	94
1923	4,034	147
1929	5,337	263

Source: **World Motor Vehicle Data 1982** (Detroit: Motor Vehicle Manufacturers Association, 1983).

Such growth rates may be translated into equally dramatic increases in floor space. The Ford Motor Company occupied only 12,000 sq. ft. of factory space in 1904. By 1907, this had been enlarged to 92,000 sq. ft. and within three years it was 638,000 sq. ft.⁵ In 1913 the company owned just over 5 million sq. ft. and in the next decade the area was approximately tripled. Albert Kahn designed most of the buildings required for this expansion.

Factory production methods also changed dramatically in the early decades of this century. More machine tools were introduced along with greater mechanization of other processes. Electricity was applied not only to lighting but to driving machines which could be controlled more accurately. Materials handling within factories was improved through the introduction of lifts, elevators, electric cranes, gravity chutes and later by mechanical conveyors and assembly lines. The fork lift truck introduced about 1916 had important effects on intra-plant movement. The organization of work was greatly modified by the careful study of processes pioneered by F.W. Taylor. All these innovations in manufacturing methods had a profound effect on productivity.⁶ In the United States, the average number of vehicles produced per employee each year rose from 1.5 in 1909 to 3.9 in 1914 and to 9.0 in 1925.⁷ All these changes required larger factory structures and more flexible floor areas in which the machinery could be redeployed as newer methods were introduced.

New manufacturing methods were not introduced without some dissent from the more traditional craft workers.⁸ As Arnold and Faurote remarked in 1915: "The Ford Motor Company has no use for experience, in the working ranks, anyway. It desires and prefers machine tool operators who have nothing to unlearn, who have no theories of correct surface speeds for metal finishing, and who will simply do what they are told to do, over and over again from bell-time to bell-time."⁹ If manufacturers were to introduce new production systems, without high rates of labour turnover, they had to improve working conditions in the factories. The "dark satanic mills" described in the reports of Royal Commissions had to be replaced by the ideas and practices of the "model factory".¹⁰ Major improvements in safety, sanitation, ventilation, lighting and general welfare had to be made as factories became larger and the work became more impersonal.¹¹ Where improvements such as lunch rooms were provided, they were "...not looked upon as philanthropy, but rather as practical economy, for a well cooked meal generally produces physical improvement and a greater working capacity on the part of the employee."¹²

By the early twentieth century, architects and structural engineers were able to match the demands for larger industrial plants with improved working conditions through the development of reinforced concrete technology.¹³ For nearly two decades the multi-storey concrete frame building became the standard form of factory construction. By 1916 it was noted that "...ninety per cent of the new factories in the course of construction are of reinforced concrete."¹⁴ The benefits of reinforced concrete construction were actively promoted by architects and also by organizations such as the Association of American Portland Cement Manufacturers and the Canadian Cement and Concrete Association.¹⁵ Among the many benefits of this new construction material were: fireproof standard with lower insurance rates; increased load carrying capabilities; high resistance to vibration and waterproof; vermin proof qualities; enhanced day lighting area; speedy construction with low initial costs.¹⁶ To these qualities might be also added longevity and flexibility in use. These features of reinforced concrete buildings may be seen in the factory and warehouse districts of most North American cities.

A new generation of very prosperous companies was also evolving in the early part of the century. These companies were more closely associated with the consumer and therefore consciously required buildings with a visible public image to form part of their informal advertising. Many of these new corporate clients of architects had multiple branches in several regions and also quickly spread overseas. The Ford Motor Company was very profitable and in the euphoria of expansion barely considered the cost of its buildings, although in the 1920s Henry Ford often spent a considerable time examining the finer construction



Figure 2. 'Willstead', Walkerville built in limestone, wood and brick filling for E. Chandler Walker in 1905.

details of each building.¹⁷ Such generous clients provided an excellent foundation for the development of Albert Kahn Associates.

ALBERT KAHN IN CANADA

The Canadian work of Albert Kahn naturally parallels the main stream of his commissions in the United States. There is still only a very limited knowledge of the details of Kahn buildings in Canada.¹⁸ The technical journals have yet to be examined in depth, although some of these fail to specify the name of the architect.¹⁹ Indeed many owners of buildings are unaware of the architect who designed the structure. Kahn's work was directly significant since he designed at least 40 major buildings and had a wider demonstration effect on the development of additional buildings which were very similar in style. There are at least three phases of Kahn's Canadian work: a period of non-industrial building before 1908; the multi-storey reinforced concrete buildings 1908-1921; and the horizontal factories 1922-1938

Kahn's earliest buildings in Canada were those commissioned by the Walker family. Mason & Rice had worked for Hiram Walker from the mid 1880s not only in Detroit but also in Walkerville and Kingsville. The Walker interests had by this time extended well beyond the distillery into a local railway system and hotels. After 1890 the Walker family became active in urban land development, as Walkerville was transformed into a form of "model town".²⁰ Albert Kahn was an active participant in the building of Walkerville, first as a member of the firm of Mason & Rice and then as an independent architect. John Pratt's study of Albert Kahn's early work in Walkerville has not only provided new detail on this phase of his career but has also presented a new interpretation of Kahn's architectural development.²¹ The design for the distillery offices (1894) was based on Kahn's earlier European architectural tour (Fig. 1). Details of the exterior were derived from the Palazzo Pandolfini in Florence, while interior designs owed much to his sketching in Venice, Nuremberg and Orleans. The second major building was the residence



Fig. 3. The Canadian Bank of Commerce, Walkerville, 1907. One of several Canadian bank buildings designed by Kahn.

for E. Chandler Walker (1904-05). 'Willstead' was a Tudor-esque mansion with stone and half-timbered walls which served as the "manor house" for the new village community of Walkerville (Fig. 2). In addition to these well known buildings, Kahn also designed row houses, mansions, a bank, and commercial blocks in Walkerville in the period from 1901 to c. 1907 (Fig. 3).

The general chronology of Kahn's architectural work in Canada may be outlined here (Appendix 1), although full details have yet to be uncovered. Kahn's most active period appears to have been between 1908 and 1917 when several large industrial plants were designed. A series of commercial buildings also probably date from this period. Most of the commercial buildings were located in the "Border Cities" (Windsor-Walkerville-Ford City) then expanding very rapidly as a centre of automotive production.²² Kahn's work there was an obvious outgrowth of his visible role in the architecture of Detroit.²³

After World War I, Kahn's work paralleled the fortunes of the Canadian auto industry and its major corporations. Ford was expanding in the early 1920s into a new generation of single-storey plants. In the late 1920s General Motors and the Chrysler Corporation were rising rapidly and commissioned new structure. The Depression with all the problems of industrial over-capacity provided little opportunity for Kahn and other industrial architects. A new building for Ford in 1937, the Chrysler engine plant in Windsor (1938) and a small parts warehouse extension in Chatham appear to have been the limits of Kahn's work at this time.

Most of Albert Kahn's commissions in Canada were associated with the American firms which were expanding into Canada in the automotive, rubber and processed food sectors. Given the geographical proximity and the corporate connections already developed by Kahn, the extension of his activities across the border was to be expected. Commissions for wholly Canadian firms were limited to Kaufman in Berlin (Kitchener), Eagle Spinning in Hamilton, the Bank of Commerce, and small businesses in the Border Cities. Kahn does not appear to have ever established a permanent branch office in Canada. He did not enjoy any special eminence in the circles of contemporary Canadian architects who seem to have resented the American architectural firms.²⁴ The Kahn reinforcing system, patented by Julius Kahn, and the steel sash windows which were also developed as part of the system appear to have been widely adopted in Canada by other factory architects. The Trussed Concrete Steel Co. established a factory and head office in Walkerville and by 1913 had a network of branches across the country.

KAHN'S INDUSTRIAL BUILDINGS 1908-1921

Our new factory is the most modern type of reinforced concrete construction. The columns, floors and stairways are also of reinforced concrete with steel bars which makes an absolutely fireproof building. The large amount of window space and the white washed walls, ceilings and pillars make an interior that is both bright and pleasant.

In short all the details of construction and equipment have had the most careful attention and nothing has been spared to make this the most modern Rubber Footwear Factory in the Dominion of Canada. These up-to-date facilities place us in a position to make a line of Footwear second to none.

This factory, like most of its contemporaries, had its own power plant which produced steam for space heating and processing and generated electricity for lighting and the machinery. Most of the Kahn factories had substantial power houses, and thus was an aspect of their design capabilities stressed in their advertising.²⁷ The Kaufman factory was extended on the King Street street frontage by 150 ft. in 1911 and again, retaining the same facade, in 1920 and 1925.

Berlin, Ontario, rising rapidly "on a foundation of factories" was also the location of a second rubber factory designed by Kahn.²⁸ The Dominion Tire plant of the Canadian Consolidated Rubber Company Ltd., Montreal, opened in February 1914, was a showcase of the new building methods:

Realizing the ideal conditions are conducive to the best work, the Company has instructed Mr. Albert Kahn, the architect of Detroit, to harmonize both the external and internal arrangements of the Factory, so that this result may be attained, and that each workman employed will have the incentive to give the best that is in him in the service of the Company. Both the interior and the exterior will be finished in a way to delight an artist and it will certainly be appreciated by the citizens of Berlin. Everything in connection with the putting together of Auto Tires must be perfect.²⁹



Fig. 4. Kahn's first Canadian factory, the Kaufman Rubber Co., Kitchener, Ontario 1911 with north and south end units added in the 1920s.

The factory consisted of a four-storey manufacturing block, 700 ft. x 90 ft. with a free standing office block and power house at the rear. The main building was very similar in style to the newly built Woodward Avenue facade of Ford's Highland Park production complex.³⁰ Kahn reinforcing bars and steel sash windows were incorporated in the building.³¹ Rising demand for automobile tires required some further extensions of approximately 180 ft. at the northern and southern ends of the production building.³² These were completed by 1919 (Fig. 5).

Albert Kahn's principal client in this period was the Ford Motor Company.³³ Gordon McGregor, the founder of the Canadian Ford company, continued the American firm's very close association with Kahn for practically all its industrial buildings. The parallels with the Detroit operations were followed in the development of a large production complex built on the edge of Walkerville in what later became Ford City.³⁴ Unlike the Highland Park plant, the Ford City complex was developed in a piecemeal fashion between 1910 and 1918. Kahn designed several large multi-storey reinforced concrete buildings: a four storey building in 1911, a six storey assembly and export packing structure in 1914 and a series of two storey machine shops between 1915 and 1918. These buildings provided Ford with the production base to manufacture 75 percent of the Model T wholly from Canadian materials. From May 1913 Canadian Ford was self-sufficient in engines, which were all manufactured at Ford City. By 1914 the plant complex was reputed to be the largest automobile plant in the British Empire and was highly visible from Detroit. The company claimed that the 450 ft. long sign with 15 ft. letters was the largest electrically illuminated sign in North America.³⁵

While the original plan for Ford City had been a fully integrated factory, manufacturing and assembling all vehicles, it soon became clear that the very rapid increase in demand was outstripping capacity. As in the United States it was decided to build a series of branch assembly plants in major markets across Canada. Each of these would be supplied with completely-knocked-down components from Ford City, which would then be assembled into finished vehicles for the local and regional market. Assembly plants were opened in London, Ontario; Toronto, Montreal and Winnipeg in 1915-16. Each of these followed the Kahn designs already developed for branch plants across the United States. The four-storey Toronto plant, located at Dupont and Christie streets, had a floor area of 132,000 sq. ft. and cost approximately \$300,000 (Fig. 6). In Winnipeg, a slightly larger five-storey building was erected which served Western Canada with Model T vehicles.³⁶ With a prime location on Portage Avenue the building was a visible advertisement for the commercial and technical success of Ford in the Prairie markets. These branch assembly plants not only relieved congestion in Ford City but also provided an additional source of profit to the company.³⁷

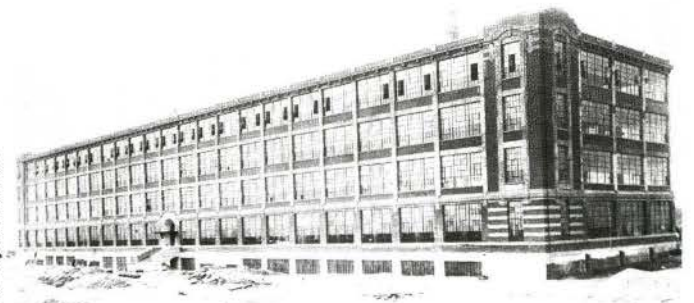


Fig. 5. Canadian Consolidated Rubber Co. Ltd., Dominion Tire Plant, Kitchener, Ontario, 1914.

KAHN'S INDUSTRIAL BUILDINGS 1922-1938

The qualities of the multi-storied reinforced concrete buildings which had contributed significantly to the new factory image and the huge increase in productivity became obsolete by the early 1920s. The floor areas of such buildings, rarely wider than 100 ft., were too constrained for the new assembly lines and horizontal materials - handling systems which were rapidly superseding the earlier vertical and gravity methods. As the volume of business revived again after the immediate post-war depression many companies, especially Ford, could afford to replace their earlier vertical buildings with the new horizontal plan structures. Albert Kahn was in the forefront of design work for this new generation of factories.³⁰

The transition from vertical to horizontal plans can be clearly illustrated in Kahn's Canadian work for Ford in 1922-23 (Fig. 7). A huge engine plant covering 928,000 sq. ft. (considerably larger than the total floor space of all the previous buildings) was erected in Ford City. Monitor roofs with steel frames provided the overhead daylight for the machine shops and engine assembly line. Kahn also designed a new power plant for the factory complex. This plant was the biggest coal-fired generating station in Canada for several decades (Fig. 8 and 9).

Market demand for Model T cars and trucks in the Ontario market provided the impetus for a new Toronto assembly plant in 1923 replacing the earlier plant only seven years later. The new plant, located in East York at Danforth and Victoria Park, was larger than the earlier building (at 182,000 sq. ft.) and was mostly of steel frame construction with distinctively large roof monitors for lighting and ventilation.³⁰ A small power house provided steam heating. The reliability of Ontario Hydro's electricity supply no longer necessitated any power generation on the site.

Albert Kahn Associates also worked for the other large motor vehicle manufacturers who were overtaking Ford in the latter part of the 1920s. Kahn probably designed buildings for General Motors of Canada at Oshawa as well as the western assembly plant for Chevrolet at Regina, opened in 1928.⁴⁰ The large new Chrysler assembly plant in south Walkerville (1929) was also probably designed by Kahn. This complex consolidated Chrysler production from a variety of local and more distant factories, including the Dodge assembly plant in Toronto.⁴¹

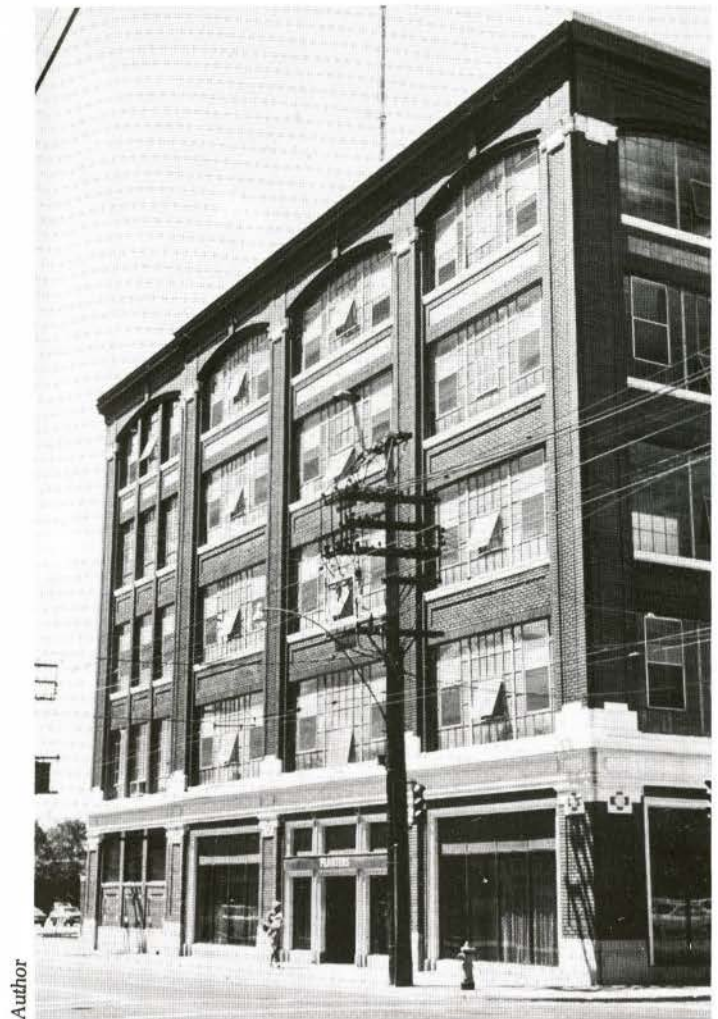
There were few opportunities for industrial work in the 1930s, given the collapse in demand and the serious overcapacity problems in the Depression. Ford commissioned Plant 6 at Windsor from Kahn in 1937. This building was almost identical to the 1923 factory although a little smaller at 586,000 sq. ft.

What appears to have been Albert Kahn's last industrial work in Canada was the Chrysler engine plant in Windsor (1938) and a small parts warehouse in Chatham. These buildings represent the final stage of Kahn's factory design work. A series of buildings for Chrysler (1936-38) in steel and glass mark a high point in the evolution of modern factory buildings. The Chrysler buildings in Windsor and Chatham show the same characteristics which were so well developed in the De Soto press shop building (1936) and the truck plant at Warren, Michigan (1938) which had a new style of monitor roofs.⁴² The Research Engineering building south of the General Motors head office in Oshawa appears to be a similar structure and may be attributed to Albert Kahn (Fig. 10).

KAHN'S CONTRIBUTION TO CANADIAN INDUSTRIAL ARCHITECTURE

Three stages of Albert Kahn's industrial work are represented in Canada and have been identified in this paper. The multi-storied, mill-type reinforced concrete factory built in the period 1905-1921 was the most widespread. There are several examples of the transitional phase of single storey construction using brick or concrete wall claddings. Finally there are few examples of the very innovative steel frame and glass wall construction in Canada, a phase which represented Kahn's final contribution to industrial building design. Increasing recognition of Kahn buildings is essential, as several have already been demolished or have almost disappeared beneath later accretions.

The Canadian industrial work of Kahn was part of a larger movement, as yet mostly unrecognized. Kahn was a highly visible and well-placed promoter of new factory architecture, especially in Detroit, but the ideas were rapidly diffused elsewhere. The role of the building firms in Canada has yet to be explored. If the advertisements are to be believed, the Montreal/Toronto firm of T. Pringle & Son Ltd. played a big part in Canadian factory design from the 1890s.⁴³ American companies had a substantial role as they followed their early multi-national clients across the border. Lockwood, Greene & Company from Boston, established a branch office in Montreal, while the Austin Company of Cleveland open-



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Fig. 6. The Ford assembly building, Christie and Dupont Streets, Toronto, 1915-16. Similar branch plants were designed by Kahn for Ford in London, Ontario, Montreal and Winnipeg as well as in 20 cities across the United States. This Toronto plant was replaced after only seven years by a horizontal layout building.

ed an office in Toronto. Canadian clients often sought U.S. architects for their new factories in the boom period just before World War I.⁴⁴

The movement stimulated by Kahn spread to Europe with some multi-storey buildings inspired by Kahn constructed in Britain 1912-16⁴⁵ and in Italy during the early 1920s. The Ford Motor Company of Canada Ltd., which had supplier rights to the British Empire outside the British Isles,⁴⁶ was influential in spreading Kahn buildings into South Africa, India, Singapore, Australia and New Zealand. The plant, in Lower Hutt, New Zealand (1936) is a scaled-down replica of the Windsor parent and assembled vehicles from the crates of parts shipped across the Pacific from Canada.

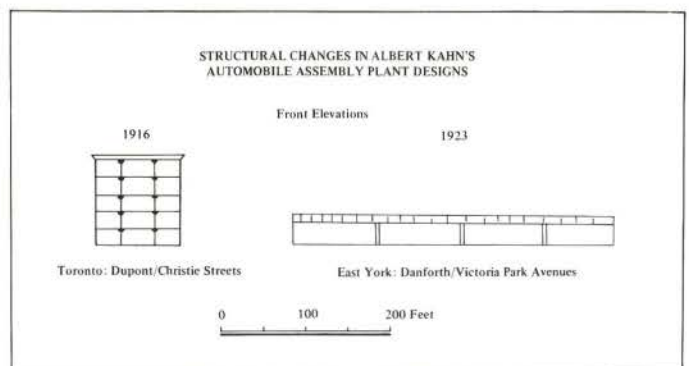


Fig. 7. Contrast in Kahn's automobile assembly plant designs 1916 and 1923.



Fig. 8. The Ford Motor Co. factory complex at East Windsor, Ontario, circa 1925. Kahn designed the multi-storey buildings on the riverfront (1910-18) the power house (1922-23) and the engine plant (1923). The latter building, of steel-frame construction, covered a floor space of nearly one million square feet.

Albert Kahn's place in architectural history may now be subject to some reappraisal, in the light of the post-modern movement which may have some new insights to offer on neglected architects of the early twentieth century. Kahn's industrial work has been somewhat ignored in the literature of modern architecture.⁴⁷ But as Hildebrand has remarked, "Kahn lays outside any architectural movement, American or European. In one aspect of his career he belonged to the eclectics, but in another he far outdistanced them."⁴⁸ There is a dichotomy in Kahn's career between the patrician, stylistically elegant, non-industrial buildings well represented in Detroit and the "...revolutionary, forward-looking, tough-minded industrial solutions..."⁴⁹ of many of his industrial plants. Such contradictions were part of the rapidly changing milieu of early twentieth century Detroit and are clearly exemplified in Kahn's best client, Henry Ford, "who apparently saw no contradiction between the nostalgia for the past of Greenfield Village and a dedication to the Model T, which had made that past irretrievable."⁵⁰ The dichotomy in some of Kahn's work, where new functions were often dressed in more traditional exteriors, may be less abhorrent to the post-modernists than it was the promoters of the modern movement.

Kahn's work was, according to Hildebrand, not only tasteful but was also genuinely and boldly innovative. He was able to design "highly original schemes which simultaneously answered problems of structure, light and ventilation."⁵¹ Unlike many of his contemporaries, Kahn was willing to find architectural solutions to purely utilitarian design pro-

blems, bringing a team approach to the complex needs of industry in a new technological age. Kahn has left some eminently useful buildings and some very handsome ones, which "constitute an important facet of architectural history in their own right."⁵² Kahn's buildings despite their enormous scale, have a harmonious relationship between form and function.

Albert Kahn and his contemporaries made a broader contribution to the built environment beyond their individual factories. The Kahn and "Kahn-type" buildings occupy a distinct place in the urban landscape of North American cities, clearly identifiable by the vertical and horizontal lines of concrete, the red brick wall fillings and the extensive areas of windows. Once these signs have been recognized, large areas of the cities of Southwestern Ontario, especially Windsor, have a new meaning. Albert Kahn, to use the words of John Stilgoe, was one of the "moulders" of the early twentieth century "industrial zone aesthetic."⁵³ □

NOTES

1. Detroit Institute of Arts, **The Legacy of Albert Kahn** (Detroit, 1970).
2. **The legacy of Albert Kahn** (1970), pp. 8-11.
3. The industrial work is most thoroughly examined in: Grant Hildebrand, **Designing for industry: the architecture of Albert Kahn** (Cambridge, Mass. M.I.T., 1974).
4. See for example:
Moritz Kahn, **The design and construction of industrial buildings** (London: Technical Journals Ltd., 1917).
George Nelson, **Industrial architecture of Albert Kahn Inc.** (New York: Architectural Book Publishing Co., 1939).
Albert Kahn Inc., **Architecture** (New York: Architectural Catalog Co., 1948).
5. **Ford Times**, VI (9), June 1913, p. 375.
6. The innovations and their effects are described in:
Hugo Diemer, **Factory organization and administration** (New York: McGraw-Hill, 1910).
Simeon J. Koshkin, **Modern materials handling** (New York: Wiley, 1932).
Daniel Nelson, **Managers and workers: Origins of the new factory system in the United States 1880-1920** (Madison: University of Wisconsin Press, 1975).
Some of the excesses of the early mechanization of the assembly processes were satirized in Charlie Chaplin's film "Modern Times" (1936) and the murals of Diego Rivera in the Detroit Institute of Arts (1934-33). See Bertram D. Wolfe, **The fabulous life of Diego Rivera** (New York: Stein & Day, 1963), pp. 302-316.
7. Gerald Bloomfield, **The world automotive industry** (Newton Abbot: David & Charles, 1978), p. 41.



Fig. 10. The reinforced concrete head office building at General Motors of Canada, Oshawa, Ontario (1926) and the Research Engineering building (c.1941).



Fig. 9. Details of brickwork, Ford Motor Co. power house (1922-23).

8. Craig Heron, 'The crisis of the craftsman: Hamilton's metal workers in the early twentieth century,' *Labour/Le Travailleur*, 6(6), 1980, pp. 7-48.
9. H. L. Arnold & F. L. Faurote, *Ford methods and Ford shops* (New York, 1915), pp. 41-42.
10. Greg Kealey ed., *Canada investigates industrialism: The Royal Commission on the relations of labour and capitalism 1889* (Toronto: University of Toronto Press, 1973).
General attitudes towards labour in the early part of the century are described in W. L. MacKenzie King, *Industry and Humanity: a study of the principles underlying industrial reconstruction* (1918, reprinted University of Toronto Press, 1973).
11. G. M. Price, *The modern factory: safety, sanitation, welfare* (New York, 1914).
12. "Industrial betterment in Canadian factories: Improved conditions make factory life more pleasant," *Industrial Canada*, January, 1907. The symbolism of these changes was recognized by Kahn in a small plaque on the west wall of the Ford assembly plant at St. Paul, Minnesota (1924): "Excellence is never granted to man but as the reward of labour."
13. See for example: Carl W. Condit, *American building art: the twentieth century* (New York: Oxford University Press, 1961), Chapter VI; Carl Condit, 'The first reinforced concrete skyscraper,' *Technology and Culture*, 9(1), 1968, pp. 1-33; W. P. Chamberlin, 'The Cleft-ridge span: America's first concrete arch,' *I.A. the Journal of the Society for Industrial Archeology*, 9, 1983, pp. 29-44.
14. *Industrial Canada*, December 1916 p. 940.
15. See for example:
Moritz Kahn, *The design and construction of industrial buildings* (London: Technical Journals Ltd., 1917).
Martin Grief, *The new industrial landscape: the story of the Austin Company* (Clinton, N.J.: The Main Street Press, 1978).
The Canadian Cement and Concrete Association was formed in 1907 and held its first annual convention in Toronto in March 1909.
16. Association of American Portland Cement Manufacturers, *Factories and Warehouses of concrete* (Philadelphia, 1911).
17. See A. Nevins & F. E. Hill, *Ford: The times, the man, the company* (New York: Scribners, 1954), p. 645.
18. There is a partial list of buildings in: Albert Kahn Inc., *Architecture* (New York: Architectural Catalog Co., 1948), pp. 159-173. Albert Kahn Associates Inc. Detroit have only very sketchy details of their early Canadian work.
19. *Industrial Canada* which generally includes fairly comprehensive details of factory buildings rarely mentions the architect's name.
20. The development of Walkerville to 1921 is described in: R. G. Hoskins, 'Hiram Walker and the origins and development of Walkerville, Ontario,' *Ontario History*, 64, 1972, 122-131. Thomas Adams in *Rural planning and development* (Ottawa: Commission of Conservation, 1917) p. 171. was very enthusiastic about Walkerville which had "...very important features in common with the garden city type of development. The grouping, arrangement and durability of the buildings, the paving of the streets and the preservation and development of natural features, in this town, make it compare favourably with the model village of Bournville and Port Sunlight in England."
21. John J. M. Pratt, 'Albert Kahn and Willistead: problems of Interpretation,' M.A., Cornell University, 1978.
22. G. T. Bloomfield, 'Industrial development in the Border Cities to 1929,' A report to the Historical Atlas of Canada project, vol. III (Report No. 11), March 1983, 26 pp.
23. W. Hawkins Ferry, *The buildings of Detroit: a history* (Detroit: Wayne State University Press, 1968).
24. Geoffrey Hunt, *John M. Lyle: Toward a Canadian architecture* (Kingston: Agnes Etherington Art Centre, Queen's University, 1982), p. 24.
25. Grant Hildebrand, *Designing for industry: the architecture of Albert Kahn* (1974) pp. 28-43.
26. Kaufman Rubber Co. Ltd., Berlin, Canada, *Catalogue* (1909).
27. Albert Kahn Inc., *Architecture* (New York: Architectural Catalog Co., 1948), pp. 80-88, 164-166.
28. Elizabeth Bloomfield, 'Building the city on a foundation of factories: The "Industrial Policy" in Berlin, Ontario 1870-1914,' *Ontario History* LXXV (3), 1983, 207-243.
29. *Daily Telegraph*, Berlin, 13 January 1913.
30. G. Hildebrand, *Designing for Industry* (1974) pp. 43-54.
31. *Industrial Canada*, January 1916, p. 944, advertisement.
32. Gerald Bloomfield and Elizabeth Bloomfield, 'Entrepreneurs and

- managers in the development of the Canadian rubber tire industry 1900-1940,' a paper presented at the Canadian Business History Conference, Trent University, Peterborough, May 1984, 21 pp.
33. A. Nevins & F.E. Hill, **Ford: The times, the man, the company** (New York: Scribners, 1954).
34. Ford City was incorporated as a village in 1912, a town in 1915 and as the city of East Windsor in 1929. It was merged in Windsor in 1935. Elizabeth & Gerald Bloomfield, **Urban growth and local services: the development of Ontario municipalities to 1981** (Guelph: Dept. of Geography, University of Guelph, 1983), p. 22.
35. **Ford Times**, Canadian Edition, July 1915, p. 459.
36. **Ford Times**, Canadian Edition, May 1916, pp. 453-454.
37. All Ford vehicles were sold f.o.b. Windsor when in practice the vehicles were actually assembled closer to the final customers. The difference in freight rates was frequently very profitable.
38. Kahn appears to have made the transition during 1921. The Fisher body plant in Cleveland was a five storey reinforced concrete building, while the new Ford assembly plant in Chicago was a single-storey building. This structure replaced the Ford six-storey building which had been completed in 1914. Rapid obsolescence of plants was a characteristic of the Ford company in this period of very rapid growth of output.
See: Detroit Insurance of Arts, **The legacy of Albert Kahn** (1970), p. 52 and A. Nevins & F.E. Hill, **Ford: Expansion and challenge, 1915-1933** (New York: Scribners, 1957), pp.256-257.
A similar transition may be noted in Canada. Kahn designed the Fisher Body Company plant in Walkerville (1913-c.1920) in a multi-storey form, although the reinforce concrete frame was wholly covered by brick. Some multi-storey buildings continued to be in demand by clients, for example: Kellogg Co. in London (c.1924) and H.J. Heinz Co. (Building M7, 1930) in Leamington.
39. The new generation of assembly plants required larger site areas usually on greenfield sites and were a significant contribution to the suburbanizing trend of industry from the 1920s.

Toronto Ford Plant

	Dupont Street (1916)	Danforth Ave. (1923)
Area covered by factory	100 x 220 ft.	380 x 480 ft.
Total site area	425 x 220 ft.	1,250 x 500 ft.

40. G.T. Bloomfield, "I can see a car in that crop": Motorization in Saskatchewan 1906-1934,' **Saskatchewan History**, XXXVII(1), 1984, p. 16.
41. The Dodge plant was probably the earlier Canadian Aeroplanes Ltd. factory, Dufferin Street, Toronto (1917). This building was John M. Lyle's only industrial commission apart from his earlier work for Ontario Hydro. See: Geoffrey Hunt, **John M. Lyle: Toward a Canadian Architecture** (Kingston, Ont.: Agnes Etherington Centre, Queen's University, 1982) p. 89.
42. These buildings have been highly acclaimed by architectural critics and historians. See: Detroit Institute of Arts, **The legacy of Albert Kahn** (1970), pp. 24-25.
43. "We plan and supervise the building of factories," advertisement, **Industrial Canada**, August 1913, p. 95.
44. The Williams, Greene & Rome Co. in Berlin, Ontario went to Philadelphia for the architect (Williams, Steele & Co.) of their new shirt factory in 1913. See: G.T. Bloomfield, **Industrial buildings and vernacular housing**, a field guide for the S.S.A.C. tour, 7 June 1984, p. 13.
45. The reinforced-concrete buildings in Scotland are discussed in: G.T. Bloomfield, 'New integrated motor works in Scotland 1899-1914,' **Industrial Archaeology Review**, V (2), 1981, pp. 126-142.
46. M. Wilkins & F.E. Hill, **American business abroad: Ford on six continents** (Detroit: Wayne State University Press, 1964), Chapter 2.
47. Henry-Russell Hitchcock, **Architecture: 19th and 20th centuries** (Harmondsworth: Penguin, 1958), pp. 361 and 403.
Reyner Banham, **Theory and design in the first machine age** (London: Architectural Press, 1960) have no mention of Albert Kahn. The conflicts between functionalism and eclecticism are considered in: John Burchard & Albert Bush-Brown, **The architecture of America: a social and cultural history** (Abridged edition 1966) p. 182.
Walter C. Kidney, **The architecture of choice: Eclecticism in America 1880-1930** (New York: Braziller, 1974).
Manfredo Tafuri & Francisco Dal Co., **Modern Architecture** (New York: Harry N. Abrams, 1979) p. 238.
48. Hildebrand, **Designing for industry** (1974), p. 222.
49. *Ibid*, p. 217.
50. *Ibid*, p. 217. See also: G.T. Bloomfield, "The business side of Henry Ford,' **The Herald** (Greenfield Village and Henry Ford Museum . special commemorative number 50th year), 8(2) 1979, pp. 6-13.

51. Hildebrand, **Designing for industry** (1974) p. 219.
52. *Ibid*, p. 222.
53. John R. Stilgoe, 'Moulding the industrial zone aesthetic: 1880-1929,' **American Studies** 16(1), pp. 5-24. See also: J.R. Stilgoe, **Metropolitan corridor: Railroads and the American scene** (New Haven, Conn.: Yale University Press, 1983).

Preliminary listing and chronology of Albert Kahn buildings in Canada INDUSTRIAL AND ASSOCIATED BUILDINGS

I Multi-storey buildings

1908	Berlin, Ont.	Footwear factory	Kaufman Rubber	AKA
1910-19	Ford City, (Windsor), Ont.	Auto works	Ford Motor Co.	AKA
1912-14	Berlin, Ont.	Tire factory	Dominion Tire	AKA
1912-19	Walkerville, Ont.	Auto bodies	Fisher Body Co.	AKA
1915	Toronto, Ont.	Assembly plant	Ford Motor Co.	AKA
1916	Winnipeg, Man.	Assembly plant	Ford Motor Co.	AKA
1916	Montreal, Que.	Assembly plant	Ford Motor Co.	AKA
1921-2	Oshawa, Ont.	Assembly plant	General Motors	
1924	London, Ont.	Boiler House	Kellogg Co.	AKA
1930	Leamington, Ont.	New Kitchen bldg. (M7)	H.J. Heinz Co.	AKA
?	Walkerville, Ont.	Heating & lighting fixtures	Canadian Hoskins Company	AKA
?	Walkerville, Ont.	Pt. distillery?	Hiram Walker	AKA
?	Hamilton, Ont.	Textile plant	Eagle Spinning Co.	AKA
?	Montreal, Que.	Rubber factory	Can. Consolidated Rubber	AKA
?	Kitchener, Ont.	Rubber factory extension, Boiler House	Can. Consolidated Rubber	AKA

II Single storey buildings

1922-23	Ford City, Ont.	Engine plant	Ford Motor Co.	
1923	East York, Ont.	Assembly plant	Ford Motor Co.	
1924?	Oshawa, Ont.	Assembly plant	General Motors	
1928	Regina, Sask.	Assembly plant	General Motors	
1929	Walkerville, Ont.	Assembly plant	Chrysler Corp.	
1937	Windsor, Ont.	Assembly plant	Ford Motor Co.	
1938	Windsor, Ont.	Engine plant	Chrysler Corp.	
1938	Chatham, Ont.	Parts warehouse	Chrysler Corp.	

COMMERCIAL AND OFFICE BUILDINGS

1894	Walkerville, Ont.	Office	Hiram Walker	AKA
C. 1907	Walkerville, Ont.	Bank	Canadian Bank of Commerce	AKA
1926	Oshawa, Ont.	Office	General Motors	
?	Windsor, Ont.	Office	Strauss Land Co.	AKA
?	Windsor, Ont.	Bank	Canadian Bank of Commerce	AKA
?	Walkerville, Ont.	Office	Walkerville Land & Building Co.	AKA
?	Walkerville, Ont.	Office	Can. Bridge Co.	AKA
?	Walkerville, Ont.	Store	Walker Stores	AKA
?	Woodstock, Ont.	Bank	Canadian Bank of Commerce	AKA
?	Summerside, P.E.I.	Bank	Canadian Bank of Commerce	AKA
?	Halifax, N.S.	Bank	Canadian Bank of Commerce	AKA

RESIDENCES

- 1904-05 Walkerville, Ont. 'Willistead' E. Chandler Walker AKA. Several additional residences and dwellings are cited in John J.M. Pratt, 'Albert Kahn and Willistead: Problems of interpretation,' M.A. thesis, Cornell University, 1978, Appendix 3.

Source: Partly based on Albert Kahn Inc., **Architecture** (New York, 1948), pp. 159-173.
Buildings shown as AKA in list above are noted in this source.