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The Grand Significance of the Grand Trunk Shops

Hayden Bulbrook

With roof assessment underway and continuing discussion of appropriate adaptive reuse of the Grand Trunk Railway Shops, I think it is long overdue to explore the grand technological significance of the Shops. After all, the material and technological breakthroughs of the shop have seldom - if ever - been explored. So let's explore!Though fruitful, a chronological history of the Shops' many expansions simply cannot be told here. Instead, I'll focus on the most fascinating and comprehensive era, the 1907-09 expansion. Although a tender shop was added in 1904, the Shops proved inadequate by 1906. As a result, planning for yet another expansion began in the winter of 1906. By August 1907, construction began on the massive 616 feet by 175 feet machine and erecting shop, as well as a boiler shop, and a powerhouse. By 1909, this massive undertaking was complete with a dinner to mark the formal opening on February 18th.

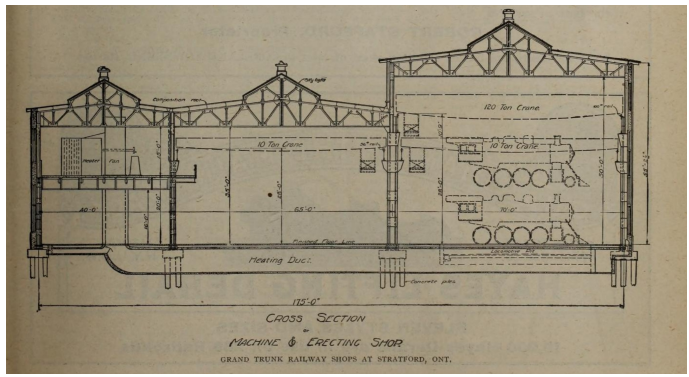

Diagram of the Shops showing concrete piles and skylights.
The Railway and Marine World, 1907

Warren trusses along the west elevation of the Grand Trunk Shops.
Hayden Bulbrook, 2020.

The Arnold Company of Chicago, Illinois supervised the engineering and construction work of the Shops in Stratford. This company was renowned across North America for its work on steam and electric railways. It was organized by Bion J. Arnold in 1896 "primarily to build electric power plants, a number of which were built at that time." By the time of the expansion of the Shops in Stratford, Arnold was a substantial figure in the engineering world. He was even noted to be a close friend of Thomas Edison who had his own connection to Stratford's railway history when he was young.
Vice President of the Grand Trunk Railway, E.H. Fitzhugh, oversaw the project. Superintendent of Motive Power, W.D. Robb, and Master Mechanic Robert Patterson worked on project details including the machine tool layout of the machine and erecting Shops. B.V. Hole of London, Ontario, was awarded the general building contract. The Canadian Bridge Company of Walkerville, Ontario fabricated and erected the structural steel. Davidson and Von Aueberg of Montreal installed the concrete piles.

Glazing

Although mothballed today, significant glazing comprised much of the Shops. The windows appear to have been rolled steel sash as seen with the steel muntins and mullions in the historic photographs. This window type was quite a new product at the time of construction, and it permitted maximum light in the building. Renowned industrial architect Albert Kahn experimented with reinforced concrete and glazed exteriors that maximized daylight, likely influencing the design of the Shops. Up until the second decade of the 20th century, natural daylight was prized and even favoured over artificial light. Engineer Harry Franklin Porter stated in 1915 that, "window glass and white paint are better than electric lamps in the daytime for supplying factory illumination."

This prioritization of natural light was seen in the use of Arthur E. Rendle's Paradigm Skylights in which 55,000 sq. feet were installed. This technology was not new for the 20th century. Rendle showcased some form of skylight at the World's Columbian Exposition in Chicago in 1893, which would have been no small feat. Its installation in the Shops is therefore fantastic.

Concrete

The GTR expansion required the extensive use of Portland cement, a key ingredient for concrete. An infant industry in Canada in the early 1890s, the use of concrete – through the production and prominence of Portland cement – skyrocketed in the first decade of the 1900s. Before Portland cement production started in Canada in 1886, domestic production would have been strictly in natural hydraulic cement, an industry that likely began in Thorold, Ontario in 1841.

Particularly significant is the use of reinforced concrete, used mainly for the walls of the surviving machine and erecting shop. While forms of reinforced concrete can be traced to the Romans, its first use in the United States was likely in 1875. Its use in Canada does not appear to have occurred much before 1904.

According to a 1909 article in Railway Master Mechanic, the expanded Shops required the use of concrete piles "in the first eight bents of the machine and erecting shop, the engine pits are also supported on concrete piles, eight concrete piles being driven under each engine pit, each figured to carry a maximum load of 35 tons." These were Simplex piles. While piles have been used for centuries, the concrete pile was quite new, having been introduced in the United States in 1901 when A.A. Raymond developed the Raymond pile.

In 1903, the Simplex pile was first introduced. It too was a cast-in-place type pile. At its most basic, the Simplex made "their piles in the ground by driving an empty cylindrical iron form into the ground and filling the hole so formed with rich concrete as the shell is drawn up. In this way the concrete is brought into intimate contact with the soil and takes a firm hold." Astoundingly, it is likely that the Shops are an early example of an industrial structure in Canada that used reinforced concrete and cast-in-place concrete piles!

Further positioning the Shops temporally, the use of concrete was rapidly adopted in the first decade of the 20th century. In fact, it was viewed by some engineers as the best possible material for industrial buildings since it was regarded as fireproof, it was rigid and could withstand the abuse of faulty workmanship and design, and its strength increased over time. As concrete became more reliable, faith in this material increased with an almost zealous fervour.

Certainly much has been said of the contribution of the Shops towards Stratford's growth and identity. I hope this article persuades those who simply see the Shops as an eyesore that they are far more than an old Stratford story. They are the story of Canada's industrialization and the desires of humankind to innovate and overcome challenges with engineering and technology. So here's to hoping that there's a strong emphasis on historical interpretation when the Grand Trunk Shops are adaptively reused!

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Do you like to write? We need people to write articles for our newsletters. The word count should be from 250 to 400 words. The topic? Something concerning the buildings in Stratford and Perth County and the stories that they tell. Contact Allan Tye allanjrtye@gmail.com

Interested in information about researching or having a plaque made? Get in touch with our plaque coordinator Carole Huband hubandca@rogers.com

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