

HISTORY NOTES

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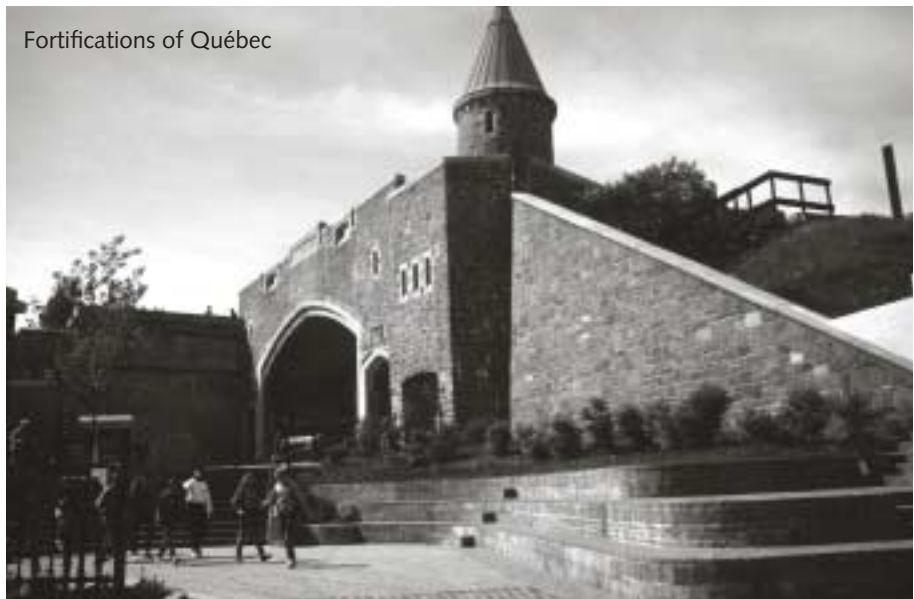
CANADIAN CIVIL ENGINEERING HISTORY THROUGH THE NATIONAL HISTORIC CIVIL ENGINEERING SITES

By Alistair MacKenzie

Born of the Colonial struggles of two major European powers and living on the doorstep of the world's one remaining super power, it is little wonder that in Canada we frequently feel that our history and heritage takes a secondary role to that of other countries. As far as the history of Civil Engineering is concerned, the bulk of literature available (at least in the English language) records the development of Civil Engineering in Europe and the United States. Works about Smeaton, Telford, Brunel and the Stephensons on one side of the Atlantic and Wright, Jervis, Eades and the Roeblings on the other side tend to give the impression that engineers of worth and engineering works of worth existed only in these countries. Some excellent books on the history of Canadian Civil Engineering, such as Norman Ball's "Professional Engineering in Canada", and "Building Canada", Mark Andrews' "For King and Country" and Peter Hart's "A Civil Society" exist, but their circulation tends to have been restricted to enthusiasts rather than to have led to any Canadian Engineers becoming "household" names in the way that Brunel is in the UK or Roebling in the United States.

Yet here in Canada, we have a truly rich history and heritage of Civil Engineering, with projects as large, innovative and technologically challenging as any in the world, and a "cast" of Civil Engineers ranging from the brooding genius to the wild eccentric, from the religious puritan to the roistering drunkard, sometimes with several of these attributes in a single person!

One of the ways in which the Society tries to make the general public and indeed, civil engineers themselves more aware of this rich heritage is through the National Historic Civil Engineering Sites program where we identify significant sites, record their relevant technical and historical details and place an informative memorial plaque in a suitable loca-



Fortifications of Québec

tion on or near the site. We have, to date, commemorated 34 of these sites, and although several important historic works are not yet included in that number, a review of those which we have commemorated and of the engineers responsible for the design and construction of these projects gives a comprehensive overview of the history of Civil Engineering in Canada.

The earliest Civil Engineering works in Canada addressed the problems of transportation and communication across the vast areas of the country, but before considering Civil Engineering in Canada in terms of the profession as we view it today, we should not forget that long before the arrival of Europeans, the Native Americans had developed very efficient methods of addressing these same problems of transportation and communication. The abundant lakes and rivers were used to form the first transportation infrastructure. Dugout canoes, birch bark canoes and skin canoes were efficient methods of water transportation, easily carried overland on what were later to be named the "portages", past rapids, or waterfalls and between

unconnected bodies of water. And it was these same transportation methods that the first European commercial entrepreneurs used in developing the fur trade. The story of the development of trade routes by the Hudson's Bay Company and the North West Company is the story of the improvement and adaptation of the early types of watercraft, by the construction of the large "Voyageur" freight canoes and the "York" and "Durham" boats, and of improvements to the water routes themselves. Canada's first canal, a short stretch by passing the rapids at Sault Ste. Marie, was constructed in 1798 by the North West Company.

The development of the Civil Engineering profession in Canada falls into three principal stages: the early works of first the French, and later the British Military engineers; the second "phase" is that of "imported" Civil Engineering expertise, mainly from Europe and the United States, followed by the third stage, the flowering of "home grown" engineers. Civil Engineering in Canada as we understand it today dates from the late Seventeenth and early Eighteenth Century with the works of the

French Military Engineers. These engineering works were principally directed at providing protection for the new small settlements against incursions from the Native Americans and from the British to the South. As in Europe, so in North America, the earliest examples of Civil Engineering works were in fact of Military construction and the oldest of our National Historic Civil Engineering Sites links us with our military past and of the struggle for supremacy of our two founding peoples. The oldest City in the New World was heavily fortified in the mid 18th. century and the historic Fortifications of Québec were commenced in 1745 under the direction of Gaspard-Joseph Chaussegros de Léry (1682-1756), Chief Engineer of the King's Works in New France from 1716 until his death. These fortifications were later expanded and improved by both French and English Military engineers. Not only do these works provide interesting evidence of the Civil Engineering knowledge and expertise of the French military, they also led to some important advances in the understanding of soil mechanics. De Léry was a truly outstanding figure worthy of consideration as the First Canadian Engineer who made multiple contributions to engineering and architecture in the New World. The forts at Chambly, Niagara and Saint Frédéric are further examples of his prolific work, as were some of the buildings for Canada's first venture into heavy industry, Les Forges du Saint-Maurice. As an Architect he was involved in Québec's Cathedral, the Château Saint-Louis, the

Intendant's Palace and Montréal's Parish Church.

De Léry also studied the possibility of constructing a canal between Montréal and Lachine, to bypass the rapids, thus anticipating the first flowering of "true" Civil Engineering works in Canada, Canada's "Canal Age", culminating eventually in the construction of the St. Lawrence Seaway. It was, indeed, with Canals that the Canadian Infrastructure communications network commenced, permitting access of people and goods far into the interior and making settlement possible, and it was with canals that Canada's Civil Engineering development commenced. However, De Léry had passed away before the first operational canal system on the St. Lawrence was commenced. A series of small canals were built between 1779 and '83, skirting the rapids above Montréal. Full development of the Canal "boom" followed but it was now the turn of the British Military Engineers with the construction of the Rideau Canal by Lt. Col. John By and the Ottawa River Canals at Grenville and Carillon by Lt. Col. Henry Du Vernet.

Several other Canals feature in our list of national Historic Civil Engineering Sites, the earliest being Nova Scotia's Shubenacadie Canal, built between 1826 and 1861, linking Halifax and Dartmouth harbours with the Bay of Fundy. Intended to develop the Nova Scotia hinterland and to draw business from St. John, New Brunswick to the Halifax area, the canal was 54 miles long and made use of seven lakes and a river. It was to have had a total of fifteen locks. The initial

plans were prepared by Francis Hall, a one time apprentice of Thomas Telford and therefore one of the second phase engineers "importing" European skills and knowledge to Canada. Lack of funding resulted in an interruption of construction between 1831 and 1854. On resumption of construction, considerable redesign had taken place and on completion it had seven locks and two marine railways. Once again, "imported" European design and construction expertise were involved as the lock designs were substantially based on those of the Forth and Clyde Canal in Central Scotland, a canal designed by the first person known to call himself a "Civil Engineer", John Smeaton. Like so many canals, however, the Shubenacadie Canal was a commercial failure, having been made quickly obsolete by the competition of railways. It is interesting to note, at this point, the way in which the world-wide engineering community is linked. To hark back briefly to the Fortifications of Québec, several examples of the cannon displayed to this day on the Québec ramparts bear the manufacturing marks of the Carron Company of Scotland, a company that employed John Smeaton as principal engineer in the design and construction of their works.

Almost contemporary with the Shubenacadie Canal was the commencement in 1833 of what would eventually become the Trent Severn Waterway. Eventually is an appropriate word as the Project took 87 years from initial concept to completion. It was a microcosm of the problems encountered in early Canadian Civil Engineering works. Hampered by lack of finances, by political indecision, indifference and, more frequently, interference, these works provide an amazing example of the grit, determination and above all of the technical skill and innovative thinking of the Civil Engineers of that era. The Waterway is 386 kilometers and features the splendid lift locks at Peterborough and Kirkfield, the marine railway at Big Chute, and 44 locks. It was the early work on the Waterway carried out by Nicol Hugh Baird that the Society particularly recognized in commemorating this Project as a National Historic Civil Engineering Site.

To be continued in the next edition...

