

Structural Material Considerations for the First Graving Dock in St. John 's, Newfoundland Harbour

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ABSTRACT

The graving dock in St. John's, Newfoundland is located at the south western end of the harbour at "River Head". Its placement is ideal because it is more or less dry during low tide and occupies an area with little traffic. The first graving dock was of wood construction and the original contract dates back to 1882.

In 1882 the advantages of having an upgraded dry dock were known for almost forty years. The earliest reference found was in 1856, when an American entrepreneur, Cyrus Field, published a pamphlet. It showed the advantages of the location of St. John's along Atlantic shipping routes and he predicted a great future for St. John's if the dock facilities could be improved.

Up to 1882 a floating dry dock was employed, but this was not sustainable as the floating dock began to deteriorate and become unsafe for lifting purposes. Also, enlarging the floating dock would be superfluous. This put pressure on government, along with economic demands, to build a permanent graving dock in St. John's.

The government entered into a contract with J.E. Simpson and Sons of New York at a cost of \$550,000, in 1882, for the construction of a wooden graving dock. Before work could commence, thorough research was conducted to ensure the most suitable structural material was selected for the graving dock in St. John's.

The Honourable J. J. Little and St. John's Harbour Master, Commander G. Robinson, were sent to Boston, Charleston, New York, Philadelphia, Baltimore, and Washington City to survey American dry docks for the government of Newfoundland. Little submitted his report on January 2nd, 1883, a bill to construct the graving dock was passed on April 21, 1883, work commenced in May of 1883 and the graving dock opened on December 10th, 1884.

The following paper will give a brief history of the graving dock and discuss Little's survey of the American dry docks through his correspondence with Engineers and those with vested interested in the ship industry. It will highlight the engineering challenges and advantages of both wooden and stone dry docks and it should become apparent why the wooden design was chosen.

1 HISTORICAL BACKGROUND

In 1856, an American entrepreneur, Cyrus Field, published a pamphlet that showed the advantages of the location of St. John's along Atlantic shipping routes and he predicted a great future for St. John's if the dock facilities could be improved. So, in the 1861 a group of local businessmen purchased and shipped a floating dry dock to St. John's harbour. The floating dock was eventually in a state of disrepair and became unsustainable. A permanent graving dock was built to relieve economic pressure from local merchants.

The permanent graving dock in St. John's Harbour is located at the southern end as shown in figure 1. It is ideally situated at a point in the harbour where there is low water at low tide and there is little traffic. The dock officially opened on December 10, 1884 when the HMS Tenedos was the first ship to enter the dock.



Figure 1: Map of St. John's Harbour showing the location of the dry dock highlighted in green (Source: www.sjpa.com)

The dock was built by J.E. Simpson and Sons of New York at a cost of \$556,000 (\$6,000 over budget). Construction began in May of 1883 and finished six months ahead of schedule with its completion in December of 1884. It was 190 meters long, 40 meters wide and drew 8 meters of water at the gate sill. When completed, it was the largest of its kind in the Western hemisphere (See figure 2).

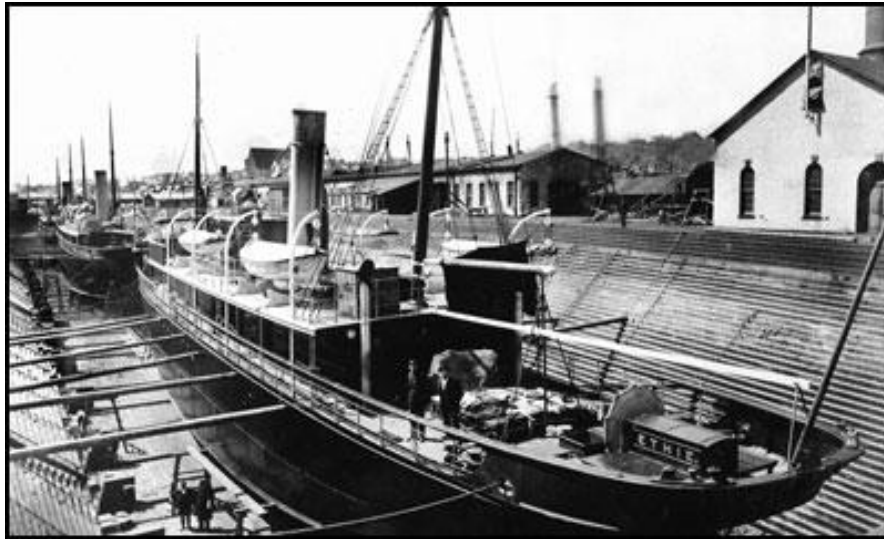


Figure 2: Wooden dry dock in St. John's Harbour.
(Source: www.virtualmuseum.ca)

J. E. Simpson and Sons originally operated the dock under a ten year lease at \$15,000 per year. However, in 1892, they went bankrupt, the lease was terminated and control was given to the Newfoundland government. In 1894 the dock was leased jointly to two local firms, Angel & Co. and Harvey & Co. They operated it for 4 years, until 1898, when the dock was purchased for \$325,000 by the Reid Newfoundland Company as part of R.G. Reid's 1898 railway contract. From 1898 to 1923 the dock served as the junction of the Reid Newfoundland Railway and "the Bay Boats" (eight 350 ton vessels of the Reid fleet). The Newfoundland government took ownership of the dock once again in 1923 and in 1924 the wooden design was deemed unsafe after 40 years of service. The wooden dock was then replaced by concrete and steel in 1925 (See figure 3). The concrete dock was completed in 1926 at a cost of \$1,104,000. It was operated as a part of the government-owned Newfoundland Railway until confederation in 1949. Under the terms of confederation, control was given to CN Railways and later, an independent subsidiary of CN Marine and Marine Atlantic until 1997. Since then it has been owned and operated by Newdock.

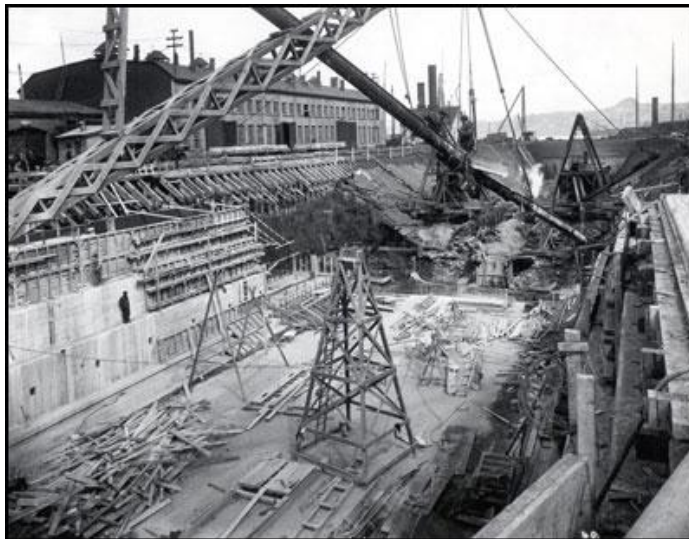


Figure 3: Replacing the wooden dry dock with concrete
(Source: www.virtualmuseum.ca)

The decision to use wood to construct the original dry dock was a decision that the Newfoundland government thoroughly scrutinized. Originally, a stone dry dock was favored and the wooden design was not even considered in the Kinniple, Morris Report, presented to the legislative council in 1879. Governor, Sir John H. Glover, ordered and paid for the Kinniple, Morris Report that favored a stone dock over a wrought iron floating dock. The comparative advantages of a stone dry dock, in summary, were as follows:

1. A stone dock would employ mostly local materials and labour over a period of some 3 or 4 years and could be expected to have a very long useful life with a minimum expenditure for maintenance.
2. A wrought iron floating dock would cost as much as a permanent stone structure of equal capacity but its maintenance costs would be greater and the entire initial cost would have to be expended off the island. (Evans, H.G., 1987)

To research dry docks further, the Newfoundland government appointed the Honourable J. J. Little and St. John's Harbour Master, Commander G. Robinson to research the American system of dry docks. They visited Boston, Charleston, New York, Philadelphia, Baltimore, and Washington City to consult with Engineers and ship experts. Little created a report that contained the various facts and opinions of those he consulted with. This report heavily favored wood construction which was a surprise to many, even Little. Little states in his report, speaking of the Simpson wooden docks, "I must frankly admit that my own prejudices were formerly against them..." This report, submitted on January 2nd, 1883, led to the passing of a bill to construct the dry dock using the wooden design. On April 21, 1883, the Newfoundland legislature passed "An Act to Provide for the Construction of a Graving Dock, and for the Other Purposes Connected Therewith." (46 Victoria, Cap. 5).

2 J. J. LITTLE AND HIS REPORT

As previously stated, J. J. Little visited Boston, Charleston, New York, Philadelphia, Baltimore, and Washington City. He inspected American docks made by J. E. Simpson and Sons of New York and also granite docks in Charleston and Brooklyn. To compare one system to the other he used the following criteria:

- Probable time for construction
- Relative utility
- Durability
- Expense of repair
- Cost of operating
- Effectiveness

He also ranked his communications with individuals in order of importance.

Communications of first importance:

- U.S. Navy, F.C. Prindle, C.E., of Brooklyn Navy Yard
- F.D. Wilson, Chief Naval Constructor, U.S. Navy, Washington, D.C.
- W.P.S. Sanger, O.E., U.S. Navy, Washington, D.C.
- Philip Hichborne, Naval Constructor, League Island Navy Yard, Philadelphia

Communications of second importance:

- James L. Randolph, Chief Engineer, Balt. & Ohio R.R. Co.

Communications of third importance:

- Hon. A.C. Harmer, Member of Congress, Philadelphia
- Hon. Wm. Pinkney White, Mayor of Baltimore

Communications of fourth importance:

- Official reports of the board of inspectors ordered by the Secretary of the Navy to inspect the Baltimore and Brooklyn dry docks
- Testimonials from merchants, shippers, and marine insurance companies
- Agents and surveyors for underwriters
- C.H. Cramp, President of W. Cramp & Sons, Ship and Engine Building Co.
- R. Garrett, President of Baltimore Dry Dock Co.
- Peter Wright & Co., a steamship company
- A. Schumacher & Co. a steamship company
- John Roberts, Superintendent and Engineer for Atlas line of steamers, NY
- Capt. Samuel Trott, cable steamship Minia

2.1 Communications of First Importance

2.1.1 U.S. Navy, F.C. Prindle, C.E., of Brooklyn Navy Yard

Prindle highlights the cost and time savings as the most important feature of the wooden structure. The cost of a wooden dock would be 30 to 50 per cent less than a stone dock. The time required for construction would be one-third to one-fourth the time of a stone dock. Also, lost time of construction during the winter season favored the wooden design as more time would be lost building a stone dock.

He admits in his report that he had his own prejudices against the wooden docks based on the belief of more deterioration and decay. However, after several years of personal experience, he was compelled to believe that all the wooden structures below the water level are “practically imperishable.” Expensive repairs to timber docks are not necessary until after 20 years of service. Repairs required to the granite dry docks at New York and Boston Navy Yards at the time, in his opinion, would considerably exceed the cost of renewal to Simpson docks of the same size during the same period.

The largest docks constructed in New York, Philadelphia, and Boston were Simpson docks and demand for their use was steadily increasing. They had the confidence and support of shipbuilders, underwriters, and steamship companies. They stayed in safe and successful use during all seasons. Also, they were favored for naval use.

Other principal advantages of wooden over stone docks were greater accessibility, better facilities for shoring and repairing vessels, better distribution of light and air, dryness, and greater safety and comfort for the workmen in freezing weather.

The feasibility of constructing an efficient timber dock upon the site foundation in St. John’s, Newfoundland was favorable, even if it was required to fill the bedrock fissures with concrete.

2.1.2 F.D. Wilson, Chief Naval Constructor, U.S. Navy, Washington, D.C.

Wilson’s opinion was the Simpson docks had many advantages over granite, especially in cold climates. The Simpson dock was one third the cost to construct. These docks were drier and subsequently men and ships were more secure.

Docks he saw of wood construction were in constant use for 20 years with slight repair and he also believed timber docks to be “practically imperishable.”

He believed that the United States Government should abandon all construction of new stone docks in favor of Simpson timber docks.

2.1.3 W.P.S. Sanger, O.E., U.S. Navy, Washington, D.C.

Sanger simply stated that he completely agreed with Wilson besides the statement that the United States should abandon the construction of anymore stone docks for Simpson's plan.

2.1.4 Philip Hichborne, Naval Constructor, League Island Navy Yard, Philadelphia

Hichborne had 25 years of experience in docking ships at the time of Little's report and docked over 300 vessels. He believed, in comparison to granite docks, the Simpson dock had better facilities for reaching all parts of the dock, provided greater economy in time, needed less labor in constructing, had greater durability, cost less in repairs, and was better adapted for docking ships. For these reasons, he preferred the use of Simpson timber docks.

2.2 Communications of Second Importance

2.2.1 James L. Randolph, Chief Engineer, Balt. & Ohio R.R. Co.

Randolph states that if the timber is kept sufficiently wet then it will be preserved and if in constant use then this is enough to keep the timber sufficiently wet. In his previous experience, two timber docks he built in Erie Basin, Brooklyn were much cheaper and faster to build than stone docks. Wash out between stones has a greater effect on the stone falling away than braced timber. Joints in Stone can be made tight with cement but with freezing and thawing the expansion and contraction opens the joints. It is easier to fasten temporary bracing to timber rather than stone. At the same price he would choose the timber dock over stone.

2.3 Communications of Third Importance

2.3.1 Hon. A.C. Harmer, Member of Congress, Philadelphia

Harmer had a sub-committee on Naval Affairs referred to him for a Bill for the construction of a dry dock at the United States Navy Yard, Philadelphia. He was to examine the best dock for government use. After a careful full investigation, he arrived at the conclusion that the Simpson dry dock was the most perfect and successful for the country. He also stated that no appropriation of money could be carried through Congress for any other type of dock.

2.3.2 Hon. Wm. Pinkney White, Mayor of Baltimore

White was instrumental in securing land from the United States government for the dry docks in Baltimore. As the mayor he had a vested interest in the docks of Baltimore. He was satisfied that the Simpson dock was the best choice in the beginning and it had stood the test of service. He was pleased with the value of the dock, its superiority over stone docks, and its durability.

2.4 Communications of Fourth Importance

Many of the communications of fourth importance restate what has already been stated. In most cases, the information contained in fourth importance communications helped shape the opinions of those of other importance. One communication of particular interest however is that of Capt. Samuel Trott.

Trott conducted his own research of dry docks and inspected stone docks closely. He was of the opinion that the stone docks of England were of “fine” construction and he believed most people considered granite far superior to wood. He then docked into one of Simpson’s wooden docks in New York on the steamship Minia. He considered the wooden dock to be one of the most complete, clean, dry, and accessible docks he had ever seen.

He then devoted some time to visiting the granite United States Navy dock at the navy yard in Brooklyn. He noted the granite dock cost \$2,000,000 and no expense was spared to make it efficient. The granite dock built here in that climate was an utter failure. Almost every stone had been moved by frost, and although joints were caulked in thick layers in almost every seam with lead, the dock still leaked and there was close to six inches of water all over the floor of the dock. Also, a 1400 ton mass of pig iron was placed near the entrance, in the bottom of the dock, to prevent the bottom from bursting up.

He had no doubt that the United States government would have to eventually turn their attention to wooden docks and condemn granite for dock purposes. He believed wood docks were cheaper to build, cheaper to maintain, and more durable. He said it can be easily shown that the wood was practically indestructible.

3 CONCLUSION

J. J. Little noted in his final report that there were four granite docks in the United States, with one in the course of construction in San Francisco. The government funded three of the stone docks and the one in San Francisco was funded by private capital. The private capital dock was eventually changed to one of wood construction and the stone was covered with wood where it was practicable to do so. Also, this was in a city where the winters are mild.

The shortest time of construction for a granite dock was 7 years, which was a smaller dock. The largest wooden Simpson dock required 18 months for construction.

Compared to stone docks, Little provided compelling evidence that wooden docks provide a savings in time of construction and greater durability, which translates to a savings in cost of operation and maintenance. The professional and knowledgeable opinions of the time strongly favored the effectiveness of a Simpson dry dock.

The weight of the opinions expressed in Little’s report could not be denied by the government and for this reason the bill that was finally passed to build the dock included the requirement for a wooden Simpson dock.

As a final note, one may ask themselves why concrete was not considered in the original construction, as eventually the dock was replaced with concrete. In the late 1800s concrete construction was in its infancy and this was not a viable option.

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