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HISTORIC BRIDGES ON THE RIDEAU WATERWAYS SYSTEM:
A PRELIMINARY REPORT
(1976)

THE ST. PETER'S CANAL SWING BRIDGE
(1976)

THE UPPER DORCHESTER COVERED BRIDGE,
WESTMORLAND COUNTY, NEW BRUNSWICK
(1977)

by
ROBERT W. PASSFIELD

PARKS CANADA
DEPARTMENT OF INDIAN
AND NORTHERN AFFAIRS

PARCS CANADA
MINISTÈRE DES AFFAIRES INDIENNES ET DU NORD
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Abstract

This report locates and identifies bridges of historic interest on the Rideau waterways system. The historic bridges are grouped according to their general type (moveable or fixed) and their material(s) of construction. A history and description of each of these structures is given along with a brief history of the bridge site.
Historic Bridges on the Rideau Waterways System

Introduction
Over the navigation channel of the Rideau Canal, including the Tay Canal branch, there are a total of forty-two bridges. Of these, six are railway bridges: 5 fixed high levels, and 1 bascule; and 36 are road bridges: 19 fixed high levels, 1 vertical lift, 1 bascule, and 15 swing bridges. In addition, there are 17 bridges at lock stations which span either the river or the waste weir channel. Of these, nine are constructed on dams/waste weirs, six over the waste weir or river channel and two are railway bridges. In all there are 59 bridges on the Rideau Waterway. None of these bridge structures were erected at the time of the canal's construction. The oldest bridge structures date from 1888. The timber king post truss swing bridges, however, are replicas of an older type of swing bridge which has been retained through reconstruction.

Of these 59 bridges 26 are briefly described in this paper. These bridges were selected on the basis of criteria established for assessing the historical significance of bridges over the Rideau waterways system in an internal document prepared by the writer in 1975.

The present report consists of short historical accounts of the individual bridges selected on the basis of the 1975 document. The bridges are grouped, and described, according to general type (moveable or fixed) and material(s) of construction. Eventually a more definitive treatment of the bridges will be done.
To supplement the information contained in this report, the "Rideau Canal: Preliminary Site Studies" series, produced by Restoration Services Division, Engineering and Architectural Branch, with the assistance of the Research Division, National Historic Parks and Sites Branch should be consulted.

Timber Swing Bridges
The five timber swing bridges found on the Rideau Canal are replicas of a swing bridge designed for use on the Rideau Canal in 1864 (Fig. 39)¹ which was in turn a modification of a type of swing bridge erected on the canal as early as 1843 if not before (Figs. 37, 38).² Previous to that date moveable bridges on the Rideau Canal were of the rolling bridge type (Fig. 36).³ The timber swing bridges have been completely rebuilt at approximately twelve year intervals over the years; but their basic structure has been maintained with but a few minor alterations.

The superstructure of each bridge consists of a heavy timber frame span, supported by a corbel frame under the heel section of the span, and strengthened by means of a Kingpost truss set over each of the two main stringers. Each truss consists of a heavy timber main post and three iron suspension rods which are fixed at one end to the main stringer at the heel, toe, and mid-point of the long-arm, and at the other end, to the transverse cap beam directly over the main posts. The bridge is further strengthened by knees and braces placed inside the main posts and the frames. To provide horizontal stability, the bridges are further equipped with iron roller wheels which run about the pivot on a concentric iron track circle, some 12 feet in diameter, set into the pivot pier. There are also roller wheels set into the toe and heel beams which run on the abutments of the bridge to provide ease of opening and closing. With the exception of the working parts, several angle braces and the suspension rods, the whole of the
superstructure is constructed of timber with a plank deck and wooden railings. The timber swing bridges vary slightly in length; but are approximately 70 feet long and have a standard clear width of 12 feet with a loading capacity of five tons. All are manually operated by means of a capstan and chains or a push bar (Fig. 39).

Timber swing bridges today are to be found at Nicholsons locks, Kilmarnock, Jones Falls, Brass Point and Lower Brewers (Washburn). All but the Brass Point bridge either span or are adjacent to lock chambers and comprise a single swing span. Of this group of timber swing bridges, the oldest crossing site is that at Kilmarnock built at the time of the construction of the canal, c.1832. The other bridges were built at Nicholsons locks in 1864, Lower Brewers (Washburn) in 1872, Jones Falls in 1883, and Brass Point in 1887 (Figs. 2-6).

The five timber swing bridges are excellent replicas of the 1864-65 model Rideau Canal swing bridge and closely approximate the appearance of the rolling bridges erected on the canal at the time of its construction. These bridges contribute a great deal toward maintaining the original appearance of the canal as built by Colonel By. They provide functioning examples of a type of historic bridge structure which can no longer be found standing on any of the other Canadian canals.

Four moveable bridges were built at the time of the canal's construction. As early as 1843 these were beginning to be replaced by swing bridges and in the following decades new swing bridge crossings were built across the canal. By the late 1880s, on the eve of the decision of the Department of Railways and Canals to commence replacing timber swing bridges with steel structures, there were 18 timber swing bridges on the Rideau Canal. Thirteen of these were single span swing bridges. The other five were swing spans forming part of larger continuous span, low level, crossings. By 1930, the number of timber swing
bridges had been reduced to 13. This number has dwindled further until today only five remain, including the Brass Point swing span.

Combination Timber Swing and Fixed Steel Bridge: 
Brass Point (1902-03)
The Brass Point timber Kingpost truss swing span forms part of a long low level bridge which crosses the narrow neck of water connecting Cranberry Lake and Little Cranberry Lake. It is located approximately half way between the Jones Falls and Upper Brewers lock stations and carries Burnt Hills Road across the waterway. This county road connects Seeley's Bay on Highway 15 on the East side of the Canal with Battersea on the main county road to the west of the canal.

The present Brass Point bridge consists of a Kingpost truss timber swing span and four fixed steel spans. The swing span is of the same design as the other Kingpost swing bridges on the Rideau Canal; while the four steel spans are low through trusses of a Warren truss design. The bridge overall is 467 feet 6 inches long with 3 steel spans of 100 feet, one of 95 feet, and a swing span of 72 feet 6 inches. The steel spans have a clear road width of 15 feet; while that of the swing span is a standard 12 feet. The loading capacity rating of the crossing has been downgraded to as low as two tons in recent years due to the deteriorating condition of one of the timber crib piers (Fig. 6).  

The first bridge erected at Brass Point in 1887, consisted of eight timber truss fixed spans and a Kingpost truss swing span supported on rock filled timber cribs and abutments. During the winter of 1902-03, the fixed timber spans were replaced by the existing four steel spans and the sub-structure was rebuilt from the waterline up. The timber swing span has been renewed from time to time with the latest renewal dating from 1964.

At one time there were as many as five low level
continuous span crossings on the Rideau system. In addition to the Brass Point bridge these included bridges erected at Beckett's Landing and Manotick in 1867, Olivers (Rideau) Ferry in 1874, and Wellington (Kars) in 1879. Each of these consisted of multiple fixed spans in conjunction with a Kingpost truss swing span. Today, the Brass Point bridge is the only one of its type standing on the Rideau Canal or anywhere else in Ontario.

Vertical Lift Bridge
Pretoria Avenue, Ottawa (1915-17)
The Pretoria Avenue vertical lift bridge which joins Pretoria Avenue on the left, or west bank of the canal to Hawthorne Avenue on the right, or east, bank is unique on the Rideau System and is apparently the only bridge of its type in Canada. Moreover, it remains virtually unchanged in appearance from the date of its construction.

The first bridge on the Pretoria Avenue site was built in 1889-90 by the Department of Railways and Canals about 600 feet north of the present lift bridge, at the foot of John Street (Argyle Avenue). This was a steel truss swing bridge resting on timber piers. When the bridge eventually proved to be too narrow and light to handle increasing traffic demands, the Corporation of the City of Ottawa entered into an agreement in 1915 with the Federal Government, with the former undertaking to build an electrically operated steel lift bridge on the line of Pretoria Avenue south of the existing swing bridge, which was to be removed. Construction commenced in 1915; and the present structure was completed in 1917.13

The Pretoria Avenue bridge erected in 1915-17 is a Strauss direct lift bridge manufactured by the Strauss Bascule Bridge Company of Chicago, U.S.A. It is a vertical lift, deck bridge consisting of three steel spans: a centre arched lift span some 84 feet long centre to centre of bearings, and two fixed approach spans. Overall the bridge
is 205 feet long with a 44 foot clear roadway and two six foot wide sidewalks. The bridge rests upon two concrete piers set in the river and its abutments. They are faced in stone above the water line with the piers being carried above the deck of the bridge, to provide towers to house the operating machinery and the bridge operator. The bridge has a vertical lift of 20 feet, which provides a total 30 foot clearance over the water when raised. It is electrically operated by means of vertical climbing racks and counterweights located in the towers (Fig. 7).\(^{14}\)

In appearance the bridge has altered little over the years. The open centre truss span and the facing on the exterior of the outside fixed span plate girders date from the original, as does the trellised iron crossing guard at either end of the bridge. The original asphalt covered timber deck and two lines of street car tracks have been removed and a different deck installed. This consists of reinforced concrete on the fixed spans and an open steel grating on the lift span.

**Steel Through Truss Swing Bridges**

At present there are five through truss swing bridges extant on the Rideau Canal system. All are rivetted steel structures, and were erected in the period 1888-1903 when the Department of Railways and Canals followed a policy of replacing the timber King post truss swing bridges with iron and/or steel superstructures. These bridges were of various truss types; and the five which remain differ widely in their structural design. They are to be found at Long Island, Burritts Rapids, the Narrows, and on Beckwith and Drummond streets in Perth (Figs. 8-12).

All of these structures are of the unequal arm, or bobtail, centre-bearing type of horizontal swing bridge which turn and are supported upon a pivot pier erected on one wall of a lock or on one bank of the navigation channel. They are stabilized by means of counterweights placed under
the short arm, or heel, of the swing span, and by roller wheels fixed to the underside of the bridge outside of the centre pivot. The roller wheels run on a concentric track circle, about 12 feet in diameter, set into the pivot pier. Three of these bridges consist of single swing spans which either cross the navigation channel (Burritts Rapids), or over a lock (Long Island and the Narrows). The other two, the Beckwith and Drummond street bridges, cross the Tay River channel in Perth and each comprises a swing and a fixed span.

Burritts Rapids (1897)
Burritts Rapids is the oldest bridge crossing on the Rideau system with the first bridge across the river at that site dating from 1824. At the time of the construction of the canal, Burritts Rapids was one of the six sites on the canal chosen for the erection of bridges. A fixed bridge was constructed there in 1832 some 900 yards above the lock. This bridge provided a 28 foot clearance over the water. In 1851, a timber kingpost truss swing bridge was erected on the site. This bridge was renewed at intervals thereafter until 1897 when the present steel through truss swing bridge was constructed.

The present Burritts Rapids bridge, erected in 1897, is an unequal arm, or bobtail, through truss structure of one span which crosses the south, or navigation, channel of the Rideau River at Burritts Rapids. It is supported upon a masonry abutment and pivot pier which form the banks of a 33 foot wide navigation channel. The bridge is 65 feet 6 inches long with a clear road width of 13 feet. It is manually operated by means of a turning lever inserted in the deck over the pivot. It has a plank deck, and wooden railings along the inside of two trusses. This bridge has the most interesting appearance of all the steel through truss swing bridges on the Rideau Canal as it is of an assymetrical truss design combining a Pratt and Fink truss.
Indeed, the Burritts Rapids bridge is of a design not found on other Canadian canals, or for that matter likely anywhere else (Fig. 8).

Long Island: 1935 (1903)
There was no bridge crossing at Long Island prior to the construction of the Rideau Canal. With the construction of the Long Island flight of locks, the stone arched dam, and the waste weirs over the by-wash channel on Nicoll's Island and Mud Creek in 1827-32, it was possible to cross the Rideau River there on foot. Pedestrians could do this by walking across the top of the lock gates and along the top of the other engineering structures. Indeed, there was a footpath connecting the stone arched dam and the two waste weirs. However, no bridge was constructed over the locks. 20

In 1863, a fixed bridge, the Dawson bridge, was built across Mud Creek just below the Nicoll's Island by-wash channel by a group of local residents. At the same time, they instituted a ferry service to convey vehicles and travellers from the east bank of the Rideau River around the head of the locks to the stone arched dam from where they could proceed directly to the Dawson bridge. 21 This was the first road crossing at Long Island.

In 1874, Mr. James Latimer under contract with the government, built a swing bridge across the upper lock at Long Island. The bridge that Latimer erected was an unequal arm, or bobtail, centre-bearing kingpost truss swing bridge. 22 The design was that adopted for use on the Rideau Canal in 1864-65. 23 Facsimiles of this model swing bridge are still being erected on the Rideau Canal today. The timber kingpost swing bridge at Long Island was rebuilt from time to time until 1935 when the present steel structure was erected over the upper lock. 24

The present Long Island swing bridge was built by the Hamilton Bridge Works Company of Hamilton, Ontario, and
erected just above the locks at Hogs Back in 1903. In 1930, it was dismantled and moved to Long Island for storage prior to its being re-erected there in 1935. This is an unequal arm, or bobtail, centre-bearing swing bridge supported upon a masonry pivot pier and abutments which rest on the lock walls. It is a low through, or pony, truss structure of a Pratt truss design with trellised posts. The bridge is 72 feet 8 inches long with a 12 foot roadway. The inside of the two main girders is lined with wooden railings. This bridge has a wooden floor consisting of three-inch planks spiked to timber joists, and was designed to have an eight ton carrying capacity. It is manually operated by means of a turning lever inserted through the deck of the bridge to operate the rack and pinion turning unit (Fig. 9).25

Narrows (1898)
Prior to the construction of the lock and waste weir at the Narrows in 1831-32, the 'Kingston and Perth Road' passed along a narrow tongue of land which separated Upper Rideau and Big Rideau Lakes.26 The water channel which cut through this narrow neck of land to connect the two lakes was very shallow, approximately 18 inches deep, and was forded by travellers using the road.27 During the construction of the canal however, an embankment was built on this tongue of land and the level of Upper Rideau Lake raised some four feet. The lock and waste weir were built in this embankment; but only the waste weir was bridged.28 No crossing was provided over the lock.29 In 1867, however, the Department of Public Works constructed a timber kingpost truss swing bridge over the lock, thereby re-opening the old 'Kingston and Perth Road' connection via the Narrows.30 This structure was renewed periodically over the years until 1964 when the present through truss steel swing bridge was erected just above the Narrows lock.31

The present Narrows bridge was originally erected in 1898 at Beveridges locks on the Tay Canal.32 In 1961, the
building of a fixed high level bridge at Beveridges rendered the swing bridge superfluous and it was moved to the Narrows, stored, and eventually re-erected there. This bridge is a rivetted steel through truss structure of the unbalanced arm, or bobtail, type with the two main girders being a modified Pratt truss. It is 69 feet 9 inches long with a 13 foot clear road width and a loading capacity of five tons. The floor of the bridge consists of three inch planks spiked to longitudinal timber joists. Wooden railings are affixed along the inside of each of the two main girders. The bridge is manually operated by means of a turning lever inserted into the deck of the bridge over the pivot (Fig. 10).

The Narrows swing bridge, and that at Long Island, are the only two examples on the Rideau Canal of a pony truss swing bridge.

The Drummond and Beckwith Street Swing Bridges, Perth (1888-89)
The Drummond and Beckwith swing bridges in Perth on the Tay Canal branch of the Rideau Canal, are all that remain of the five swing bridges erected over that canal branch when it was rebuilt in 1883-91. Both bridges comprise a fixed and swing span and cross the river channel in Perth on their respective street alignments. These bridges were built by the Robert Weddell Bridge and Engine Works of Trenton, Ontario, and are of the same basic design. The swing spans can best be described as being a Kingpost truss with latticed main posts and transverse cap beam from which suspension cables are hung to support the ends of a low through girder span of the Howe truss type. The fixed spans are simple Howe trusses. Structurally the swing spans are of the unequal arm, or bobtail, centre-bearing swing bridge type stabilized by means of a ring of roller wheels outside of the pivot. Each of the swing spans is 77 feet long with a clear road width of 14 feet 6 inches, and has a
plank deck nailed to timber joists. Their loading capacity is presently rated at five tons.

The bridges differ slightly in that the Beckwith St. bridge is built on a 13 degree skew; and the Drummond St. bridge has a 3 foot 6 inch wide sidewalk cantilevered on the outside of the main girder on the downstream side. The substructures of the two bridges are similar in appearance and consist of masonry abutments, piers and pivot piers. They differ however in height with the Drummond St. bridge having a vertical clearance of 10 feet 6 inches over the water and the Beckwith St. bridge clearing the water by 6 feet 6 inches. There is also a pedestrian pathway passing under the Drummond St. bridge between the pivot pier and the heel abutment. The fixed span of each bridge is identical to the other in appearance and in overall dimensions being 70 feet long with a 14 foot 6 inch clear roadway width. The bridges were manually operated by means of a turning lever inserted into the deck to operate the rack and pinion turning unit (Figs. 11, 12).

At present both the Beckwith and the Drummond street bridges are still being used by vehicle traffic; but the swing spans of the bridges were fixed in 1941 so that they are no longer operational in terms of permitting the passage of marine traffic. On each bridge, the flooring, including the joists, planking, and the 6 inch by 6 inch timber runners along each side of the deck, when last renewed in November 1973, was continued over the joint of the two spans thereby preventing the bridge from being swung. Also at some time or other, several haphazard spot welds have been made to further fix the span: for example, the lock pin shaft on the Beckwith swing span has been spot welded into the socket of the seating plate on the fixed span; and the handrail of the Drummond swing span sidewalk has been spot welded to the handrail on the abutment by means of a piece of 1 inch by 0.25 inch flat steel four inches long. To the same end several timber shims have been
driven under the span on the heel abutment, pivot pier and centre pier of each bridge. Further downstream, the fixed low level concrete bridge built on the Craig Street alignment in 1954 has only an eight foot clearance above the water. This effectively prevents pleasure craft from proceeding upstream to the Perth basin. In terms of road traffic, the Beckwith bridge serves purely local needs; while the Craig and Drummond Street bridges are on the main route connecting Highways 7 to the North with 43 to the South-East (Figs. 11-13).

The Drummond and Beckwith St. bridges are the two oldest steel swing bridges on the Rideau Canal system, and are of a type no longer found on Canadian canals. Both bridges are in keeping with the historic character of many of the homes in the area. On Drummond Street, the Canadian Inventory of Historic Building has recorded 25 buildings which number includes only those presumed or known to have been erected before about 1890. They are domestic buildings of frame or brick and vary considerably in size and architectural style. Included, among others, are an attractive Regency style house of 1859, three large brick houses of Italianate detailing probably dating from the 1880s, two examples of Second Empire design also from the 1880 period as well as several attractive houses of Classic Revival origin. Outstanding among the buildings recorded is the Summit house erected in 1823 and just recently plaqued by the Ontario Historic Board. The majority of the buildings recorded appear to be well kept and in some instances handsomely landscaped presenting the residential district of Drummond Street as a most attractive area.

Fixed Timber Bridges
The Cataraqui River bridges located at Jones Falls and at Upper Brewers Mills are fine examples of an older type of low level, fixed bridge, with rock filled timber piers, which was built over waste weirs and non-navigable parts of the
Rideau waterway from the time of the canal's construction. Each of these survivors adds much to the picturesque nature of the settings in which they are found (Figs. 14, 15).

Jones Falls (1930)
The low level fixed timber bridge at Jones Falls is located across the upper end of Whitefish Lake on the Cataraqui River downstream from Jones Falls Dam. It is part of a county road crossing which includes the Kingpost swing bridge over lock 42. The first fixed bridge at this site was constructed in 1883. It has been rebuilt and repaired from time to time. The present bridge dates from 1930 when major renewals were made to the bridge superstructure.42

The fixed bridge is a simple timber beam, continuous span structure consisting of timber stringers supported on short supplementary beams placed longitudinally over the bridge piers. The deck of the bridge is planked; and there are wooden railings along each side of the bridge. The total length of the six spans of the bridge is 246 feet; and it has a clear road width of 16 feet and a load limit of five tons. The substructure of the bridge consists of rock filled timber cribs and abutments similar to the original piers. Indeed, they may well be the original piers, at least below the water line. Overall, the present structure bears a close resemblance to the original bridge erected on the site in 1883 (Fig. 14).44

Upper Brewers Mills (1934-35)
The fixed timber bridge at Upper Brewers is located over the Cataraqui River channel at that lock station. Until 1967 it formed, together with the former swing bridge over lock 44, part of County Road 12 which connects Sudbury with Highway 15 across the canal. However, when in that year the new high level reinforced concrete bridge was opened 1400 feet down-stream from the lockstation, the road alignment was changed accordingly.45 At that time, the timber Kingpost
swing over lock 44 was removed; but the fixed timber bridge over the river was retained to provide a road access to the locks from Highway 15.  

Apparently there was a road crossing at Upper Brewers Mills before the construction of the Rideau Canal. This crossing was restored through the erection of a timber Kingpost swing bridge over the upper lock in 1850. There was a timber fixed bridge over the river from the time of the canal's construction. Both bridges were renewed from time to time thereafter. The substructure of the present fixed bridge was last rebuilt in 1919-20 and the superstructure in 1934-35.  

The bridge is a simple timber beam structure of a single span with its floor joists, or stringers, resting on rock filled timber crib abutments. The deck of the bridge is planked. There is a wooden railing along each side. The span is 35 feet long with a clear road width of 16 feet, and a load limit of five tons. This bridge closely resembles the timber fixed bridge which crossed the river in the same location in the year 1830 (Fig. 15).  

Reinforced Concrete Highlevel Bridges  
The Plaza and the Bank Street bridges are two reinforced high level bridges of particular interest. Both were constructed just prior to the First World War; but they differ significantly in their appearance. The Bank Street bridge is a massive solitary structure constructed totally of reinforced concrete with little embellishment. The Plaza bridge is part of a larger complex and is a more ornate structure with its super-structure being faced in stone and surmounted by a sandstone balustrade (Figs. 16, 17).  

The Plaza Bridge, Ottawa  
The Plaza Bridge which crosses the Rideau Canal just above the eight Ottawa locks is a rather unusual structure. In effect
it is two bridges in one, connecting Sparks Street on the
west bank with Rideau Street on the east bank, and
Wellington on the west bank with Rideau Street. It was
constructed in 1912 to replace two separate, but adjacent
bridges: the Sappers' and the Dufferin.

The first bridge on the site, the Sappers', was
built in 1828 by the Royal Engineers at the time of the
construction of the canal. It was a fixed, high level
structure constructed of dressed stone with a single arched
span crossing the canal and stone parapets which enclosed a
roadway of 18 feet clear width. This bridge provided a
28 foot clearance over the canal and a road connection
between Sparks and Rideau streets. In 1871, Samuel
Keefer, a Brockville Civil Engineer of note, was employed to
design and build a new bridge on the Wellington-Rideau
alignment. In the following year, Keefer built the
Dufferin bridge. This was a high level fixed structure
comprising three arched spans each 70 feet long, constructed
of wrought iron plate girders which formed the springing of
the arches. The superstructure was supported on two heavy
ashlar piers and abutments. At the same time, Keefer
removed the stone parapets from the Sappers' bridge to
obtain a 24 foot wide roadway and proceeded to widen it to
50 feet overall. The finished bridge was then united to the
Dufferin bridge on the east bank by means of a stone
retaining wall of 20 foot radius.

The present bridge, the Plaza Bridge, was built in
1912 at which time the Sappers' and the Dufferin bridges
were totally demolished. At the same time the
triangular open area which formerly separated the south side
of the Dufferin Bridge from the north side of the former
Sappers' Bridge was bridged over to form a single triangular
shaped bridge with a plaza in the centre. This structure
consists of a reinforced concrete slab deck supported on
steel beams which in turn rest upon concrete piers and
abutments. The piers from the springing line up, and the
outside face of the arches are faced with stone. There is a sandstone balustrade. It is a three arched span, high level fixed bridge with the centre span over the canal providing a 26 foot 5 inch clearance above water level. In 1938, or shortly thereafter, the bridge was widened by extending the upstream side of the bridge about 18 feet out, on the east bank, to meet the corner of (Union) Central Station and swinging the west bank end upstream some 75 feet to bring the south face of the bridge in line with the north face of the Station. This, however, altered the appearance of the bridge only slightly as the balustrade and stone facing of the new section was made to conform in detail to that of the existing bridge (Fig. 16).

The Plaza Bridge was constructed at the same time as the Chateau Laurier and Union Station and with the other two structures forms to all appearances an integrated complex with each structure complementing the other. The Plaza Bridge has become an Ottawa landmark.

Bank Street Bridge, Ottawa (1913-14)
The Bank Street bridge crossing the Rideau Canal in Ottawa is a high level fixed bridge constructed of reinforced concrete. It was built by the Corporation of the City of Ottawa in 1913-14. The first bridge over the canal on the Bank Street alignment was constructed by the Department of Railways and Canals in 1866. In that year, a Kingpost truss swing bridge was erected. This was replaced by a similar swing bridge in 1882 and in turn by a through truss steel swing bridge in 1898. In 1910, the City Corporation approached the Department of Railways and Canals for permission to build a new bridge which would be suitable for the passage of electric trolley cars as well as for motor vehicles. Permission was granted and in 1913-14, the City of Ottawa erected the present structure.

The present Bank Street bridge is a high level fixed
bridge constructed entirely of reinforced concrete. It consists of six arched spans with the southernmost arch spanning Colonel By Drive, the adjacent two arches crossing the canal, and the two arches on the North bank next to the canal spanning two lanes of the Driveway on that side of the canal. The northernmost arch is in-filled with wood to form a storage shed. The Bank Street bridge has an arched deck four traffic lanes wide, two six foot wide sidewalks, and was originally crossed by a double line of electric car tracks, since removed. It is presently equipped with lighting fixtures and steel handrails such as are common to most modern highway bridges (Fig. 17).

The modernization of the deck of the Bank Street bridge has deprived it of its original appearance; however, much remains that renders it of interest. This bridge represents an early attempt to provide a crossing over the canal which would permit the unimpeded passage of heavy road vehicles, such as street cars, and yet would not interfere with marine traffic on the canal. With its massive size and concrete arch type of construction, it has become a landmark dominating the canal horizon at Lansdowne Park.

_Bascule Bridge: Kingston (1915-16)_
The Kingston Bascule bridge is located in the Kingston Causeway which carries Highway 2 across Kingston Harbour at the Cataraqui River entrance to the Rideau Canal. The first bridge on this site was erected in 1827, prior to the construction of the Rideau Canal. This was a timber bridge, approximately one third of a mile long, consisting of numerous 40 foot spans and a single swing span, supported on masonry piers. The present bascule bridge was constructed in 1915-16 as part of a causeway. In the causeway there are three bridges, separated by man-made islands: a fixed steel, low level, through truss bridge at the left bank; the bascule bridge in the centre; and a reinforced concrete bridge at the right bank which is used
as a through passage by smaller pleasure craft.

The Bascule bridge is a Strauss trunnion bascule type of lift bridge designed by the Strauss Bascule Bridge Company of Chicago. It is a one span structure, 160 feet long with a 24 foot clear road width, and a 4 foot wide sidewalk cantilevered on the outside of the upstream side. The lift span consists of a high through, Warren, truss with posts; and it is floored with a steel grating deck. The bridge is operated by means of an electric motor-gasoline engine (Figs. 18, 19).68

Bascule bridges made their first appearance over Canadian canals at the commencement of the second decade of the 20th century when the first bascule was erected at Lindsay, Ontario on the Trent Canal. Within a year seven bridges of the same type were commenced and several followed in the next few years including the Kingston bascule built in 1915-16.69 For a brief period these bridges appear to have been very much in demand for canal crossings; but they soon gave way again to swing bridges of the through truss and through plate girder types. The Kingston bascule bridge, built in the early years of the bascule bridge demand, provides an excellent example of this type of bridge. Another bridge of this type found on the Rideau System is the C.N.R. bridge above the detached lock at Smiths Falls.

Through Plate Girder Swing Bridges
The five through plate girder swing bridges on the Rideau Canal are all of a kind. They are of the unequal arm, or bobtail, centre-bearing type of horizontal swing bridge which is stabilized with the aid of cast iron ballast counter-weights and roller wheels. There are four roller wheels outside of the centre pivot which run on a concentric track circle fixed to the pivot pier; and two rollers at each end of the bridge which seat on curved surface rest
castings fixed to the abutments on the centre line of the main girders (bridge closed). Each bridge structure consists of two main girders, approximately five feet deep, of rivetted or welded plate steel, joined at their base by transverse "I" beams which support the floor. The decking of these bridges is of different types. The two oldest bridges, erected at Merrickville in 1933 and Chaffey's in 1949, have laminated wood and an asphalt plank deck, respectively. The other three, erected at Kingston Mills in 1956, on Abbott St., Smiths Falls in 1959, and at Old Slys in 1962, have a combination concrete and steel grating deck with concrete on the short arm and steel grating on the long arm of the bridge. These bridges vary in length from 74 feet to 87 feet and in road width from 12 feet 6 inches to 24 feet, and have a loading capacity of 20 tons, with the exception of the Chaffey's span which is limited to ten tons. All of the plate girder swing bridges are electrically operated by means of a two horsepower motor, reducer, and rack and pinion drive unit, with the exception of the Chaffey's bridge which is hydraulically operated (Figs. 20-25).

These particular bridges are representative of a type of structure erected at a particular period in the history of the canal.

Other Fixed Bridges
There are four fixed bridges on the Rideau Waterway which are of significant interest. These represent different types of bridge structures ranging from the high level arched span Laurier bridge, to the low truss bridge over the waste weir channel on Confederation Drive in Smiths Falls, to the deck truss and the high through truss, or box beam, bridges found at Burritts Rapids and Nicholsons locks, respectively, on the west branch of the Rideau River (Figs. 26-31).
Laurier Bridge (1900-01)
The Laurier bridge which carries Laurier Avenue across the Rideau canal is a combination steel and concrete structure. It comprises eleven spans: four steel spans over the canal and the Queen Elizabeth Driveway on the west bank, which are all that remains of the original bridge erected in 1900-01, and seven concrete spans on the east bank which were built in 1943 to replace the steel spans carrying Laurier Avenue over the Canadian National Railway tracks.

The first bridge on the site of the present Laurier Avenue bridge was built by the Corporation of the City of Ottawa in 1872 to connect Maria Street (Laurier Avenue) on the west bank of the canal with Theodore Street on the east bank. It was a high level fixed, skew, bridge consisting of one timber Queenpost truss span some 60 feet long and two smaller trestle approach spans supported on trestle framework towers. The whole structure was made of rough-cut cedar logs. The wooden truss, which provided a 28 foot clearance over the canal, was completely reconstructed in 1891. Four years later the bridge was extended further along the line of Theodore Street east to permit trains to pass underneath the roadway on the east bank. By an agreement with the City of Ottawa, the Ottawa, Arnprior and Parry Sound Railway Company was given permission in 1895, to construct a wooden viaduct some 200 feet long and 28 feet wide complete with sidewalks, over their railway lines. This structure abutted on the Laurier bridge to form one integral structure. It was supported on trestle bents approximately 16 feet centre to centre. Moreover, the railway also agreed to maintain that portion of the bridge, and to replace it with an iron viaduct of the same length which would conform in materials, style, height and width to any bridge which the Corporation of Ottawa or the Federal Government might in the future build on the Maria Street alignment. This agreement was carried out in 1900-01. At that time the Department of Public Works decided
to replace the Laurier Avenue (formerly Maria Street) bridge with a more modern masonry and steel structure.75

The bridge built in 1900-01 was 344 feet long with 38 foot wide roadway and consisted of eight steel girder spans supported on steel trestle bents with rock faced ashlar footings and abutments. The reinforced concrete deck was supported on four lines of main longitudinal girders consisting of a 35 foot plate girder span on the west side of the canal over the (Queen Elizabeth Driveway) roadway; the centre 80 foot arched span; and a plate girder viaduct 226 feet long on the east side over the Canada Atlantic Railway Company tracks. The bridge was also equipped with two eight foot wide sidewalks cantilevered on the side of the outside girders and surmounted with 14 iron lamp posts with electric lights. It was built on a skew, and provided a 27 foot clearance over the canal water level.76

Today all that remains of the Laurier Bridge erected in 1900-01 are the steel girder spans on the West bank and the steel arched span over the canal. The railway viaduct portion of the bridge on the east bank was replaced in 1943 by a reinforced concrete bridge over the Canadian National Railway tracks.77 Moreover, the original steel handrailings and lamp posts have been replaced and, at present, the appearance of the deck conforms to that of any modern reinforced concrete highway bridge. The substructure of the Laurier Avenue bridge, and particularly the rivetted arch span, is of interest as it exposes to view the elaborate arrangement of braces and stiffeners adopted to support longitudinal girders on late 19th and early 20th century bridges. This contrasts directly with the clean, uncluttered lines of the more modern reinforced concrete high level bridges found elsewhere along the Rideau Canal. In all, what remains of the original 1900-01 Laurier Avenue bridge is an interesting piece of industrial archaeology (Figs. 26, 27).
The waste weir channel bridge on Confederation Drive on the north side of the canal basin in Smiths Falls, was erected in 1904 by the Locomotive and Machine Company of Montreal. It is located approximately 50 feet below the waste weir dam and provides a through driveway connecting Beckwith Street on the east, via Confederation Drive across Jason Island and the high stone dam, with city streets to the north of the stone dam. The bridge is a low level, fixed steel structure consisting of two Warren truss spans. Overall, it is 159 feet long and 16 feet wide, inside of the trusses, and has a five foot wide sidewalk cantilevered on the outside of the upstream truss. The deck of the bridge consists of three inch planks spiked to 12 inch wooden joists, or stingers; and it has a carrying capacity of five tons. The substructure comprises a masonry pier and two concrete abutments.

The Confederation Drive bridge site apparently dates from the time of the canal's construction when a bridge was built by the operators of a mill on Jason Island. This bridge, of which to date virtually nothing is known, crossed the waste weir channel a short distance below the waste weir dam. In 1849, the Royal Engineers laid out a road, Basin Street to the east of the bridge to connect with Beckwith Street, and built a new, more substantial bridge on the same alignment as the former bridge. At the same time a road, Jason Street, was apparently built from the western end of the bridge across Jason Island and the high stone dam to connect up with existing streets to the north of the stone dam. The 1849 bridge was rebuilt in 1870, and was completely renewed in 1889. At the latter date, the bridge site was moved a short distance to the south to align with Canal Street adjacent to the old Basin Street road allowance which was abandoned. In 1904, this bridge was
in turn replaced by the present structure. The existing bridge was owned and maintained by the Department of Transport until 1968 when it was transferred to the town of Smiths Falls (Figs. 28, 29). The present Confederation Drive bridge provides access from Beckwith Street to Centennial Park which the Town of Smiths Falls recently laid out on Jason Island. It is an example of a type of truss bridge, the Warren truss, which was very popular among bridge builders during the heyday of steel truss bridge construction. Two other road bridges of interest, the Burritts Rapids deck truss bridge and the high through truss bridge at Nicholson's locks, are not located on the Rideau Canal proper. They are located over the Rideau River at locksites where the canal occupies an artificial channel cut into the east bank of the river. To date little research has been carried out on either of these structures.

Burritts Rapids Fixed Bridge (1920)
The Burritts Rapids bridge is a low level, fixed steel structure consisting of two Warren deck truss spans. It was erected by the Ontario Bridge Company in 1920. The hand-rails are latticed steel; and there is a sidewalk on the upstream side cantilevered outside the truss. The bridge has a wooden, asphalt covered, deck and is supported upon a concrete pier and abutments. It is the only example of a deck truss road bridge to be found on the Rideau Canal (Fig. 30).

Nicholson's Fixed Bridge (c. 1900)
The Nicholson's lock fixed steel bridge consists of a high through truss, or box beam, span with a steel beam approach span on the right bank. The Dominion Bridge Company erected this bridge about 1900. It has a wooden, asphalt covered, deck and is supported upon a concrete pier and abutments. This type of bridge was seldom built along the
Rideau as a fixed bridge and there were never any swing bridges of this type constructed on the Rideau although they are found on other Canadian canals, such as the Lachine. At present this bridge, along with the fixed bridge in the Kingston Causeway and the multi-span bridge at Beckett's Landing, are the only bridges of this type to be found on the Rideau Canal (Fig. 31).

Railway Bridge:

**Canadian National Railways Bascule Bridge (1911)**
The Canadian National Railway bascule bridge at Smiths Falls is located just above the detached lock. This is a Scherzer rolling lift bascule bridge carrying a single line of track. There are also two through plate girder approach spans supported on concrete piers and abutments. The lift span is 69 feet long and is manually operated. During the navigation season, the bridge is kept open (raised), and is closed only for the passage of trains (Figs. 32, 33).

This bridge was erected in 1911 at a time when a number of bascule bridges, both road and rail, were being erected on Canadian canals. It differs slightly in design from the Kingston bascule. The lift spans also are different with the railway bridge having a through plate girder lift span and that of the Kingston bascule being a high through truss.

**Conclusion**
The Rideau Canal as it stands is particularly unique to North American historic canals in that it is a functioning canal system with original locks, operating machinery and auxiliary structures, or close replicas thereof, still standing and in use. The bridges on the canal are part of this historic canal in two respects. On the one hand, there are five timber swing bridges extant which are replicas of the swing bridges erected on the canal at an early date; and, on the other hand, there are bridges of various types
constructed at different periods in its history. In effect, the Rideau Canal bridges provide a visual history of the evolution of canal bridge structures which reflect developments in bridge building technology from the early 19th century to the present.
### Appendix A. List of Historic Bridges On The Rideau Waterways System

<table>
<thead>
<tr>
<th>Bridge Name</th>
<th>Date of 1st Bridge</th>
<th>Date of Erection of Existing Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Plaza (fixed concrete, high level)</td>
<td>1828</td>
<td>1912</td>
</tr>
<tr>
<td>Laurier Avenue (fixed high level, steel - concrete)</td>
<td>1872</td>
<td>1900-01 steel spans 1943 concrete spans</td>
</tr>
<tr>
<td>Pretoria Avenue (vertical lift)</td>
<td>1889-90</td>
<td>1915-17</td>
</tr>
<tr>
<td>Bank Street (fixed concrete, high level)</td>
<td>1866</td>
<td>1913-14</td>
</tr>
<tr>
<td>Long Island (steel through truss swing)</td>
<td>1874</td>
<td>1935 (1903)¹</td>
</tr>
<tr>
<td>Burritts Rapids (steel through truss swing)</td>
<td>1824²</td>
<td>1897</td>
</tr>
</tbody>
</table>
Nicholsons Locks (timber Kingpost truss swing) 1864 1971

Merrickville (through plate girder swing) c. 1832 1933

Kilmarnock (timber King Post truss swing) c. 1832 1970

Old Sly's (through plate girder swing) 1862 1962

Abbott St., Smiths Falls (through plate girder swing) c. 1832 1959

C.N.R., Smiths Falls (Rolling lift bascule) ? 1911

The Narrows (steel through truss swing) 1867 1964 (1898)¹

Chaffeys Lock (through plate girder swing) Pre-dates the canal ² 1949

Jones Falls (timber King Post truss swing) 1883 1960-61

Brass Point (4 steel fixed spans - timber Kingpost swing) 1887 1903-04 steel spans 1964 timber swing

Washburn (Lower Brewers) (timber Kingpost swing) 1872 1967
Kingston Mills (through plate girder swing) 1832 1956

Kingston Causeway (Trunnion bascule) 1827 1915-16

**Tay Canal** (Perth)

Beckwith St., Perth (steel fixed - steel swing) 1834(?) 1889

Drummond St., Perth (steel fixed - steel swing) 1834(?) 1889

**On the River/Waste Weir Channel**

*Rideau Canal* (Ottawa to Kingston)

Burritts Rapids (fixed steel deck truss) 1824 1920

Nicholson's Locks (fixed, high through truss) 1864 c. 1900

Confederation Drive, Smiths Falls (fixed steel, pony truss) c. 1832 1904

Jones Falls (fixed timber, low level) 1883 1930

Upper Brewers Mills (fixed timber, low level) Prior to 1832 1924 Sub-structure 1934-35 Super-structure
List of Historic Bridges on the Rideau Waterways System

Endnotes

1. The Long Island swing bridge was originally erected at Hogs Back in 1903. In 1930 it was dismantled and moved to Long Island where it was re-erected in 1935.

2. The 1824 bridge at Burritts Rapids, which pre-dated the construction of the canal, was the first bridge erected on the Rideau.

3. This bridge was originally erected at Beveridge locks in 1898, but was moved to the Narrows in 1961 and re-erected in 1964.

4. The fixed bridge over the Rideau River at Chaffeys Mills was removed by the Royal Engineers at the time of the canal's construction. A floating bridge of some sort replaced it until 1884 when a kingpost truss swing bridge was erected over the lock and a fixed bridge over the waste weir to complete the crossing.
Appendix B. Explanation of Technical Terms Used in this Report.

**Bascule bridge**: A bridge with a moveable leaf, one end of which can be raised about a horizontal axis with the aid of counterweights affixed to the opposite end. There are two types of bascule bridges: the trunnion or pivot bascule (q.v.), and the rolling lift bascule (q.v.).

**Bridge truss**: A rigid frame formed by an assembly of bridge members. When properly designed, a truss consists of a triangle or combination of triangles, and derives its strength from the rigidity of that configuration. Under heavy loading a triangle will hold its shape until its side members or joints are crushed.

**Cap beam (transverse cap beam)**: A horizontal member fixed across the top of the king posts of a bridge to tie the trusses together and thereby strengthen them against lateral pressures.

**Centre-bearing swing bridge**: A swing bridge designed so that the weight of the bridge is carried by the centre pivot. This type of swing bridge usually has a concentric circle of roller wheels about the centre pivot; but they serve principally to stabilize the bridge. A stiff floor beam, or beams, passing over the centre pivot carries the truss loads to the pivot (Fig. 39).
Corbel frame: A supplementary frame set beneath the main frame of a swing bridge span to strengthen it. The side members of the corbel frame extend from the heel of the swing bridge along the bottom of the main stringers for a good part of their length.

Deck truss bridge: A bridge of any truss design in which the roadway rests on top of the trusses. This is in contradistinction to the through truss bridge (q.v.; Fig. 35).

Equal arm swing bridge (double arm swing bridge): A swing bridge with the pivot situated equidistant from its ends. The pivot of equal arm swing bridges is usually located on a pier in the centre of the water channel being spanned (Fig. 35).

Fink truss: One of several bridge trusses (q.v.) invented by Albert Fink, a 19th century American railway bridge builder. The primary members of the Fink truss seen at Burritts Rapids form three triangles. For longer spans, the two outer triangles were divided with additional members (Fig. 34).

High through truss bridge: A through truss bridge (q.v.) with a deep truss. These bridges usually have lateral struts joining the top of the trusses above the roadway to strengthen them against turning about their base under lateral pressures (Fig. 35).

Howe truss: A truss design patented in 1840 by William Howe of Massachusetts. It consists of parallel top and bottom chords with vertical posts and two diagonals in each panel. One of the distinctive features of this truss is found in the division of stress wherein the verticals are treated as
tension members and the diagonals as compression members. The verticals were wrought iron rods and the diagonals were wood; but as iron gradually replaced wood as the primary construction materials, the verticals came to be constructed of wrought iron the diagonals of cast iron. The Howe truss was the most widely used truss form in the 19th century (Fig. 34).

**Kingpost truss:** The earliest form of truss used in bridge building. It consists of a centre vertical post, the kingpost, with a diagonal brace on each side forming two right angled triangles (Fig. 34).

**Pony truss bridge:** A through truss bridge (q.v.) with a shallow truss. The trusses of a pony truss bridge are joined only by the floor beams of the bridge (Fig. 35).

**Pratt truss:** A truss design patented by Caleb and Thomas Pratt of Massachusetts, Connecticut in 1844. In appearance, this truss conformed closely to the standard Howe truss, but the action of the web members was exactly reversed. The diagonals were in tension and constructed of wrought iron, and the vertical members were in compression and were of wood or cast iron. The superiority of the Pratt truss consisted of having the vertical members in compression rather than the diagonals which were more susceptible to buckling in wide panels. This truss was simplified as advances were made in calculating stresses, so that by 1860 the diagonals were reduced to single members in all but the two centre panels and the end panels. The modified Pratt truss was further simplified in the 1870s when the diagonals were reduced to a single diagonal system throughout the length of the truss. The Pratt truss was rather slow in gaining acceptance; but in time it became second only to the Howe truss in terms of its popularity among bridge builders (Fig. 34).
Queenpost truss: An early form of truss which evolved from the kingpost truss to meet a need for longer bridge spans. It consists of two vertical posts, the queenposts, joined by a horizontal member on top of the posts with a diagonal brace at each end (Fig. 34).

Rim-bearing swing bridge: A swing bridge designed so that the weight of the bridge is carried by a concentric circle of roller wheels about the centre pivot which serves only as an axis about which the bridge turns. The diameter of the roller wheel circle is usually equal to the width of the trusses with some of the roller wheels being positioned directly under each truss (Figs. 37, 38).

Rolling bridge: A moveable bridge set on roller wheels so that the whole structure can be retracted. The wheels usually run on tracks built into the ground, and counterweights are affixed to the bridge to keep the extended end from dipping down when the bridge is being retracted. The Rideau Canal rolling bridges were strengthened by means of a kingpost truss (q.v.; Fig. 36).

Rolling lift bascule bridge: A type of bascule bridge (q.v.) invented by William Scherzer, the founder of the Scherzer Rolling Lift Bridge Company of Chicago, and patented in 1893. It differs from the earlier trunnion bascule (q.v.) in that the trunnions are replaced with rockers which enable the lift span to rock backwards as it moves upwards. This all but eliminates friction as the bridge is being lifted (Figs. 32, 33).

Skew bridge: A bridge built diagonally across a river or stream rather than perpendicular to it.
**Springing (Spring line):** A line which can be drawn joining the points where the arch of a bridge meets the supporting abutments or piers.

**Swing bridge:** A moveable bridge which swings horizontally about a vertical axis. Swing bridges may be of either the centre-bearing (q.v.) or rim-bearing (q.v.) design, and conform either to the equal arm (q.v.) or unbalanced arm (q.v.) configuration.

**Through truss bridge:** A bridge of any truss design in which the roadway rests upon the bottom horizontal members. This is in contradistinction to the deck truss bridge (q.v.). The through truss may be further differentiated into a high through truss (q.v.) or a pony truss (q.v.) bridge depending on the depth of the truss (Fig. 35).

**Trunnion bascule bridge (pivot bascule bridge):** A bascule bridge (q.v.) with the lift span pivoting at one end about an axle, or, more correctly, trunnions (Figs. 18, 19).

**Unbalanced arm swing bridge (single arm swing bridge):** A swing bridge with its pivot pier on one side of the water channel with a long arm extending across it. The short arm, or heel, of this type of structure is counterbalanced to compensate for the extra weight and length of the long arm (Fig. 35).

**Warren truss:** A truss design developed in England by James Warren and Willoughby Monzani, and patented in 1848. The truss consisted of diagonals alternately sloped in opposite directions, and did not have any vertical members. The Warren truss did not attain much popularity until the late 19th century; and then it was in a modified form consisting
of the single diagonal with vertical posts. In this later form after 1900, the Warren and the single diagonal Pratt truss became the most common, as well as the most efficient, truss forms utilized in bridge construction. Today, the Warren and Pratt trusses are used almost exclusively in steel truss bridge construction (Fig. 35).
Bridge trusses:

King Post Truss
Queen Post Truss
Howe Truss

1841

1876
St. Peter's Howe Truss with King Post Truss Tower

1844
Pratt Truss (Parallel Chords)

1860's
Modified Pratt Truss

1870's
Modified Pratt Truss

1919
Modified Pratt Truss
Erected at St. Peter's
Bridge Trusses:

- Warren Truss
  - 1848
- Warren Truss with Posts
- Warren Truss Double-Diagonal System
- Warren Truss
  - Erected at St. Peter's, 1931

Through Truss
- Bridge

Deck Truss
- Bridge

Swing Bridge Conformations:

- Unbalanced or Single Arm
  - Swing Bridge
- Equal or Double Arm
  - Swing Bridge
Endnotes

1 Department of Indian Affairs and Northern Development (hereafter cited as DIAND), Canal Records, File No. 4052-253, J.D. Slater, Superintendent, Rideau Canal, to F. Braun, Secretary, Department of Public Works, 30 November 1864.

2 The earliest reference to the erection of a swing bridge over the Rideau Canal is a Royal Engineers drawing, dated 15 November 1843. DIAND, National Historic Parks and Sites Branch, Historic Prints, Drawings and Photographs Collection, Lieutenant H. White, R.E., "Plan and Elevation of Swing Bridge constructed at Merrickville over the Rideau Canal", Royal Engineers Office, Bytown, 15 November 1843.


The first moveable bridges erected over the Rideau Canal were of the rolling bridge type rather than swing bridges. However, they were of a kingpost truss design and closely approximated in appearance the later swing bridges although they operated on a different working principle.

Lieutenant Frome, R.E., Papers, pp.69-97.

Public Archives of Canada (hereafter cited as PAC), RG43, B4a, Vol. 210, F.A. Wise, Superintending Engineer, Rideau Canal, to the Manager, Lachine Iron and Steel Bridge Company, Montreal, 6 September 1887.

These figures are based on a calculation taking into account the dates of construction of the various bridges crossing the Rideau Canal in the late 19th century as well as an investigation of the type of bridge found at each of these locations c. 1890.


DIAND, Canal Records, File No. 4052 - 261, Brass Point Bridge.


DIAND, Canal Records, File No. 4052 - 233, Agreement No. 21557: Agreement between His Majesty the King, the Corporation of the City of Ottawa, and the Ottawa Improvement Commission, 10 August 1915.
16 Lieutenant Frome, R.E., Papers, pp. 69-97.
17 Ibid., p. 83.
18 PAC, National Map Collection, Rideau Canal - 1851, Captain Charles E. Ford, R.E., "Rideau Canal, Burritts Rapids, Plan, Elevation and Section of Bridge constructed over the canal at this station", Royal Engineers Office, Bytown, 31 October 1851.
19 DIAND, Canal Records, File No. 4052 - 224, Vol. I, "Specifications for one steel rivetted swing bridge to be built across the Rideau Canal at Burritts Rapids to replace the present old wooden swing", 10 January 1897.
20 PAC, National Map Collection, Rideau Canal - 1831, Captain James C. Victor, R.E., "Map from the head of Long Island to the Black Rapids and of the River Jacques from Richmond", 23 March 1831.
21 DIAND, Canal Records, File No. 4052 - 253, F.A. Wise, Superintending Engineer to F. Braun, Secretary, Department of Public Works, 12 May 1875; and ibid., "Memorial praying for the construction of a bridge over the canal at Long Island, to the Honourable H.L. Langevin, Minister of Public Works", 3 March 1870.
23 DIAND, Canal Records, File No. 4052 - 255, Vol. I, J.D. Slater, Superintendent, Rideau Canal to F. Braun, Secretary, Department of Public Works, 3 February 1865.
24 DIAND, Canal Records, File No. 4052 - 253, John Murphy, Acting Superintending Engineer, to Col. A.E. Dubuc, Chief Engineer, Department of Railways and Canals, 20 July 1935.
25 Ibid., Murphy to Dubuc, 20 July 1935; and ibid., E.E.G., Bridge Engineer, Memorandum to A.E. Dubuc, 6 June 1935.

26 PAC, R.G. 11, Series II, Vol. 59, File No. 75, Benjamin Tett to the Honourable Charles Alleyn, m.p.p., Chief Commissioner of the Board of Works, Toronto, 23 June 1858; and DIAND, Canal Records, File No. 4052 - 253, J.D. Slater, Superintendent, Rideau Canal, to F. Braun, Secretary, Department of Public Works, 30 November 1864.


29 PAC, RG 11, Series II, Vol. 59, File No. 75, Benjamin Tett to the Honourable Charles Alleyn, 23 June 1858.


32 DIAND, Canals Engineering Files, Bridge Contract No. 12992: Agreement between the Dominion Bridge Company Ltd., and Her Majesty Queen Victoria, represented by the Minister of Railways and Canals, for the construction of one new steel swing bridge at Beveridges Bay locks over the Rideau Canal, 20 January 1898.

34 DIAND, Canals Engineering Files, Bridge Contract No. 12992: Agreement between the Dominion Bridge Company Ltd. and Her Majesty Queen Victoria, 20 January 1898.


36 Ibid.

37 DIAND, Canals Engineering, Rideau Canal Bridge Book, Entries for Bridge No. 23, Beckwith Street Swing Bridge, Perth, and Bridge No. 24, Drummond Street Swing Bridge, Perth.

38 DIAND, Canal Records, File No. 4052 - 258, L.W. Clark, Superintending Engineer, Memorandum, 6 November 1970.

39 Author's observations made on a visit to the bridge site in August 1974.


41 Information furnished the author by Barbara A. Humphreys, Head, Canadian Inventory of Historic Building, National Historic Parks and Sites Branch, DIAND.

42 DIAND, Canals Engineering, Rideau Canal Bridge Book, Entry for Bridge No. 34, Jones Falls fixed timber bridge.

43 Ibid.

44 DIAND, National Historic Parks and Sites Branch, Historic Prints, Drawings and Photographs Collection, Jones Falls photograph no. R4-020-6-0051, provenience: Harold Nichol Collection.


43

47 PAC, RG 43, Bl, Vol. 229, F.A. Wise, Superintending Engineer, Rideau Canal, to A.P. Bradley, Secretary, Department of Railways and Canals, 24 October 1883.

48 Provincial Archives of Ontario (hereafter cited as PAO), Burrowes Sketch No. 65, Brewers Upper Mills, May 1830.


51 DIAND, Canals Engineering, Rideau Canal Bridge Book, Entry for Bridge No. 38, Upper Brewers Mills timber fixed bridge.

52. PAO, Burrowes Sketch No. 65, Brewers Upper Mills, May 1830.


54 PAO, Burrowes Sketch No. 13, First Eight Locks of the Rideau Canal, (1834); and DIAND, Canal Records, File No. 4052-231, Vol. I, Petition of M.J. Currier to Mr. McDougall, Provincial Secretary, 13 February 1865.


58 Ibid., Samuel Keefer to J.P. Featherstone, 29 May 1871.

59 PAC, RG 11, Series IX, Vol. 96, O'Toole and McGilivray, Contractors, to the Honourable F.D. Monk, Minister of Public Works, 14 October 1912.
60 PAC, RG 11, Series IX, Vol. 96, D. Ewart, Chief Architect, Public Works, Memorandum to J.B. Hunter, Deputy Minister, (plans enclosed), 25 April 1912.

61 DIAND, Canals Engineering Microfilm Files, Rideau Canal, Plaza Bridge, "Improvements to Confederation Park and the widening of the Bridge Structure", 7 July 1938.


64 DIAND, Canal Records, File No. 4052 - 234, Vol. II, W.H. Bowden, Chief Engineer, Department of Railways and Canals, Memorandum Re High Level Bridge at Bank Street, Ottawa, 14 October 1911.

65 Ibid., A.T. Phillips, Superintending Engineer to Col. A.E. Dubuc, Chief Engineer, Department of Railways and Canals, 10 May 1929.


67 DIAND, Canals Engineering, Rideau Canal Bridge Book, Entries for the La Salle Causeway and Fixed Bridges, and the La Salle Causeway and Bascule Bridge, Kingston.

68 Ibid., Entry for the La Salle Causeway and Bascule bridge.

69 Department of Railways and Canals, Annual Report, 1910-1911, (Ottawa: King's Printer, 1911), Trent Canal, Wellington Street, Lindsay, Ontario, p. 39.

71 DIAND, Canal Records, File No. 4052 - 232, J.D. Slater, Superintendent, Rideau Canal to F. Braun, Secretary, Department of Public Works, Ottawa, 10 June 1872.


73 DIAND, Canal Records, File No. 4052 - 232, J.D. Slater, Superintendent, Rideau Canal, to F. Braun, Secretary, Department of Public Works, Ottawa, 10 June 1872.

74 Ibid., "Extracts from a Report of the Department of Public Works, 1901", The Ottawa Bridges.


76 Ibid., pp. 228-232.

77 Date inscribed on the Laurier Avenue concrete bridge abutment.

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DESIGN of SWING BRIDGE RIDEAU CANAL.

Aug. 1874

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Plan of Upper Frame

CROSS SECTION AT C.D.

CROSS SECTION AT A.E.

CROSS SECTION AT E.E.
The St. Peter's Canal Swing Bridge
by Robert W. Passfield
1976
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The St. Peter's Canal swing bridge is located on Highway 4 which connects the Canso Causeway on the west coast of Cape Breton Island, Nova Scotia, with Sydney on the east coast. It carries the highway across the northern end of the canal just to the south of the Bras d'Or lakes. The canal itself runs north-south and provides a navigable waterway between the interior Bras d'Or lakes and St. Peter's Bay on the Atlantic Ocean to the south, a distance of approximately 0.5 miles (Fig. 1). The present swing bridge, an unequal arm steel pony truss (Fig. 2), was erected in 1931.

This report describes the history of this bridge and its predecessors and provides a brief historical account of the canal and its surroundings. A glossary of bridge truss types and sketches of the bridge trusses described in this report (immediately following the glossary) have been provided.
Early History of the Site

Nicholas Denys
The site of the present St. Peter's canal was for the better part of 300 years regarded as a potentially important trade and communications centre, as well as an area of some strategic importance for the defence of the northern half of the continent. In terms of trade and communications, the narrow isthmus gave an easy access, originally by portage overland and later by canal, into the interior of Cape Breton Island; and St. Peter's Bay provided a safe harbour close to the fisheries. Moreover, a fortress constructed there could not only command the route into the interior and serve as a secure base for defending the fisheries, but from the heights of Mount Granville, on the East side of St. Peter's Bay, the passage of any sailing vessels proceeding along the coast toward the Gulf of St. Lawrence, could be observed.

The first settlement at St. Peter's commenced in 1653 when Nicholas Denys, a French merchant-adventurer engaged in the fisheries and the fur trade along the south coast of Nova Scotia, established a fur trading-fishing post on St. Peter's Bay.¹ The previous year, Denys had purchased the trading-fishing rights to all of the coast and islands of the Gulf of St. Lawrence from Canso to Gaspé from the Company of New France. He also obtained a commission from the King of France which made him Governor and Lieutenant General of the same area. Armed with this authority, Denys sought to develop a viable settlement at St. Peter's which
could serve as a base for his far-flung operations. The fort he erected was situated at the north-east corner of St. Peter's Bay just at the foot of the western slope of Mount Granville, some 250 feet west of the present canal entrance (Fig. 3). (Denys referred to Mount Granville in his book, *The Description and Natural History of the Coasts of North America (Acadia)*, 1672, [translated 1908] as 'the mountain'. Mount Granville was not named as such until the 18th century when it was named in honour of Lord George Grenville, the British Secretary of State. Over the years, the name has been spelled two ways: 'Grenville' and 'Granville', with the latter seeming to be the more common.) This fort consisted of a low earthen embankment, one to three feet high, surmounted with a wooden palisade forming an enclosure of about 40 feet square. From this fort, Denys carried on the fur trade with the Indians and engaged in agricultural pursuits, clearing and cultivating some 80 acres of land on the top of Mount Granville. In addition, he built boats and erected buildings for the carrying on of the fisheries, cut timber for masting vessels and for burning to secure the potash needed for soap making. To facilitate his trade with the interior Denys constructed a road (known locally today as the "Haulover" or "Portage Road") across the isthmus over which large boats could be dragged by oxen to avoid the long circuit around Cape Breton Island. At a later date, the road was improved by the construction of skids which permitted even larger boats to be dragged over the isthmus. Denys' settlement prospered, but differences over territorial claims and trading rights embroiled him in a series of disputes with other French merchants and the ensuing raids and seizures of trading goods caused disastrous disruptions. Finally, a fire which completely destroyed his establishment at St. Peter's during the winter of 1668-69, forced him to abandon
the site. He retired to another of his trading-fishing posts at Nepisiguit (Bathurst) with his employees and their dependents, and then returned to France. Denys returned to Nepisiguit several years before his death there in 1688; but he made no attempt to revive his former settlement at St. Peter's. 7

Although an important fisheries-fur trading post, Denys' settlement at St. Peter's was not, while it endured, the only or the most important of his posts. Prior to settling at St. Peter's, Denys had established fishing-fur trading posts at Rossignol (Liverpool) and La Have, 8 and thereafter at Chedabouctou (Guysborough), St. Anne's, Nipisiguit (Bathurst) and on the Isle of Misou in the Baye des Chaleurs. 9 His principal post appears to have been at Chedabouctou where he had a large warehouse and employed some 120 men. 10 Nevertheless, Denys' withdrawal from Cape Breton Island marked the temporary end of European settlement there. 11

When, at the conclusion of the War of the Spanish Succession in 1713, the French were forced to withdraw from Newfoundland and mainland Nova Scotia, a renewed effort was made to promote settlement on Cape Breton Island based on the fisheries and trade. Strategically, Cape Breton was viewed as being the key to the defence of French Canada, a critical area which had to be fortified and settled on a sound economic basis. 12 Included in this grand design was the hope that a settled population on Cape Breton Island, with its harbours open the year round, would prove capable of supplying the French West Indies with the fish, breadstuffs, beef and timber hitherto supplied surreptitiously by the New Englanders. 13 To this end, the French officials and inhabitants of Newfoundland were removed to Cape Breton; 14 and efforts, ultimately abortive, were made to encourage the French Acadians to move
to the Island. Major settlements were made at St. Peter's, English Bay, and St. Anne's, renamed respectively Port Toulouse, Louisbourg and Port Dauphin, as well as at several other locations. The island of Cape Breton itself was renamed l'Isle Royalle.

Needing a strongly fortified base, the French considered Port Toulouse (St. Peter's) and Port Dauphin (St. Anne's) as well as Louisbourg (English Bay), as potential sites for a fortress before deciding in favour of Louisbourg (Fig. 4). Work on the construction of the latter commenced in 1720.

Port Toulouse
In re-establishing a settlement at St. Peter's, the French were well aware of the commercial-military potential of the site, which was renamed Port Toulouse in honour of the Count of Toulouse, a naval commander of some distinction, reputed to have been an illegitimate son of Louis XIV and Madame Montespan. Although Louisbourg was chosen over Port Toulouse as the location of the major fortifications for the island, a barracks was built at Port Toulouse and a garrison stationed there. The barracks consisted of six buildings erected to the east of Denys' original settlement site and on the opposite side of Mount Granville along the south coast of Point Jerome. The barracks were to be protected by the construction of fortifications.

It is not known at present what, if any, fortifications were constructed at Port Toulouse at that time. As early as 1717, there were plans drawn up for the building of a fortified wall, with two bastions, which was to extend across the neck of Point Jerome in the rear of the barracks buildings (Fig. 5). These fortifications, however, were not built. The barracks, nonetheless, were occupied by
French troops. The garrison numbered 62 men in 1722, but was reduced to 25 men by the late 1730's. Plans were drawn up in 1731 and again in 1733 to better house the officers and men stationed there (Figs. 6, 7). In 1734, further plans were proposed for the construction of a fort with two bastions on its landward side and a semi-circular battery facing the sea. It was to be constructed of earth with a wooden palisade (Figs. 8, 9).

In 1734 there were several houses and a brickyard at the former site of St. Peter's, then called "Petit St. Pierre," along the coast at the head of Denys' haulover road, and several dwellings at its terminus at "Petit Pas" on the shore of Bras d'Or Lake. The Parish of St. Pierre, however, was located to the east of the fort, or barracks, on Point Jerome, and consisted of about 15 dwellings and their adjoining gardens stretching in a line along the coast to the mouth of a small inlet to the east (Figs. 8, 10). By 1751 settlement tended to center on "Petit St. Pierre," and to extend beyond toward the west along the coast almost to the Tillard River. This shift in settlement may have taken place after 1745. In that year, the fort at Port Toulouse, and perhaps also the dwellings in the Parish of St. Pierre, were destroyed by a New England expedition which plundered Port Toulouse on the way to its successful assault against Louisbourg. Following the restitution of Louisbourg to France, the latter proceeded to strengthen her defences on Cape Breton Island. As part of that effort, a fort was built at Port Toulouse in the period 1749-51 (Fig. 11). This fort was constructed of earth and timber, rather than masonry. In 1765 only a few remains were still visible.

During the period of the French re-settlement of Cape Breton, following the Treaty of Utrecht in 1713, Port Toulouse rapidly developed into a commercial-communications
centre for the whole island. Indeed, it was second in importance only to Louisbourg itself with which it was connected by means of a road constructed in 1752 by the Count de Raymond, the Governor of Cape Breton. By sea, Port Toulouse was within easy sailing distance of Louisbourg and l'Isle Saint Jean (Prince Edward Island), and via Denys' road across the isthmus and the Bras d'Or lakes, was in close contact with the interior of Cape Breton. Port Toulouse carried on an active trade with all of these areas of settlement as its inhabitants engaged in boat building, and the cutting of firewood and building timber during the winter, and farming in the summer. In addition, they raised beef, kept poultry, and tended to the fisheries. Port Toulouse, in fact, supplied most of the food requirements of Louisbourg. The former was also the fur trading center for the area as the Indians of Cape Breton and Acadia came there to exchange their furs for trade goods. The population of Port Toulouse grew with the development of trade and by the end of the French regime, consisted of 230 persons, exclusive of the officers and men of the fort, at a time when the population of the whole island did not exceed 4,000 persons.

With the fall of Louisbourg in 1758, Cape Breton came under British control. Five years later it was ceded formally by France in the Treaty of Paris, and Port Toulouse was renamed St. Peter's. For two decades following the British conquest, no effort was made to develop the island; and the population, greatly reduced, remained insignificant. This was the result of a deliberate policy instituted by the British government which immediately following the capture of Louisbourg removed the French population of Cape Breton by deporting them to France. The settlements, and no doubt the forts at places such as Port Toulouse and Port Dauphin, were probably destroyed in
keeping with the fate which befell Louisbourg where the fortifications were totally demolished leaving only a few houses standing. The government also forbade the granting of land on the island, issuing only licenses of occupation to those engaged in the fisheries; and in 1774, it reserved the timber of the island for the use of the Royal Navy. In addition, the British government was loath to permit extensive exploitation of the known coal deposits on the island out of a concern lest they be used to furnish the basis for the development of an iron manufacturing industry in the mainland colonies which would compete with the mother country's manufacturing concerns. Thus, by 1765 the population of the island did not exceed 1,000, exclusive of the Micmacs. In 1768 when the last British troops were withdrawn from the island, only 300 Acadians and some 400 Newfoundlanders, Irish and "Americans" remained. These were men primarily engaged in the fisheries, at a time when even the fisheries were not prospering. The settlement at Port Toulouse reflected these developments as only a few fishermen and traders continued to live there.

The Loyalist Settlers
When settlement revived again on Cape Breton Island, it was the immediate result of an influx of loyalists from the American colonies, who were encouraged to settle there after 1784. One of the first groups to arrive passed through St. Peter's, and across the isthmus, to found a new settlement at Baddeck on Lake Bras d'Or. In addition to Baddeck, other centres of loyalist settlement were Sydney Harbour, Ingonish, Port Hood, the Gut of Canso and St. Peter's. At this time most of the land on the isthmus at St. Peter's was cleared and cultivated. The settlement consisted of several large structures built just to the west of Mount
Granville, in the vicinity of the present Bay entrance to
the canal, and a cluster of houses at the head of the
Anse-du-Loup just north of Point Tillard. The earlier
French settlement of Port Toulouse, just to the east of
Point Jerome on the opposite side of Mount Granville, was
apparently not revived. There are no structures appearing
on a 1788 map of the area; and only the ruins of Fort
Toulouse were to be seen two decades earlier.

Fort Dorchester
Although the loyalist influx into Cape Breton served to form
the basis of the first permanent settlements on the island,
including the re-settlement of St. Peter's, little
development seems to have taken place. The outbreak of
war with France in 1793, however, did result in a short
lived revival of interest in St. Peter's. For the better
part of a century the strategic importance of St. Peter's
was a matter of note, commanding as it did the southern
entrance into the interior of Cape Breton and overlooking
the southern sea approaches to the Gulf of St. Lawrence.
Added to these advantages were the natural advantages of its
harbour and its environs which lent themselves to being
fortified on an extensive scale, and were capable of being
used as a centre for the defence and prosecution of the
fisheries.

Under the French regime, as has been noted, serious
consideration had been given to making St. Peter's (Port
Toulouse) the base of fortifications for the defence of Cape
Breton, and indeed of Canada, before a decision was taken in
favour of Louisbourg. Even at the close of the French
regime, the strategic importance and natural advantages of
Port Toulouse were cited in support of recommendations that
St. Peter's Bay be strongly fortified. Under the
British, following the cession of the island by France in the Treaty of Paris of 1763, periodic suggestions were made in favour of re-fortifying St. Peter's. Indeed, Captain Samuel Holland who was employed in 1765 to make a survey of Britain's new acquisitions reported that St. Peter's would be the easiest place to fortify and should be developed as a planned settlement. Holland suggested that the projected settlement might be called Frederic Town and surveyed 8,320 acres into town lots. Nothing was done to follow up his efforts or recommendations. The natural advantages of St. Peter's, however, were not long in impressing themselves upon William Macarmick, who was appointed Lieutenant Governor of Cape Breton in 1787.

Charged with the defence of the island, Macarmick quickly saw the strategic importance of St. Peter's Bay and Mount Granville. He stated his opinion that fortifications could easily be erected on Mount Granville; and that once fortified, St. Peter's could serve as the chief centre of defence for the island. The fortifications at Louisbourg, of course, had been systematically blown up by Army engineers in 1760; but even at that, Macarmick considered St. Peter's to be a superior site for the defence of the island and the fisheries. He recommended that a triangular fort with bastions at the salients be constructed on the summit of Mount Granville and mounted with 50 cannon consisting of 24 pounders on the main walls and 12 pounders in the bastions. Such a fort it was stated would require a garrison of 1,000 men, including gunners.

With the outbreak of war against revolutionary France in 1793, Macarmick commenced to fortify Mount Granville. On his own initiative he purchased eight small guns and sent Lieutenant Colonel George Moore, the militia officer in command of the southern district of Cape Breton, to St. Peter's to erect a guard house on Mount Granville and mount
the guns. Moore was further ordered to construct a magazine and to spend the winter of 1793–94 in collecting materials and making fascines to expedite the erection of a redoubt in the spring. With the aid of the local militia, who volunteered two days labour per man and worked in gangs of from 30 to 40 men, the fortifications on Mount Granville were completed by June 1794 (Fig. 12). The redoubt so completed was named Fort Dorchester in honour of Sir Guy Carleton, Lord Dorchester, then Governor-in-Chief of British North America.

Fort Dorchester consisted, in addition to a guardhouse and magazine, of a square redoubt with 15 embrasures mounted with cannon. Ultimate 16 guns were purchased for the fort. The fort, however, was never garrisoned as Macarmick was caught up with the problems involved in constructing defences for Sydney, and the failure to secure material support from the British government, which had never sanctioned the construction of Fort Dorchester, forced him to order the withdrawal of Lieutenant Colonel Moore and his men in June 1794. Fort Dorchester was thus abandoned to the elements. Four years later it was reported that the batteries of Fort Dorchester were "all in ruins."
The St. Peter's Canal

St. Peter's in the Early 19th Century

By the turn of the 19th century St. Peter's was, like Louisbourg, a former important centre of communications, trade and defence, which had been reduced for the most part to ruins in the course of the Anglo-French wars of the 18th century. St. Peter's, however, had never managed to attain the high hopes held out for it despite the natural advantages that it enjoyed. From the time of Denys' first settlement its potential was recognized; but with the exception of the period following the conclusion of the Treaty of Utrecht (1713) when Port Toulouse enjoyed an extended period of prosperity, St. Peter's fared rather badly. In general, the difficulties experienced at St. Peter's were the result of factors which had affected the whole island of Cape Breton, and continued to do so. In 1800 Cape Breton had only six miles of passable roads;¹ and a population of about 2,000² composed of loyalists and Acadians scattered over the entire island. The Acadians were for the most part recent arrivals. Some 300 of them had returned to Cape Breton at the turn of the century from the French island of Miquelon where they had settled following their enforced removal from Cape Breton on Britain's acquisition of the island.³ These settlers were soon swamped by large groups of Scottish immigrants who came to Cape Breton between the years 1802 and 1820. In those years the population increased from 2,000 to 9,000 as the Scots spread throughout the island to engage in fishing,
farming and shipbuilding; but St. Peter's seems to have derived little if any immediate benefit from this Scottish immigration.

In 1825 when the early surveys for St. Peter's canal were being carried out, St. Peter's consisted of a small number of buildings, five or more, situated to the east of Mount Granville along the shore between Point Jerome and Kavenagh Creek in the general area of the former settlement of Port Toulouse. Several houses were also to be found on the shore of Bras d'Or Lake at the northern end of Denys' haulover road. The ruins of Macarmick's redoubt, Fort Dorchester, on the summit of Mount Granville and of Denys' fur trading fort at the foot of the western slope of Mount Granville were still visible. In addition, there was a road which connected the southern end of Denys' road at St. Peter's Bay with the settlement of St. Peter's to the east of Point Jerome, and a road passing to the east of Mount Granville connecting St. Peter's with the houses on Bras d'Or Lake (Fig. 12). There was no settlement at all in the area of the present site of the village of St. Peter's to the west of the canal. This village grew up on the west bank of St. Peter's Canal following the completion of the canal in 1869.

The Construction of the Canal
Despite its strategic location and natural advantages, St. Peter's was not a settlement of any size or note in the early 19th century when the Nova Scotia legislature had a survey undertaken of the feasibility and cost of constructing a canal through the isthmus at St. Peter's. Indeed, with the exception of the local residents of Richmond County, Cape Breton, who would have benefited directly from a canal, there was little apparent enthusiasm exhibited by either Nova Scotians or their government for
its construction.

When Cape Breton was re-annexed to Nova Scotia in 1820, the possibility of cutting a canal through the isthmus was one of numerous suggestions made for the development of the island. The interest of the Nova Scotian government, however, was focused on the construction of a canal between Halifax and the Basin of Minas by way of the Schubenacadie River. In the spring of 1825, a civil engineer, Francis Hall, was commissioned to make a survey and prepare a report on the Schubenacadie canal scheme. Upon completion of this work, he was sent to St. Peter's to prepare a similar report on a future canal there. Hall submitted his two reports to the Nova Scotia House of Assembly in February 1826. The Schubenacadie report resulted in decisions being taken toward the furtherance of that work, but nothing was done to follow up the report on the St. Peter's canal project.

In his report, Hall recommended that the southern end of St. Peter's canal should be located in the north-east corner of St. Peter's Bay, at the western foot of Mount Granville. Departing from there it should follow the line of a marsh which stretched almost directly north to the Bras d'Or lakes and ran roughly parallel to Denys' haulover road which skirted its western flank (Fig. 12). The cut was to be 2,700 feet long and 13 feet deep with a 52 foot width at the water surface and 21 foot width at the bottom, necessitating the excavation of 206,556 cubic yards of earth and rock. The total cost of the project, including an allowance for the cost of constructing 1200 yards of timber retaining walls, a regulating lock and stop gates, and a drawbridge, plus contingencies, was estimated at £17,150.4.5. When it was eventually constructed some forty years or more later, the canal closely followed the route surveyed by Hall. For the time being, however, the project remained dormant but not forgotten by its avid
supporters.

As in the days of Denys', it was the desire to avoid the long difficult sailing voyage around Cape Breton Island that fostered the local interest in improving the means of transportation across the isthmus. By the early 19th century, the construction of a canal which would give ocean schooners direct access to the interior Bras d'Or lakes from the south seemed the ideal solution. Cape Breton was developing an extensive ocean-going trade exporting fish, lumber, coal and gypsum and importing manufactured goods and foodstuffs; and a canal across the isthmus, its advocates maintained, would facilitate this trade and contribute immensely to the rapid development of the island. Nevertheless, all of the attention of the legislature, as well as the monies available for canal construction, were concentrated on the Schubenacadie canal project. As that project experienced ever increasing difficulties and rising costs, whatever interest the legislature had had in undertaking canal construction gradually waned. Part of the difficulty experienced on the part of Cape Bretoners in securing the support of the province for the construction of a canal at St. Peter's was no doubt attributable to Nova Scotia's geographic position. Unlike the Canadas where geography and the close proximity of the United States necessitated canals both for their continued economic development (i.e. the St. Lawrence Canals) and defence (i.e. the Rideau Canal), the future prosperity and security of Nova Scotia was not perceived to be directly dependent on canal construction. Nova Scotia with its miles of coast line was capably defended by the Royal Navy and British troops garrisoned in the several harbours; and her trade was carried in sea-going and coastal vessels which had access to the towns via the numerous harbours. Even the interior Bras d'Or lakes could be
entered directly by ocean schooners at the north-east end, although this involved a hazardous and difficult trip around the island. Since neither the defence nor development of the province rested directly upon canals, there was a correspondingly lesser interest in undertaking their construction.  

In the years following the submission of Hall's Report, Cape Bretoners continued to apply pressure on the government, and succeeded in 1839 in securing government approval for a second survey. Following the completion of this survey, an act was passed to incorporate a private company, the St. Peter's Canal Company, to carry out construction. The company, however, was unable to raise the capital required to proceed. In response to petitions from Richmond County, a committee appointed by the legislature did re-study the St. Peter's canal project in 1848, but refused to make any recommendations without further information on the benefits to be obtained by its construction. Subsequently, two civil engineers, Charles and Lewis Fairbanks, undertook on their own initiative to survey the canal route and gather statistical information on the trade of the area. In 1850 they submitted their report to the legislature which responded with an "Act to Incorporate the St. Peter's Canal Company." This company was empowered to offer capital stock for sale to the public which it did with little success, even after the government stepped in a year later to guarantee the interest. At this point the government of Nova Scotia experienced a change of attitude. In April 1853, it passed an "Act to provide for the construction of the St. Peter's Canal" which appointed three commissioners with power to undertake the cutting of the canal, and provided them with £12,000 credit on the treasury. Work commenced on September 7, 1854.
From the beginning construction progressed slowly, so slowly that in September 1856 work was totally suspended pending an investigation of the difficulties encountered. By that time, a cut along the whole 2,400 foot length of the canal to a depth of 10 to 15 feet was all that had been accomplished. Work was resumed in July 1864 under the direction of Henry F. Perley, a provincial engineer. In May of the following year, the legislature passed an Act placing responsibility for the canal's construction on the Board of Works in Halifax with $125,000 at its disposal for the completion of the work. At Confederation, jurisdiction over all Canadian canals passed to the new federal government; and the federal Department of Public Works took over the work in progress on the St. Peter's canal. The construction of the canal was finally completed in August 1869, fifteen years after its commencement and some 44 years after the first survey.

The canal as constructed was a cut approximately 0.5 miles long and 28.5 feet wide at water level with a 13 foot depth of water. It provided a navigable waterway between St. Peter's Bay on the Atlantic Ocean and St. Peter's Inlet on the Bras d'Or lakes. The line of the canal ran almost north-south, just to the east of the old haulover or portage road. Both sides of the canal were lined for a good part of their length with a retaining wall built either of timber backfilled with stone or of coursed masonry. A single tidal lock, 122 feet long and 26 feet wide with 13 feet of water on the sill and four pairs of lock gates, was constructed at the Atlantic end of the canal. It had a floor of wood on a clay foundation with coursed masonry walls. A swing bridge was also erected across the northern end of the canal. Since the commencement of construction in 1854, the canal had cost a total of $295,596.40 of which the government of Nova Scotia had
contributed $156,523.31 and the federal government $139,073.09. However, almost upon its completion demands were made that the canal be enlarged; and in the 106 years since, several major structural changes have been made in a continuing effort to improve the canal.

St. Peter's Canal, 1869-75
St. Peter's Canal had been built in response to pressure from interested Cape Bretoners who were convinced that a canal through the isthmus at St. Peter's would facilitate the exploitation of Cape Breton's natural resources and increase the trade of the area. These hopes were not long in being realized as upon its completion coal, fish, lumber and gypsum were shipped out in large quantities, and flour and agricultural products purchased in Prince Edward Island and mainland Nova Scotia were carried into the interior. The canal soon proved to be too small to meet the demands being placed on it, and in 1872 the federal government undertook to enlarge it as part of a general scheme of canal enlargement for Canadian canals. Work commenced in June 1876, and was completed in October 1880. During this period, the width of the canal was increased from 26 to 48 feet by cutting the west bank back 22 feet, and it was deepened five feet throughout. A new lock 200 feet long and 48 feet wide with 18 feet of water on the sill at low tide was constructed just to the west of the old lock and the former filled in (Fig. 13).

The enlarged canal attracted an even greater number of vessels. In the decade of the 1880's it averaged over a thousand passages per annum, almost four times that of 1870, the canal's first full year of operation. During the last decades of the 19th century, a series of improvements were made to the canal in addition to routine maintenance
and repairs. In the late eighties and early nineties, extensive timber wharfs were constructed at both entrances to the canal. In 1885, the haulover road was repaired and the following year a road was constructed between the new village of St. Peter's, on the western side of the St. Peter's Bay entrance to the canal, and the new lock.\(^{32}\) During these years freight passing through the canal consisted primarily of fish, coal, lumber and flour.\(^{33}\)

The next major improvement of the canal was undertaken in the period May 1912 to January 1918 during which time the southern entrance was modified and a new concrete lock constructed just to the west and adjacent to the former lock.\(^{34}\) This lock was of the same width and depth, 48 feet and 18 feet respectively, as that of 1876-80; but it was 300 feet long, an increase of 100 feet in length. The existing timber lock gates, built in 1896, were repaired and re-installed in the new lock.\(^{35}\)

Since 1918 improvements made to the canal have consisted for the most part of replacing deteriorating timber structures with steel and concrete.\(^{36}\) In 1919 the timber swing bridge was replaced with a steel swing span and it was replaced in turn by the existing steel swing bridge in 1931. The timber retaining walls and wharfs have also, since the 1930s, been undergoing a gradual piece-meal replacement in concrete as repairs were, and are, required.\(^{37}\)

The present canal then, with the exception of its southern entrance which has been realigned and moved further west on two separate occasions, still follows the original line of canal as constructed in 1869 in close proximity to the line surveyed by Francis Hall in 1825. It runs parallel to, and just to the east of Denys' haulover road, the original transportation link across the isthmus. The present southern entrance of the canal passes between the
site of Denys' fort, located on its west bank, and Mount Granville on its east bank on which Lieutenant Governor Macarmick had earlier constructed Fort Dorchester. Fort Toulouse, and the French settlement of that name, were located on Point Jerome which forms a protecting arm jutting out into St. Peter's Bay on the eastern side of the canal entrance. Of the canal constructed in 1854-69 little remains other than the cut itself, widened in 1876-80. The retaining walls have gradually been reconstructed in concrete; the lock has been completely rebuilt and relocated on two separate occasions; and four successive swing bridges have been erected over the canal.
Bridge Structures on St. Peter's Canal

The First Howe Truss Swing Bridge (ca. 1869)
At the time of the construction of St. Peter's Canal the haulover or portage road of Denys' remained in use alongside the canal; but to carry the Halifax to Sydney Post Road, which crossed the line of the new canal just to the south of the Bras d'Or lakes, a moveable bridge was required. Thus, in 1869 the first St. Peter's canal swing bridge was erected. This was an unequal arm, wooden Howe truss span 87 feet long and 14 feet wide.¹ The abutments and pivot pier were constructed of limestone quarried locally.² One interesting feature of this bridge was the arched passageways built into both the east abutment and the pivot pier through which the tow paths passed along both banks of the canal. Unfortunately, very little is known of this bridge structure.

The Second Howe Truss Swing Bridge (ca. 1876) (Figs. 14, 15)
Following the widening of the canal, 1876-80, a new timber swing bridge was built on the same alignment as the original structure. The masonry pivot pier and the western abutment of the bridge were completely re-built with the pivot pier measuring approximately 20 feet square by 20 feet high, again being constructed with an arched passageway, 10 feet wide and 15 feet high under the keystone. The new western abutment, because of the high bank on the western approach
to the canal was merely 5 feet deep by 20 feet wide and 8 feet high. The original east abutment with its arched passageway, was incorporated into the new substructure. It was raised in height and two wing walls were constructed which extended back 50 feet from the abutment to enable the level of the approach road to be raised some six feet at the bridge. The abutment itself was 20 feet high, and 20 feet across with a passageway 6 feet wide and 9 feet high under the keystone.

The superstructure of the new bridge was similar to the original. It was of the unbalanced arm, rim bearing type with the weight of the bridge bearing upon a circle of roller wheels on a 18 foot diameter track circle. The swing span was a Howe truss with its ends supported by means of a king post truss consisting of a tower and suspension rods. The tower was 35 feet high and constructed with six vertical posts of 10 in. by 10 in. oak, aligned three to each side and framed with heavy sway and diagonal braces. Four iron suspension rods, varying in size from 1.0 in. to 1.5 in. in diameter, were affixed to the tower and to each side of the bridge over the main chords to complete the king post truss. The panels of the Howe truss consisted of heavy 3 in. by 6 in. oak diagonals with iron posts 1.0 in. or 1.5 in. in diameter. The upper and lower chords were constructed of double 4 in. by 12 in. timbers spliced together. The bridge was 132 feet long with a 12 foot clear road width and a 17 ft. 8 in. vertical clearance over the roadway. The deck was of 3 in. pine plank running longitudinally on oak joists.

With the exception of the pivot pier which had to be completely rebuilt in 1891 to correct an increasing lean to the west, the second Howe truss swing bridge remained in operation with only minor repairs until 1919. In that year it was replaced as part of the canal improvement programme
The steel swing bridge erected over the St. Peter's Canal in 1919 was an older structure moved to the site from Cardinal, Ontario. It was originally a double or equal arm swing bridge, built by the Dominion Bridge Company in 1897 for use during the construction of the Galops Canal. On the completion of that canal the bridge was dismantled and moved to the bank of the canal at Cardinal where it was reassembled, but apparently never put into use. This bridge was a high through Pratt truss, center-bearing type of swing bridge 196 feet long center to center bearings with a 12 foot clear roadway. In effect, it was 64 feet longer than the old timber Howe truss span on the St. Peter's Canal.

To accommodate the steel bridge to the St. Peter's bridge substructure, two panels of the bridge truss, some 28 feet, were cut off and the end of the bridge was rebuilt and counterbalanced, thereby converting an equal arm into an unequal arm swing bridge. To the same end, several changes were made in the pivot pier and abutments (Fig. 17). The top of the pivot pier was rebuilt to accommodate a center-bearing swing bridge and strengthened by inserting four steel girders, two 20 in. "I" beams and two 24 in. "I" beams, over the arch of the passageway through the pier. At the same time the top of the east abutment was cut down to permit the end of the bridge, which extended back 18 feet more than the previous bridge, to swing over the abutment. The west abutment was removed and re-constructed in masonry about 18 feet farther west. The level of the deck of the bridge and its alignment remained the same; but the increased length of the swing span introduced a sharp turn.
in the roadway on the western approach.\textsuperscript{10}

The steel swing bridge erected over the St. Peter's Canal in 1919, was thus an unequal arm, center-bearing structure of the high through truss type. It consisted of two Pratt trusses with sloping upper chords, 24 feet deep at the center and 18 feet at the top of the inclined end posts, joined at the base by 20 inch "I" beams. Both the upper and lower chords and the posts were built up members consisting of back to back channels with the upper chord and posts being constructed of 8 inch and the lower chord of 10 inch channels. The diagonals in the panels consisted of back to back angles varying in size from 2.5 in. by 2.5 in. by 5/16 in. to 4 in. by 3 in. by 5/16 in. The floor of the bridge was built of planking spiked to 4 in. by 14 in. joists which ran longitudinally across the steel floor beams. The modified swing span was 168.0 ft. long center to center bearings.\textsuperscript{11}

The Warren Truss Swing Bridge (1931) (Figs. 2, 17)

By 1930, damage inflicted on the St. Peter's swing bridge through the passage of heavy lumber trucks, necessitated its replacement.\textsuperscript{12} A contract was given to the Standard Steel Construction Company of Port Robinson, Ontario, to replace the 1919 through truss span with a low pony truss swing bridge.\textsuperscript{13} This bridge, erected in 1931, was an unequal arm, center-bearing structure of a Warren truss design with vertical posts and inclined end posts. The truss was approximately 10 feet deep. This bridge, which still occupies the site, has a wooden floor, a clear road width of 16 ft. 5.5 in., and a designed carrying capacity of 20 tons. It is 135 feet long, face to face ballast walls, some 33 feet shorter than the 1919 swing bridge which it replaced.\textsuperscript{14}
To accommodate the shorter span, the west abutment was removed and rebuilt in concrete 18 feet forward. The original masonry east abutment was retained and its coping built up to fill the gap left by the new bridge span which extended 15 feet less than the previous bridge over the abutment. The masonry pivot pier was retained. At the same time about 360 feet of new highway approach road were constructed on the western approach to the bridge to reduce the sharp turn introduced into the road by the westward extension of the 1919 bridge.\textsuperscript{15}

Since its erection in 1931, the steel pony truss swing bridge has continued to serve the traffic needs of the area with only routine repairs and maintenance being carried out, including a complete refurbishing and rehabilitation undertaken in 1963. It has also continued to be manually operated, as were all of the previous three bridges erected on the site. The substructure, however, has been altered somewhat since 1931. In 1964, a crack appeared in the old masonry of the east abutment and the concrete west abutment began to shift forward. Two years later the east abutment was rebuilt completely in concrete without the arched passageway of the original masonry abutment, and the west abutment was repaired and stabilized.\textsuperscript{16} The old masonry pivot pier was also replaced in concrete, probably about the same time.

The present swing bridge carrying Highway 4 across the St. Peter's Canal was thus erected in 1931 and is a low steel pony truss swing bridge of a Warren truss design. It is 135 feet long with a 16 ft. 5.5 in. clear road width, and a wooden deck. The substructure, consisting of a pivot pier and two abutments, is constructed of reinforced concrete with the pivot pier being located on the west bank of the canal. Thus, both the superstructure and the substructure of the bridge post-date 1930.
Historic Significance of the Current Swing Bridge

The present pony truss swing bridge erected on the St. Peter's Canal in 1931 is of a common type constructed over Canadian canals in the first three decades of this century. In the context of Canadian canals, this bridge is not unique as the same type can be found, for example, on the Rideau Canal at Long Island and the Narrows. In terms of the history of the St. Peter's Canal, the bridge is of relatively recent origin and is the fourth bridge to occupy the site since the canal's construction in 1869. Thus, it is not a structure associated directly with the early history of the canal in any respect other than that it occupies the same position as the original bridge and its successors. However, from the viewpoint of the Maritime region, this bridge is of significant historic interest as it is the only road swing bridge in operation in Nova Scotia, and possibly in all of the Maritimes. The St. Peter's Canal swing bridge is thus of definite interest as a representative of a particular type of swing bridge, an unbalanced arm, center-bearing swing of a Warren truss design, which although once prominent of Canadian canals is now fast disappearing. In addition, the bridge still swings by means of a manually operated rack and pinion turning gear system such as has served a succession of different types of swing bridges on Canadian canals from the late 19th century to the present.

The bridge is located in an area rich in historic interest and on a main road leading to Louisbourg. In the vicinity of St. Peter's, in addition to the swing bridge and the canal itself, there is a museum, (the Nicholas Denys Museum), a provincial park, a recreation centre, as well as the former site of Denys' fort on St. Peter's Bay just to the west of the canal entrance, Fort Dorchester on Mount Granville, and Fort Toulouse on Point Jerome. The village
of St. Peter's and the Canal itself were plaqued at the recommendation of the Historic Sites and Monuments Board of Canada in 1931 (Figs. 19, 20).
Endnotes

Early History of the Site


2 Ibid., p. 178; Robert R. McLeod (*Markland or Nova Scotia, Its History, Natural Resources and Native Beauties* [n.p.: Markland Publishing Company, 1903], p. 493), states that Denys' book contains "drawings of the buildings and fortifications he erected at St. Peter's." The 1908 reprint, however, contains only a general map of the area dated 1672, and a sketch of a shed for drying fish.


4 Department of Indian Affairs and Northern Development, Canal Records, File No. 4052-211, Volume 4, Duncan Carrie, Secretary, St. Peter's Board of Trade, Nova Scotia, to the Honourable Allen MacEachen, Minister of Health and Welfare, 8 June 1966.

5 Nicholas Denys, op. cit., p. 179.


7 Denys, op. cit., pp. 6-8.

8 Ibid., p. 5.

9 Richard Brown, *A History of the Island of Cape Breton*, with some account of the Discovery and Settlement of
Canada, Nova Scotia and Newfoundland (London: 1869), Sampson, Low, Son and Marston, p. 89.

10 Ibid., p. 101.


13 W.S. MacNutt, op. cit., p. 11.


15 Harold A. Innis, op. cit., p. 52.


17 Harold A. Innis, op. cit., p. 52.

18 Various plans for the fortification of Port Toulouse, extant in the Nova Scotia public archives, attest to the recognition of the strategic importance of the site from an early date. The Public Archives of Canada, Report on Canadian Archives, 1905, Vol. I, "Archives of Fortifications of the Colonies," pp. 19-20, mentions several plans and memoirs on the subject of both the defence and economic potential of the site dating from 1717 to 1734. The holdings of the Nova Scotia archives
have not been consulted in researching this report, but the *Report on Canadian Archives* (1905) does give a brief statement of the subject matter of each plan or memoir listed. Thomas Pichon, *Lettres et memoires Pour servir a L'Histoire naturelle, Civile et Politique du Cap Breton depuis son establishment jusqu'a la reprise de cette Isle par les Anglais en 1758* [La Haye: Pierre Gosse, 1760], pp. 15-6, and 31-4), also wrote of the military potential of the site and the commercial activities carried on there.

19 J.G. Bourinot, op. cit., p. 258.


21 PAC, Map Room, H3/201 - 1717, "Plan du Port Toulouse et de ses Environs, avec des projets de Fortification, 1717."

22 Pers. Com., Eric Krause, Staff Historian, Fortress of Louisbourg, National Historic Park, author, 2 April 1976. According to Krause there is a good deal of primary material in French sources relating to Port Toulouse; but as yet, little work has been done on the subject.


24 Ibid., p. 20, "Plan of small fort of 2 bastions ... projected at the port of Toulouse," M. Verrier, 1734.

27 PAC, Report on Canadian Archives, Vol. 1 (1905), p. 173, lists a despatch sent to the French government on 25 July 1752, which is extant in the Nova Scotia public archives and consists of a statement of the expenses incurred in the building of Louisbourg in 1751, as well as for Port Toulouse and Isle St. Jean 1749-51. Robert McLeod, op. cit., p. 494, mentions seeing a plan of a fort built in 1749 at St. Peter's. This would be Port Toulouse. The fort built in 1749-50 (Fig. 11) differs greatly from the fort which the French proposed to build there in 1751 (Fig. 12) and also earlier in 1734 (Fig. 8).
29 Thomas Pichon, op. cit., p. 34; J.G. Bourinot, Historical and Descriptive Account of the Island of Cape Breton (hereafter cited as Historical and Descriptive Account), (Montreal: W. Foster Brown and Co., 1892), p. 90.
30 Thomas Pichon, op. cit., p. 15.
31 Ibid., pp. 33-4.
32 Ibid., p. 33; J.G. Bourinot, Historical and Descriptive Account, p. 90.
33 J.G. Bourinot, Historical and Descriptive Account, p. 236.
36 W.S. MacNutt, op. cit., p. 49.
37 Ibid., pp. 64, 67.
38 Ibid., pp. 66-7.
40 Robert J. Morgan, op. cit., p. 5.
41 W.S. MacNutt, op. cit., p. 67.
43 Robert J. Morgan, op. cit., p. 7; W.S. MacNutt, op. cit., p. 93.
44 PAC, Map Room, H3/201 - 1788, "Plan of the Isthmus and Harbour of St. Peter's in the Island of Cape Breton, September 1788."
45 Ibid.
47 W.S. MacNutt, op. cit., p. 113.
48 Harold A. Innis, op. cit., p. 52.
49 Thomas Pichon, op. cit., pp. 31-34.
52 Ibid., p. 288; PAC, MG11, C.O. 217, Vol. 110, microfilm reel B-1062, Macarmick to Dorchester, 10 June 1794, p. 111.
54 Ibid., Vol. 110, microfilm reel B-1062, Macarmick to Dorchester, 20 December 1793, p. 46.
The St. Peter's Canal

1 W.S. MacNutt, op. cit., p. 113.
2 Robert J. Morgan, op. cit., p. 12.
3 W.S. MacNutt, op. cit., p. 113. Some 300 Acadians, who had settled on the French Island of Miquelon following their enforced removal from Cape Breton on Britain's acquisition of the island, returned to settle on Cape Breton at the close of the 18th century.
4 Robert J. Morgan, op. cit., p. 12.
construction of the St. Peter's Canal and its subsequent development.


10 Thomas C. Haliburton, op. cit., p. 240.

11 Ibid., p. 238.

12 Tony E. Walker, op. cit., p. 12.


16 Ibid., pp. 21-4.

17 Ibid., pp. 25-8. Part of the difficulty in selling stock in the canal with a guaranteed interest of 3.5 per cent was, as Walker points out, that the government at the same time was offering 6 per cent interest to investors in the provincial railways.

18 Ibid., p. 29.

19 Ibid., p. 33.

20 Ibid., pp. 34-5.

21 Ibid., p. 45.

22 Ibid., pp. 48-9.

23 Ibid., p. 52. For a detailed description of the canal's construction and the difficulties experienced, see ibid., pp. 32-51.

24 Ibid., p. 71.


26 Tony E. Walker, op. cit., p. 50.

27 Ibid., pp. 51-2.
28 Tony E. Walker, "St. Peter's Canal Illustrations." Photo Collection on file, National Historic Parks and Sites Branch, Parks Canada, 1973 (hereafter cited as "Illustrations"), Appendix D.

29 J.P. Heisler, op. cit., p. 129. In addition to the size of the canal which restricted its use to vessels of 150 tons or less, other problems included periodic landslides experienced because of the steep slopes of the original banks which were later cut back.

30 Tony E. Walker, "Illustrations," Note No. 6.


32 Ibid., pp. 76-8.

33 Ibid., p. 80.

34 Ibid., p. 105.

35 Ibid., p. 129.

36 Ibid., p. 126.

37 For a summary of repairs and major maintenance work carried out on the canal during the 1920s and through to the present, see ibid., pp. 121-36.

Bridge Structures on St. Peter's Canal

1 Tony E. Walker, "Illustrations," Appendix F; Department of Indian and Northern Affairs (hereafter cited as DINA), Canal Records, File No. 4052-211, Vol. 2, Memorandum to the Chief Engineer, 22 March 1928.


4 Tony E. Walker, "Illustrations," Appendix F.

5 DINA, E & A Branch, Engineering Drawing No. N - 2 - 104.
6 Tony E. Walker, "Illustrations," Appendix F.
8 DINA, Canal Records, File No. 4052-211, Vol. 1, Department of Railways and Canals, Specifications for the Removal and Re-erection of the Old Steel Swing Bridge at Cardinal, Ontario, 22 August 1918.
10 Ibid.
11 Ibid.
12 Tony E. Walker, "Illustrations," Appendix F.
16 Tony E. Walker, "Illustrations," Appendix F.
17 A railway swing bridge span does exist at Grand Narrows, Cape Breton, to the north of St. Peter's Canal, where it crosses Bras d'Or Lake. This is a double arm through truss swing bridge which forms two spans of a much longer continuous span bridge.
BRIDGE TRUSSES. A truss is a framed structure with diagonal members which derive their strength from the rigidity of the triangles formed by the diagonals. Two of the earliest forms of bridge trusses were the Kingpost truss and the Queenpost truss borrowed from the truss framing of roofs. Additional diagonal struts were added to both trusses in adapting them for bridge construction. During the 1840s numerous new forms of trusses were invented to provide greater strength and rigidity in the truss, and foremost amongst these were the Howe, the Pratt and the Warren trusses.

THE HOWE TRUSS. Patented in 1840 by William Howe of Massachusetts, consisted of parallel top and bottom chords with vertical posts and two diagonals in each panel. One of the distinctive features of this truss is found in the division of stress wherein the verticals are treated as tension members and the diagonals as compression members. The verticals were wrought iron rods and the diagonals were of wood; but as iron gradually replaced wood as the primary construction material, the verticals came to be constructed of wrought iron and the diagonals of cast iron. The Howe truss was the most widely used truss form in the 19th century.

The two Howe truss swing bridges erected across the St. Peter's Canal ca. 1869 and 1876 were strengthened by means of a Kingpost truss consisting of a tower (main post) and
iron suspension rods.

THE PRATT TRUSS. Patented by Caleb and Thomas Pratt in 1844. In appearance, this truss conformed closely to the standard Howe truss, but the action of the web members was exactly reversed. The diagonals were in tension and constructed of wrought iron, and the vertical members were in compression and were of wood or cast iron. The superiority of the Pratt truss consisted of having the vertical members in compression rather than the diagonals which were more susceptible to buckling in wide panels. The 1844 Pratt truss was designed for iron, or iron and timber, construction with parallel chords or an arched top chord. This truss was simplified as advances were made in calculating stresses, so that by 1860 the diagonals were reduced to single members in all but the two center panels and the end panels. The modified Pratt truss was further simplified in the 1870s when the diagonals were reduced to a single diagonal system throughout the length of the truss. The Pratt truss was rather slow in gaining acceptance; but in time it became second only to the Howe truss in terms of its popularity among bridge builders.

The modified double arm Pratt truss swing bridge erected at St. Peter's in 1919, when originally built in 1897, was a single diagonal Pratt truss with inclined upper chords and end posts, and double diagonals in the three outer panels excluding the end panels.

THE WARREN TRUSS. Invented in England by James Warren and the Willoughby Monzani, and patented in 1848. The truss consisted of diagonals alternately sloped in opposite directions, and did not have any vertical members. The Warren truss did not attain much popularity until the late 19th century; and then it was in a modified form consisting
of the single diagonal with vertical posts. In this later form after 1900, the Warren and the single diagonal Pratt truss became the most common, as well as the most efficient, truss forms utilized in bridge construction. Another form of the Warren truss developed at a later date is the double diagonal. Today, the Warren and Pratt trusses are used almost exclusively in steel truss-bridge construction. The Warren truss swing bridge at St. Peter's corresponds to the original Warren truss design of 1848.

THROUGH TRUSS BRIDGE. One of any truss design in which the roadway of a bridge rests upon the bottom horizontal members. This is in contradistinction to a deck truss in which the roadway is built upon the top horizontal member. The through truss may be further differentiated into a high through truss, and a low, or pony, truss bridge depending on the depth of the truss. A high through truss usually has lateral struts joining the upper chords.

CENTER-BEARING SWING BRIDGES. Moveable bridges which swing horizontally about a vertical axis may be of either the center-bearing or the rim-bearing type. With the center-bearing type, the weight of the bridge is supported upon the center pivot and the concentric circle of roller wheels serves only to stabilize the bridge. Such bridge structures have stiff floor beams passing over the center pivot to carry truss loads to the pivot. With the rim-bearing type of swing bridge, the weight of the bridge rests upon the concentric circle of roller wheels and the center pivot serves only as an axis about which the bridge turns.

UNBALANCED OR SINGLE ARM SWING BRIDGES. Swing bridges are usually constructed in keeping with one of two basic
conformations, viz. the unbalanced or single arm model, and the equal or double arm model. The former has its pivot pier on one side of the navigation channel with a long arm extending across the channel. The short arm, or heel, of this bridge structure is counter-balanced to compensate for the extra weight and length of the long arm. The equal, or double, arm swing bridge, as its name implies usually has its pivot located in the center of the water channel, in effect dividing it into two channels. The arms of the bridge extend an equal distance across both channels. Double arm swing bridges are usually of the high truss type. Single arm bridges can be, and are, of both the high and low truss type.
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Walker, Tony E.
Map of St. Peter's Canal and vicinity with regional map insert. (Maps by D. Ford.)
2 Photograph of the 1931 St. Peter's Canal swing bridge. The concrete abutments and pivot pier were constructed at a later date. (Department of Indian and Northern Affairs.)
Photograph of the site of Denys' fort with map insert. The caption on the 1906 photograph points out the location of Denys' fort vis-à-vis the canal entrance and the lock visible on the right side of the photograph. The present entrance to the canal and the existing lock, constructed in 1912-18, are to be found just to the west and adjacent to the 1876-80 lock shown here. The mansard-roofed structure, (the lockmaster's house), and the remains of Denys' fort were not affected by the change made in the canal alignment in the period 1912-18. The long gable-roofed structure shown on the west bank, however, had to be removed as it was directly in line with the new entrance.

(Nicholas Denys, *The Description and Natural History of the Coasts of North America, (Acadia)*, tr. and ed. by W.F. Ganong, Toronto: The Champlain Society, 1908, pp. 176-77.) (Photograph and map reproduced by permission of the Champlain Society.)
4 Carte de L'isle Royalle, 1717. (PAC, Map Division, H3/201, Louisbourg-Port Toulouse, 1717.)
Carte de l'Île Royale près du Golfe du fleuve Saint-Laurent à 45 de latitude et 322 degrés d'longitude, avec un plan de la terre d'Acadie.

1717

A l'échelle, p. un pouce.
Plan du Port Toulouze avec les projets de fortification, 1717. (PAC, Map Division, H3/201, Louisbourg-Port Toulouse, 1717.)
6 Profil et Élévation des Casernes à faire au Port Toulouse, 1733. (PAC, Map Division, H3/250, Port Toulouse, 1733.)
'Profil et élévation du moulin à farine, sur place, conteneur 1733. Signé: Pierre.'
7 Profil et Elevation du Logement du Commandant du port Toulouse, 1733. (PAC, Map Division, H3/250, Port Toulouse, 1733.)
Étude de la maison de Fumel, construite en 1733.

Profil et élévation du bâtiment.

Signé: Pierre.
8 Carte du Port Toulouze dans L'isle Royalle; et Plan du Fort Toulouze, 1733. (PAC, Map Division, Ph/250, Fort Toulouse, 1733.)
Plan d'un Fort projeté au Port Toulouse. The fort constructed in the 1730s may well have been much less elaborate than the projected structure depicted here. The fort actually constructed on the site in 1749-50, for example, consisted simply of a wooden palisade enclosing military buildings (see Fig. 11). (PAC, Map Division, F/250, Port Toulouse - 1734.)
PLAN D'UN FORT PROJETÉ AU PORT TOULOUSE pour mettre en sûreté le Dendem, dans lequel on a représenté en couleur rouge les bâtiments qu'on Estès Établis l'Année 1713, avec la Vue prise du côté du Port.

A. Logement du commandant.
B. Logement des officiers.
C. Magasins des vivres.
D. Chapelle.
E. Caisse de Salut.
F. Corps de garde.
G. Prise.
H. Batterie.
I. Bastion de gauche.
J. Bastion de droite.
K. Batterie de gauche.
L. Batterie de droite.

Profil pris sur la ligne A-B.

Profil pris sur la ligne C-D.
Plan de partie du Port Toulouze dans l'isle Royalle, 1733. (PAC, Map Division, V1/240, Port Toulouse - 1733.)
PLAN de partie du Port
Toulouse dans île Royalle ou est représenté en couleur jaune l'établissement à faire en île des Canaries, le Logement du Commandant, et des Officiers,
Magasin des Vivres, et d'une Batterie pour la défense du Port.
Plan des Batimens construits au Port Toulouse en 1749 et 1750. (PAC, Map Division, H3/250, Port Toulouse - 1751-52.)
Plan des Bâtiments construits au Port Toulouze en 1749 et 1750 à usage du Service des troupes y détaillées de Louisbourg.

A. logement du Commandant
B. Cabaneau à son usage
C. Cazernes de 24 cabanes pour 48 soldats
D. Chapelle
E EE. logement des trois Officiers subalternes
FF. logement de l'Amouriez et du Chaurgien
G. Magasin des Vivres
H. Prison.

Échelle.
Map of the canal route surveyed by Francis Hall, 1825. The canal when constructed closely followed the line proposed by Hall. The site of Denys' fort to the west of the proposed canal and of Fort Rochester to the east on Mount Granville as well as Denys' haulover road paralleling the canal route, are all clearly marked. Note the town of St. Peter's at that time was located on the site of Port Toulouse well to the east of Mount Granville. The 'Old Proposed Line, A-B' shown on the map was apparently a canal alignment favoured by some of the local residents. (T.C. Haliburton, An Historical and Statistical Account of Nova Scotia, Halifax: Joseph Howe Publisher, 1829, Vol. 2, p. 238.)
Plan of the proposed canal enlargement of 1876. (Parks Canada, Canals Engineering, microfilmed drawings, St. Peter's Canal, drawing no. N-20-187.1.)
Engineering drawing of the 1876 swing bridge. Note the former (c.1869) east abutment incorporated into the new bridge substructure. To date no drawings have been found for the first bridge erected over the canal. (Parks Canada, Canals Engineering, microfilmed drawings, St. Peter's Canal, drawing no. N-2-104.)
Photograph of the 1876 swing bridge. This photograph was taken September 22, 1910. (PAC, Picture Division, Photo no. C53890.)
Photograph of the 1919 swing bridge. (PAC, Picture Division, Photo no. C53887.)
Engineering drawing of the 1931 swing bridge superimposed on the 1919 and 1876 swing bridges. (Parks Canada, Canals Engineering, microfilmed drawings, St. Peter's Canal, drawing no. N-2-101.)
The Nicholas Denys' Museum, St. Peter's, Nova Scotia.

(Roy Martheleur photograph, courtesy of C. & G. MacLeod Ltd., Sydney, Nova Scotia.)
Photograph of the plaque erected at the St. Peter's Canal by the Historic Sites and Monuments Board of Canada in 1931. (Parks Canada.)
ST. PETER'S CANAL.

Connecting St. Peter's Bay with the Bras d'Or Lakes, it follows substantially the portage of the old French trading days and materially shortens the distance to the eastern coasts of Cape Breton.

First surveyed in 1825. Construction commenced 1854, but suspended 1856; renewed 1865 and completed 1869. Enlarged 1873-1881; 1912-1917.

ERECTED 1931.
Photograph of the plaque erected at St. Peter's, Nova Scotia, by the Historic Sites and Monuments Board of Canada in 1931. (Parks Canada.)
SAINT PIERRE
EMPLACEMENT DU POSTE ÉTABLI PAR NICOLAS DENYS EN 1650.
NOMMÉ PORT TOULOUSE ET FORTIFIÉ À
POINTE-JÉRÔME, CE POSTE DEVINT, EN 1713,
L'UN DES TROIS POSTES PRINCIPAUX DE
L'ÎLE ROYALE.
DÉTRUIT PAR LES TROUPES DE PEPPERELL
EN 1745; REPRISE PAR LES FRANÇAIS EN
1748, ABANDONNÉ PAR EUX EN 1758.

ST. PETERS
SITE OF DENYS' FORT AND TRADING
POST, BUILT 1650.
SELECTED IN 1713 AS ONE OF THE
THREE PRINCIPAL POSTS IN ISLE ROYALE,
NAMED PORT TOULOUSE, AND FORTIFIED
BY WORKS AT POINT JÉRÔME.
DESTROYED BY PEPPERELL'S TROOPS
1745; RE-OCCUPIED BY THE FRENCH, 1748;
EVACUATED, 1758.
The Upper Dorchester Covered Bridge,
Westmorland County, New Brunswick
by Robert W. Passfield
1977
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Abstract

This report on the Upper Dorchester Covered Bridge in Westmorland County, New Brunswick, attempts to place the Upper Dorchester bridge in the context of covered bridge engineering and architecture as it evolved in North America. This report was originally prepared for the Historic Sites and Monuments Board of Canada.
The Upper Dorchester Covered Bridge

Introduction
The Upper Dorchester covered bridge spans the Memramcook River on the road to Taylor Village in Westmorland County, New Brunswick. It was built in 1924 for the New Brunswick Department of Public Works by K. McLaggan and Company of North Devon, who were low bidders on the contract at $94,200.00. The five span, Howe truss covered bridge they erected is 848 feet long overall. It is the second longest covered bridge in North America, and may well be the second longest in the world.

The present structure is the third bridge to be built on the site. The first bridge, originally called the 'Rockland Bridge', collapsed in October 1890. It was a multi-span Burr arch-truss bridge erected in 1877. During the winter of 1891-92, a second bridge was framed and raised on the same site by Messrs. Simons and Burpee. In 1917 this bridge, which like its predecessor was not a covered bridge, was blown down in a high wind; and seven years later the present bridge was erected on the same alignment.

The Upper Dorchester covered bridge erected in 1924 has undergone few visible changes over the years, although a good part of it has since been replaced. On September 19th 1932, three spans on the west end of the bridge were destroyed in a gale. These were later rebuilt so that today all five spans of the bridge remain in keeping with the plans drawn up by the New Brunswick Public Works Department in December 1923. The top and bottom chords of each truss are made up of three 3 in. by 7 in. Douglas fir timbers spliced together. The vertical tension rods in each truss are paired at 13 ft. 8 in.
intervals with the rods varying from 1 1/8 in. to 2 3/8 in. in diameter. The crossed timber compression members between the tension rods vary in size from 9 in. by 10 in. to 6 in. by 8 in.

The five trusses vary in length from a 136 foot clear span at one end of the bridge, to three 164 foot clear span center trusses, to an 183 foot clear end span. The deck of the bridge, which has been replanked from time to time, has a 15 ft. 10 in. clear road width. The metal sheeting on the gable roof is a later addition in place of the original cedar shingles, while the vertical board siding may be original or perhaps was replaced in kind from time to time. The rock filled timber crib piers and abutments are part of the original structure. Indeed, the below water portion of two of the piers dates from the construction of the previous bridge in 1891-92. In 1924, two of the former bridge piers were removed down to the low water mark, and then rebuilt and incorporated into the existing structure. The paint on the ends of the bridge, white with green trim, is of a more recent date. The weatherboard on the sides has been left unpainted as it was when first erected. The original plans of the 1924 Upper Dorchester bridge are on file with the Provincial Public Works Department, Fredericton, New Brunswick.

The Upper Dorchester covered bridge continued in use until 1972 when it was closed to vehicular traffic. Today the superstructure of the bridge is reportedly in good condition with the exception of the bottom chord of one truss which shows signs of rot and splitting. The floor boards are badly worn, and the weatherboard siding has been torn off or damaged in several places along the bottom of the structure by ice at high tide. The piers have deteriorated badly. Most of them have lost a good deal of their wood sheathing, and the timber cribs are showing signs of severe rot. Two of the piers have disgorged much of their stone filling; while the two abutments, which also show signs of rot, are being crushed by the weight of the bridge
superstructure. The poor condition of the bridge substructure is not surprising. Situated where it is, the Upper Dorchester covered bridge has to withstand a strong river current as well as the exceptionally high tides of the Bay of Fundy which batter against it twice a day. Since it was closed to traffic in 1972, the Upper Dorchester covered bridge has been left unattended to deteriorate.

Early Bridge Construction in North America

The design and construction of wooden bridges reached its highest development in the United States during the first half of the nineteenth century. Wood, which was cheap and plentiful, predominated in North America as the material of bridge construction in contrast to Europe where major bridges tended to be built of stone. The construction of wood bridges, as distinct from those of stone, involved American bridgebuilders in the use of trusses which in time resulted in their making major advances in bridge building through the invention of new truss designs. The use of wood trusses in turn was directly related to the introduction into North America of the covered bridge.

The earliest bridges built in North America, as well as in Europe, were not covered structures. They were simply logs thrown across a stream to serve as stringers across which planks or logs were fixed to form a deck. Sometimes these single span structures were strengthened by means of a truss built over each of the two outside stringers. The early bridge trusses, the kingpost and the queenpost, were the same as those used in roof construction. On longer spans, a multiple kingpost truss was often used. By the late 18th century, however, American bridge builders were seeking to build spans far longer than had even been attempted before to bridge rivers where the construction of piers was impracticable. This presented a new problem as there were limits beyond which a kingpost, or a queenpost, truss could not be extended.
Two of the earliest bridge builders to successfully overcome the problem of constructing long span bridges were Timothy Palmer and Theodore Burr of New England. In 1797 and 1804, respectively, each patented a bridge design of his own devising which made use of an arch to strength a multiple kingpost truss. In that period, numerous combination arch-truss bridges were built by Palmer, Burr and several others, which proved the strength of their basic design. The combination arch-truss designs were a definite innovation in American bridge building; but it is not known to what extent, if any, Palmer and/or Burr were influenced by developments in European bridge construction technology.

Trusses were first introduced into bridge building during the Renaissance, and were an innovation which has been hailed as "the most significant scientific contribution of the Renaissance". Until that time, wood bridges were of the simple stringer type; while stone bridges were built on the principle of the arch. The earliest known plans of bridge trusses were published by Andrea Palladio of Vicenza, Italy, in A Treatise on Architecture, (4 vols., 1570). Palladio sketched four designs including the queenpost, then in common use, the multiple king-post, and two variations of a combination arch and truss. The advantage of trusses, as Palladio pointed out, was that they could support exceptionally long spans and be built with short lengths of timber. After some 200 years of neglect by bridge builders, A Treatise on Architecture was translated into English in 1742; and so it may well have been available to Palmer and Burr when they developed their combination arch-truss designs. It has been pointed out that "[Timothy Palmer's] work bears a striking resemblance to the truss designs recorded by Andrea Palladio...." Whatever its origin, the introduction of the combination arch-truss into American bridgebuilding soon brought the covered bridge in its wake.
Introduction of Covered Bridges into North America

With the construction of large long span bridges made possible by the use of the multiple-kingpost truss, and even more so by the introduction of the combination arch-truss, American bridge builders were faced with a critical problem of wood rot. Wood that is alternately wet and dry is particularly susceptible to rot which quickly destroys a structure subject to stresses such as are placed on a bridge. Early efforts to protect truss bridges from rot included painting the joints and wood pins with turpentine and linseed oil; but this did not prove satisfactory in increasing the life of a wooden truss bridge appreciably beyond the standard ten to twelve years. Another early method, often used in conjunction with the above, was to box in both trusses with pine boards. This was intended to protect the truss from moisture, as well as soak out any dampness found in the truss timbers. One of the earliest recorded uses of this method of protecting truss timbers was on a bridge built over the Connecticut River in 1785 by Enoch Hale. That bridge was doubly significant, as it was the first long span bridge made possible by utilizing a truss as more than just a strengthener for a simple stringer span. Two decades later, the covered bridge was introduced as an answer to the problem of rot in wood truss bridges.

The first North American covered bridge, as distinct from a boxed truss bridge, was the 'Permanent Bridge' built over the Schuylkill River at Philadelphia, Pennsylvania, in 1804-05. This combination arch-truss bridge was erected by Timothy Palmer in 1804, and roofed and sided with weatherboarding the following year at the suggestion of Richard Peters, the President of the Schuylkill Permanent Bridge Company. Peters was concerned about preventing rot in the trusses; and Palmer, who supported this undertaking, estimated that his bridge would "last 30 and perhaps 40 years if well covered". Judging from Palmer's remarks, the idea of covering a bridge, as distinct from the actual undertaking itself, was not at all novel.
Covered bridges soon proved to be superior to boxed truss bridges as the trusses of the latter were often destroyed or blown into a leaning position by strong winds. Overhead bracing could prevent this; but then the bracing was subject to rot if not protected by a roof. Covered bridges were introduced into American bridge construction to overcome a particular problem, wood rot, which had become acute with the construction of large long span wood truss bridges. The concept of a covered bridge, however, was not of American origin.

The earliest known reference in North America to a covered bridge is a sketch in a magazine published in 1787, which shows a multiple kingpost truss bridge with a roof and siding. A decade later, in January 1797, the first American patent for a covered bridge was granted to Charles W. Peale. Both bridges were intended to span the Schuylkill River at Philadelphia; but neither was built. Covered bridges, however, were in existence in Europe and in other forested regions of the world centuries before that decade.

Roofed over stone bridges are reputed to have been built in China over 2,000 years ago; and the earliest recorded roofed bridge was over the Euphrates River in 783 B.C. Among the earliest wooden covered bridges known to have existed, there are several in Europe which have been continually repaired and maintained to the present day. The oldest include two Swiss covered bridges, one over the Rhine at Basel which dates from 1225 and the other, the Kapellbruck, erected over the Ruess River in Lucerne in 1333. An Austrian wooden covered bridge over the Subersach River dates from 1347. In Europe in the 13th and 14th centuries, as in North America centuries later, wooden bridges were roofed to keep moisture out of the bridge members. Wooden covered bridges continued to be built in various western European countries, principally in Switzerland, Austria and Germany, down through succeeding centuries right up until the decade of the 1950's if not more recently. In the United States, thousands of covered bridges were erected...
in the decades after 1850; but they obviously in no way represented an unique undertaking. The history of covered bridge construction, however, is intertwined with the evolution of truss designs, and here American bridgebuilders were pre-eminently innovative and inventive.

Evolution of Bridge Truss Designs
In addition to the basic Palladian combination arch-truss design used by Palmer and Burr in slightly modified forms, there were three new trusses, invented by Americans in the first half of the 19th century, which quickly became standard designs for covered bridge construction. These were the Town lattice truss, the Long truss, and the Howe truss which were patented in 1820, 1830 and 1840, respectively. Other trusses were developed from these basic designs; but the four early trusses, together with the much older kingpost and queenpost trusses which continued to be used on short spans, remained the most popular in covered bridge construction. They were religiously reproduced by bridgebuilders everywhere who paid royalties to the inventors based on the length of bridge built.

The combination arch-truss bridge, which became known as the 'Burr arch' or 'Burr arch-truss' bridge, and variations thereon, completely dominated covered bridge construction during the first two decades of the 19th century. So many were erected by Burr, or built in keeping with his patent, that Theodore Burr is often referred to as the 'father of American bridge building'. During the 1820's, the Town lattice truss invented by a Connecticut architect, Ithiel Town, came into widespread use. The lattice truss was a light weight, strong structure much easier to build than the Burr arch-truss. It was the first type of long span truss bridge to be built without the strengthening arch characteristic of the Burr bridge. The first lattice truss bridge was erected in 1813. During the 1830's, the popularity of the Town lattice truss was challenged among
covered bridge builders on both roads and the newly constructed railroads, by the Long truss. 54 This truss, invented by an United States Army engineer, Brevet-Colonel Stephen H. Long, consisted of a series of panels with posts and an 'X' in each panel. 55 After 1840, however, bridge building was dominated by the Howe truss which sparked the greatest period of covered bridge construction, for both road and rail, ever experienced in the United States. 56

The truss design which William Howe of Massachusetts invented had a significant impact on bridge building for several reasons. In the first place, it introduced iron into wooden bridge construction by replacing the panel posts of the Long truss with iron tension rods. 57 This innovation not only enabled the tension and compression of the truss to be adjusted by turning nuts threaded on the ends of the iron rods; but also made it possible to prefabricate the members for quick erection. 58 Previously truss bridges had had to be built twice over. To attain the great accuracy required in making the joints and aligning the pin holes, truss members were laboriously cut, drilled and fitted together on the ground, and then dismantled and re-erected over the bridge piers with the additional support of a temporary timber scaffolding. 59 The Howe truss removed the necessity of resorting to this time-consuming, ever critical, procedure. The introduction of iron rods into wooden truss bridge construction, however, eventually encouraged experiments with trusses made entirely of iron which resulted in a good many American wooden truss covered bridges being replaced by iron truss bridges in the period 1870 to 1890. 60

Iron truss bridges, as well as the steel truss bridges introduced somewhat later, used the standard truss designs, and the several variations thereon, developed for wooden bridges during the first half of the 19th century as well as several new trusses invented at mid-century or thereafter. 61 But the virtual abandonment of the wood truss in major bridge construction efforts, marked the end of the general utility of
covered bridges.

**Existing American Covered Bridges**

In the United States in recent decades, covered bridges have been built for the most part only in isolated instances in areas where wood is still cheap and plentiful. One of the last major covered bridge building programmes there was undertaken during the 1920's and 1930's in Oregon where a number of Howe truss covered bridges were built by the state highways department. It has been estimated that over 10,000 covered bridges have been erected in the United States over a period of some 150 years of which some 1,344 were still standing in 1959. The bulk of these are found in five states: Pennsylvania, Ohio, Indiana, Vermont and Oregon. Among the surviving covered bridges for which truss types have been recorded, by far the most numerous, some 373, are of a Burr arch-truss design, followed by 168 Town lattice truss bridges, and 161 Howe truss bridges. The next most numerous comprise truss types used on short spans, specifically the queenpost truss of which there were 104, and the kingpost, or modified kingpost, which numbered 89. There were also ten Long truss covered bridges in existence in 1959, as well as several representatives of other less well known truss types.

The covered bridges that are extant in the United States are for the most part neither very old nor especially long. The more spectacular covered bridges were erected over important river crossings; and these were the first to be replaced by more modern structures. The oldest surviving covered bridge in the United States is a Burr arch-truss, some 160 feet long, erected in 1825 in Cumberland County, Pennsylvania. The longest multi-span covered bridge extant in the United States is the Cornish-Windsor bridge, consisting of two Town lattice truss spans 468 feet long overall. It was built over the Connecticut River in 1866. Among existing single span covered bridges,
the longest clear span is a 210 foot modified Long truss bridge, 'Old Blenheim', built in 1854 over Schoharie Creek in North Blenheim, New York.\textsuperscript{72} There are also some 25 railroad covered bridges extant in the United States. Most are of a Howe truss design. They differ somewhat from the conventional roadway covered bridge in that they tend to be high and narrow, and are usually whitewashed, or in some instances even sheeted with metal.\textsuperscript{73} In addition, railway covered bridges were built with raised ventilators spaced along the roof ridge and with an opening along the top of the side walls up under the roof eaves.\textsuperscript{74} The opening along under the eaves, however, was often found also on roadway covered bridges. The covered bridges of the United States have been removed at a rapidly accelerating rate in recent years;\textsuperscript{75} and this has resulted in efforts to preserve those that remain.

One of the first societies dedicated to the preservation of covered bridges was founded in New England in 1949. It has since evolved into the 'National Society for the Preservation of Covered Bridges Inc.' with its headquarters in Boston.\textsuperscript{76} This society, and a number of others founded since, are attempting through their various publications to win public support for the retention, preservation, and restoration of covered bridges in the United States.\textsuperscript{77} These efforts have been seconded by a government initiative in at least one state, Maine, which, mindful of the strong tourist attraction provided by covered bridges, has offered financial aid to any city or town interested in retaining and restoring a covered bridge.\textsuperscript{78}

The history of American covered bridge construction, and even the present threats to their continued survival, are of direct significance to Canada because Canadian covered bridges are facing the same fate today and, in the past, were constructed in keeping with American design developments. The latter, however, has not been thoroughly documented.
Canadian Covered Bridges
In contrast to the United States where several histories of covered bridge construction have been written, there is no published material in Canada relating directly to the history of Canadian covered bridges. Several publications, however, do provide information on existing covered bridges in Canada. Among the most useful are a recently published book by Lyn and Richard Harrington, entitled Covered Bridges of Central and Eastern Canada, which consists of a brief, at best rather sketchy, commentary on the covered bridge in Canada together with descriptions and illustrations of a number of selected structures. The provincial governments of Québec and New Brunswick have put out pamphlets which provide inventories of the covered bridges standing in their respective provinces. Only in the Québec publication, however, has a systematic attempt been made to identify the truss type of all covered bridges extant in the province. Although by no means comprehensive, these sources can be utilized, and have been, to arrive at some idea of the number, type, and notable characteristics of existing Canadian covered bridges.

Covered bridge construction in Canada seems to have been confined principally to the provinces of Québec and New Brunswick as witnessed by the relative number of surviving structures. Covered bridges were never built in Newfoundland or Western Canada, and only seven of them are known to have been built in Ontario. At least three covered bridges, perhaps more, were built in Nova Scotia. In contrast, in Québec around the turn of the 20th century over 1,000 covered bridges were erected. Some were toll bridges built by individuals or private companies; but most were erected on colonization roads by the provincial Department of Colonization as part of an effort to open up the interior of that province to settlement. In New Brunswick also, hundreds of covered bridges were erected about the same time period. As of 1975, covered bridges are to be found in all four provinces, with 80 surviving in Québec, 107 in New
Brunswick, and one each in Ontario and Nova Scotia.

Among the surviving Canadian covered bridges, there are none anywhere nearly as old as their oldest American counterparts. The oldest Canadian covered bridge is at West Montrose, Ontario where it was erected in 1881. With the exception of two structures built in 1899, all of the covered bridges extant in New Brunswick, for which dates of construction are known, were erected in the twentieth century. The oldest covered bridge standing in Québec dates from 1888. The truss types of surviving Canadian covered bridges are also not nearly as varied as those found in the United States. In Québec and New Brunswick bridgebuilders tended to stick to a few standard truss patterns. Almost all of the surviving covered bridges in Québec are of a Town lattice truss design with only a few kingpost and Howe truss bridges to be seen. There is, however, a covered bridge at Powerscourt, Québec, which is "believed to be the only covered bridge in the world built with the McCallum inflexible arched truss". Most of the surviving covered bridges in New Brunswick are of a Howe truss design with a dozen or so examples of the Burr arch-truss and a single Town lattice truss. With the exception of the McCallum truss, these are all standard truss types of which a good many examples survive in the United States. Canada does, however, have several exceptionally long covered bridges still standing, particularly in New Brunswick. Indeed one, the Hartland covered bridge over the St. John River at Hartland, New Brunswick is recognized as the longest covered bridge in the world. This seven span, Howe truss bridge is 1,282 feet long overall and was erected in 1920. There are at least five covered bridges in Canada longer than the longest American covered bridge, including the Upper Dorchester covered bridge. The longest covered bridge ever built was the Columbia–Wrightsville, Pennsylvania bridge erected in 1812 and since demolished. It was 5,960 feet long.

In Canada, as in the United States, covered bridges are being demolished at a rapid rate. In 1965, there were 246 covered
bridges in Québec and 170 in New Brunswick; whereas in 1975, there were only 80 in Québec and 107 in New Brunswick. In recent years, however, efforts have been made by interested individuals and several provincial government departments to preserve covered bridges.

In New Brunswick, several individuals interested in the preservation of covered bridges came together in 1972-73 to form a voluntary association, the 'League for Rural Renewal'. Since that time the League has been responsible for securing the establishment of eight picnic parks at the site of restored covered bridges. These bridge restoration-picnic park projects were accomplished with the assistance of federal 'New Horizons Programme' funds as well as the active aid of the provincial Department of Tourism which provides picnic furniture and the Department of Highways which took an active part in repairing and restoring the bridges. Fourteen more bridge-picnic parks are apparently planned.

In Québec, the Ministère de la Voirie has after a careful study and appraisal, recently identified 51 covered bridges which it asserts should be preserved. Parking is to be provided for visitors in close proximity to these structures which are to be repaired and maintained. To relieve some of the covered bridges of heavy traffic demands, by-pass bridges are going to be built as has been done by the Ontario Department of Highways to protect the West Montrose covered bridge. Not all covered bridges, of course, can be retained and restored or, indeed, are worthy of such a treatment.

Assessment of the Upper Dorchester Covered Bridge

The Upper Dorchester covered bridge has no distinctive characteristics or peculiar features which, apart from its exceptional length, serve to distinguish it from other New Brunswick covered bridges. In this respect, it is characteristic of New Brunswick covered bridges which are uniformly plain and quite utilitarian.
At present, there are 107 covered bridges extant in New Brunswick of which eight are multi-span structures, including the Upper Dorchester bridge.\footnote{105} The longest covered bridge in New Brunswick, which is also the longest in the World, is the seven span Hartland bridge at 1,282 feet.\footnote{106} The five span Upper Dorchester bridge at 848 feet, is by far the second longest covered bridge in New Brunswick as well as in North America, and may possibly be the second longest in the world.\footnote{107} The next longest New Brunswick covered bridge is the three span St. Nicholas River bridge at 495 feet. In terms of age or longevity, there is nothing distinctive about the Upper Dorchester bridge which was erected in 1924. All of the long multi-span covered bridges standing in New Brunswick today, with the possible exception of one undated structure, were erected in the 1920's. The two oldest New Brunswick covered bridges date from 1899; while the oldest Canadian covered bridge at West Montrose, Ontario, dates from 1881. The Upper Dorchester bridge is also rather nondescript in appearance.

The Upper Dorchester covered bridge is totally lacking in the ornamental work that distinguishes the portals of some Québec and several American bridges.\footnote{108} The ends of the Upper Dorchester bridge rise straight up from the deck to the roof line with no embellishment on the portal or gable end. The opening of the portal itself is cut in an arch at the top, but is otherwise quite plain. This is in contrast to the projecting gable end of the West Montrose covered bridge, for example, or the interesting stepped back ends of the Coulonge River covered bridge in Pontiac County, Québec. The simple arch opening in the portal of the Upper Dorchester bridge is very common on North American covered bridges;\footnote{109} while the lack of a gable projection is characteristic of many New Brunswick covered bridges.\footnote{110} The vertical weatherboard siding on the Upper Dorchester bridge is also typical of New Brunswick covered bridges in contrast to Québec where siding on covered bridges is usually clapboard or tongue-and-groove nailed on horizontally.\footnote{111}
Weatherboarding has been applied to the interior of the bridge trusses for a short distance in from the portal to protect the trusses from a driving rain. This was a common practice in covered bridge construction, and is in no way unique to the Upper Dorchester structure or New Brunswick covered bridges.\textsuperscript{112} The triangular shape of the interior weatherboarding, however, is characteristic of New Brunswick, as opposed to Québec where a square shape has prevailed.\textsuperscript{113} The elongated roofed openings in the side walls at one end of the Upper Dorchester covered bridge are likewise not unique. In recent years similar openings at eye level with small projecting roofs to keep out snow and rain, have been cut in numerous covered bridges to provide a better field in vision for cars crossing the bridge.\textsuperscript{114} This is particularly necessary on the Upper Dorchester bridge as a Canadian National Railways track passes along the river bank a short distance from that end of the bridge. The Upper Dorchester covered bridge lacks several features which are relatively common on covered bridges. It has no openings in the side walls for light or ventilation. Often roofed openings, windows, or even louvred vents such as on the West Montrose, Ontario, covered bridge, were placed in the side walls to admit light and/or air to the interior of the bridge. Some New Brunswick covered bridges even have hinged shutters covering openings in the side walls.\textsuperscript{115} Again, the Upper Dorchester structure is unlike many covered bridges in both Canada and the United States which were constructed with roof overhangs to protect openings left all along the top of the side walls under the eaves for the admittance of light and air.\textsuperscript{116}

Structurally, there is little that distinguishes the Upper Dorchester bridge. The vast majority of surviving covered bridges in New Brunswick are of the Howe truss type as is the Upper Dorchester bridge.\textsuperscript{117} It is also the third most numerous truss type among surviving American covered bridges.\textsuperscript{118} The stone filled timber crib piers and abutments of the Upper Dorchester bridge are of interest as the type of substructure
is rapidly being replaced with poured concrete piers and abutments under surviving covered bridges in both Canada and the United States.119
Endnotes

1 New Brunswick. Legislative Assembly, Report of the Controller General on the Public Accounts of the Province of New Brunswick for the fiscal year ended 31st October 1924 (Fredericton, 1924), p. 42.

2 Moncton Daily Transcript, 6 October 1890.

3 Moncton Daily Times, 19 September 1932; and an old photograph of the bridge, a xerox copy of which was sent to the researcher by Mr. Wayne Gillcash of College Bridge, New Brunswick. The researcher would like to thank Mr. Gillcash for the historical material he has forwarded relating to the Upper Dorchester bridge.

4 Moncton Daily Transcript, 2 March 1892.


6 Moncton Daily Times, 19 September 1932.


9 New Brunswick. Department of Tourism, Covered Bridges (n.p., n.d.), p. 15.


13 Ibid., p. 11.


18 Eric Sloane, op. cit., p. 100; Richard Sanders Allen, *Middle Atlantic States*, p. 5.

19 Hegen Petersen, op. cit., p. 6.


22 Kramer A. Adams, op. cit., p. 29.

23 Hegen Petersen, op. cit., p. 6.

24 Ibid.


26 Eric Sloane, op. cit., p. 81.


28 Eric Sloane, op. cit., p. 81.

29 Ibid.

Writings on the history of covered bridge construction generally accept the 'Permanent Bridge' of 1805 as the first American covered bridge. However, Adams claims that the Watford Bridge built over the Hudson River in 1804 by Theodore Burr was the "first span to be originally designed and built as a covered bridge" (Kramer A. Adams, op. cit., p. 29).

Herbert Wheaton Congdon, *The Covered Bridge, An Old American Landmark whose Romance, Stability, and Craftsmanship are typified by the Structures remaining in Vermont* (Middlebury, Vermont: Vermont Books, 1959), p. 64. Congdon goes so far as to suggest that the problem of wind damage experienced with boxed truss bridges accounts directly for the development of the covered bridge in America (Ibid.).


Eric Sloane, op. cit., p. 80.


Lyn and Richard Harrington, op. cit., p. 15.

Kramer A. Adams, op. cit., p. 29.


Ibid.

Hegen Petersen, op. cit., pp. 7, 12.


Hegen Petersen, op. cit., p. 12.

*NSPCB, World Guide* iv.

Eric Sloane, op. cit., p. 95.

Ibid., p. 100.


Kramer A. Adams, op. cit., p. 29.

Ibid.


Ibid., p. 16.

Ibid., p. 103.


Hegen Petersen, op. cit., p. 11.

Herbert Wheaton Congdon, op. cit., p. 83.


Hegen Petersen, op. cit., pp. 22-25.

Ibid., p. 22; Kramer A. Adams, op. cit., p. 31.

Hegen Petersen, op. cit., p. 13.


Ibid.

Author's tabulation is based on truss types listed in NSPCB, *World Guide*, passim. Other truss types found among surviving American covered bridges are the Haupt truss (2); Pratt truss (5); Warren truss (8); and the Grove truss (7). This list is by no means complete as the recording of truss types is as yet incomplete.

Hegen Petersen, op. cit., p. 34.

Ibid., pp. 28-29.


Ibid., p. 31.

Ibid., p. 32.

Ibid., p. 34.

Herbert Wheaton Congdon, op. cit., p. 106.

Kramer A. Adams, op. cit., p. 56; and Hegen Petersen, op. cit., p. 13.
For a list of the various periodicals published by covered bridge societies, see Hegen Petersen, op. cit., pp. 45-46.


Lyn and Richard Harrington, op. cit., pp. 81-87, have an appendix which lists the location and length of the surviving covered bridges in Québec and New Brunswick as well as the dates of construction of most of the existing New Brunswick covered bridges. It does not list the truss type.

In addition to these published pamphlets, the Ministry of Transport of Québec has prepared an unpublished report, entitled "Ponts Couverts du Québec", which locates and lists the truss type of covered bridges in the province. Unfortunately few of the dates of construction are listed.

Lyn and Richard Harrington, op. cit., vi.

Ibid., p. 74.

Ibid., viii.


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Lyn and Richard Harrington, op. cit., vi.

Ibid., p. 74.

Ibid., viii.

Québec. Ministère du Tourisme, Ponts couverts, Québec covered bridges, p. 4.

New Brunswick. Department of Tourism, Covered Bridges of New Brunswick, p. 6.

Lyn and Richard Harrington, op. cit., vii.

Ibid., p. 50.

Ontario. Provincial Archives, Record Group 14, Historical Collection, Department of Highways of Ontario, Information Section, "West Montrose Covered Bridge,"
February 1959.


90 Québec. Ministère du Tourisme, Ponts couverts, Québec covered bridges, p. 6. The researcher has been unable to ascertain the date of construction of the lone Nova Scotia covered bridge over the Kennetcook River in Hants County. Presumably it was erected at the turn of the century or thereafter as were all of the surviving covered bridges in New Brunswick.

91 Ibid., p. 4.

92 Lyn and Richard Harrington, op. cit., p. 20.


94 Lyn and Richard Harrington, op. cit., p. 10.

95 Hegen Petersen, op. cit., p. 31.


98 Lyn and Richard Harrington, op. cit., p. 65.


100 Lyn and Richard Harrington, op. cit., p. 65.

101 See Québec. Ministère des Transports (Ministère de la Voirie), "Ponts Couverts du Québec", Sections IV, V, VI.

102 Québec. Ministère du Tourisme, Ponts couverts, Québec covered bridges, p. 4.

103 Ontario. Provincial Archives, RG14, Historical Collection, "New West Montrose Bridge on Highway No. 86," July 1960;
ibid., Department of Travel and Publicity, "Ontario's last covered bridge to be commemorated," 23 August 1960. An historical plaque was erected by the Ontario Department of Travel and Publicity, acting on the advice of the Archaeological and Historic Sites Board of Ontario on 28 August 1960 to commemorate the last covered bridge standing in Ontario.

104 Lyn and Richard Harrington, op. cit., p. 17.
105 Ibid., p. 50.
106 Hegen Petersen, op. cit., p. 32.
107 Lyn and Richard Harrington, op. cit., p. 28.
108 Ibid., p. 86.
109 Herbert Wheaton Congdon, op. cit., p. 134.
110 This statement is based on a perusal of the numerous photographs of New Brunswick covered bridges in Lyn and Richard Harrington, op. cit., passim.
111 Ibid., p. 44.
112 Herbert Wheaton Congdon, op. cit., p. 71.
113 Lyn and Richard Harrington, op. cit., p. 46.
114 Ibid., p. 44.
115 Ibid., and the photographs of covered bridges therein.
116 Hegen Petersen, op. cit., p. 26; Lyn and Richard Harrington, op. cit., p. 44.
119 Lyn and Richard Harrington, op. cit., p. 33.
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Kingpost Truss

Queenpost Truss

Multiple Kingpost Truss

Boxed Truss Bridge (Kingpost)

Burr Arch-Truss Bridge - 1804

Figure 1
Palmer Arch-Truss - 1797

Town Lattice Truss - 1820

Long Panel Truss - 1830

Figure 2
Howe Truss - 1840

McCallum inflexible Arch-Truss
1851

Stepped-Back Portal -
Coulange River, Quebec.

Overhung Portal -
West Montrose, Ontario

Figure 3
4 Map showing the location of the Upper Dorchester Covered Bridge.

5 Regional Map, Upper Dorchester, New Brunswick.
Portal of the Upper Dorchester Covered Bridge (Photo: J.R. Mowat, September 1976).

Interior of the Upper Dorchester Bridge (Photo: J.R. Mowat, September, 1976).
Upper Dorchester covered bridge (Photo: J.K. Mowat, September, 1976)