

YORK STREET BRIDGE, TORONTO.

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This structure stands near the foot of York St., Toronto, & affords access from the city to the water-front for vehicles & foot-passengers, over the intervening railway tracks. It was built under the provisions of "The Esplanade agreement, 1892," the parties thereto being the C. P. & G. T. Ry. Co's. & the City of Toronto. This agreement was one of the results of the endeavors of the C.P.R. to establish a freight yard in the central part of the city, & under it that Co. was to construct the bridge, & the cost was to be borne in equal parts by that Co. & the city, unless the courts should decide that the G.T.R. was liable for a share, & the plans of the structure were prepared in Montreal under the direction of P. A. Peterson, Chief Engineer of the C.P.R., and were approved by the Toronto City Engineer. Work on the ground was commenced May 1, 1896, & the bridge was opened for traffic about the beginning of Aug., 1897. The erection took much longer than anticipated, owing to the contractors for the ironwork being unable to obtain their raw material fast enough, & to a ship-load of timber for the deck being wrecked en route, & by differences arising between the Co. & the city regarding the finishing up of the roadway.

The general design of the bridge is a steel trestle, composed of about 32 spans deck-plate girder ranging from 30 to 70 ft. span, with wooden stringers & decks. There are also in addition 2 spans of less than 20 ft. rolled steel I beams. These girders & I beams rest in iron columns, standing on stone pedestals, except at the 3 ends of the bridge, where there are stone abutments. The width of the roadway, except on the southerly ramps, is 37 ft. 6 in., with sidewalks on each side 7 ft. 6 in. wide. On the southerly ramps the width of roadway is 32 ft. 6 in., with one 7 ft. 6 in. sidewalk.

The ground-plan of the bridge is "T-shaped," with the base resting on the south side of Front St., & it extends southerly therefrom across the deviation of York St. & the railway tracks to Lake St., a distance of about 906 ft. Here the ramps of the bridge turn, one to the right & the other to the left, & descend to the level of the street, & the length of these ramps is each about 316 ft., making a total length of bridge of 1,538 ft.

From Front St. the roadway of the bridge rises with a grade of 1 ft. in 20, for about 298 ft., & at the Lake St. ends there are similar falling grades of 1 in 20, about 500 ft. in length, & heavy loads to the railway freight-sheds are taken over these grades every day & no special difficulty seems to be experienced.

There are in all 3 abutments and 68 pedestal blocks. The foundation of the two Lake St. abutments & all the pedestal blocks, except 14 north of the south line of the old Esplanade, are on piles driven to the ledge rock. This was necessary, as the land was formerly part of Toronto Harbor, & had only been filled in the year previously with miscellaneous rubbish, earth, brickbats, tin cans, as well as more objectionable refuse.

When piles were to be driven an excavation was carried down to 1 ft. below zero level of the water of Toronto Harbor, & soundings were then taken down to the rock. The piles were then cut off the correct length & driven home with a "follower," & under the specifications the piles were to be cut off 1 ft. below zero level, & the above method was found less expensive than actually cutting them under water, & it was very seldom that a pile had to be cut when once driven home. Only a very blunt point was made on the pile before driving, & four piles were driven for the small pedestals, 18 for the medium & 9 for the

large pedestals. Under the abutments the piles were 4 ft. centres longitudinally & 2 ft. 6 in. transversely.

The excavation was then carried down 6 inches below the top of the pile & 2 ft. in depth of concrete put in. In some cases where the underlying material was very soft, short lengths of 2 in. plank were laid flat under the concrete between the piles, in order to keep the concrete from settling in the soft material before it was set. The concrete foundation is 7 ft. square under 10 of the pedestals, carrying the longer spans; 6 ft. sq. under 9 pedestals; 5 ft. 6 in. sq. under 5 pedestals, & 4 ft. 6 in. square under the remaining 44, & is generally 2 in. deep. The concrete was composed as follows, except when laid under water: Cement 1 part; clean, sharp sand 3 parts; broken stone 5

parts; all by measure, & under water the concrete was composed, cement 1 part; sand 2 parts; broken stone 5 parts.

Below ground the stone-work is what is known as "Rubble masonry." Above ground it is "Rock-faced ashlar," & was built under the C.P.R. standard masonry specifications. The stone was brought partly from the contractors' quarries at Owen Sound & partly from the Orangeville quarry. The contractor for concrete and masonry work was D. Chalmers of Owen Sound, & the piling was done by the Ry. Co.'s own men & its track pile driver. The two top courses of the pedestals had to be drilled before being placed in position to receive the 1 1/4 in. iron rods which secured the iron columns to the masonry, & some little difficulty was experienced in drilling completely through these stones without breaking

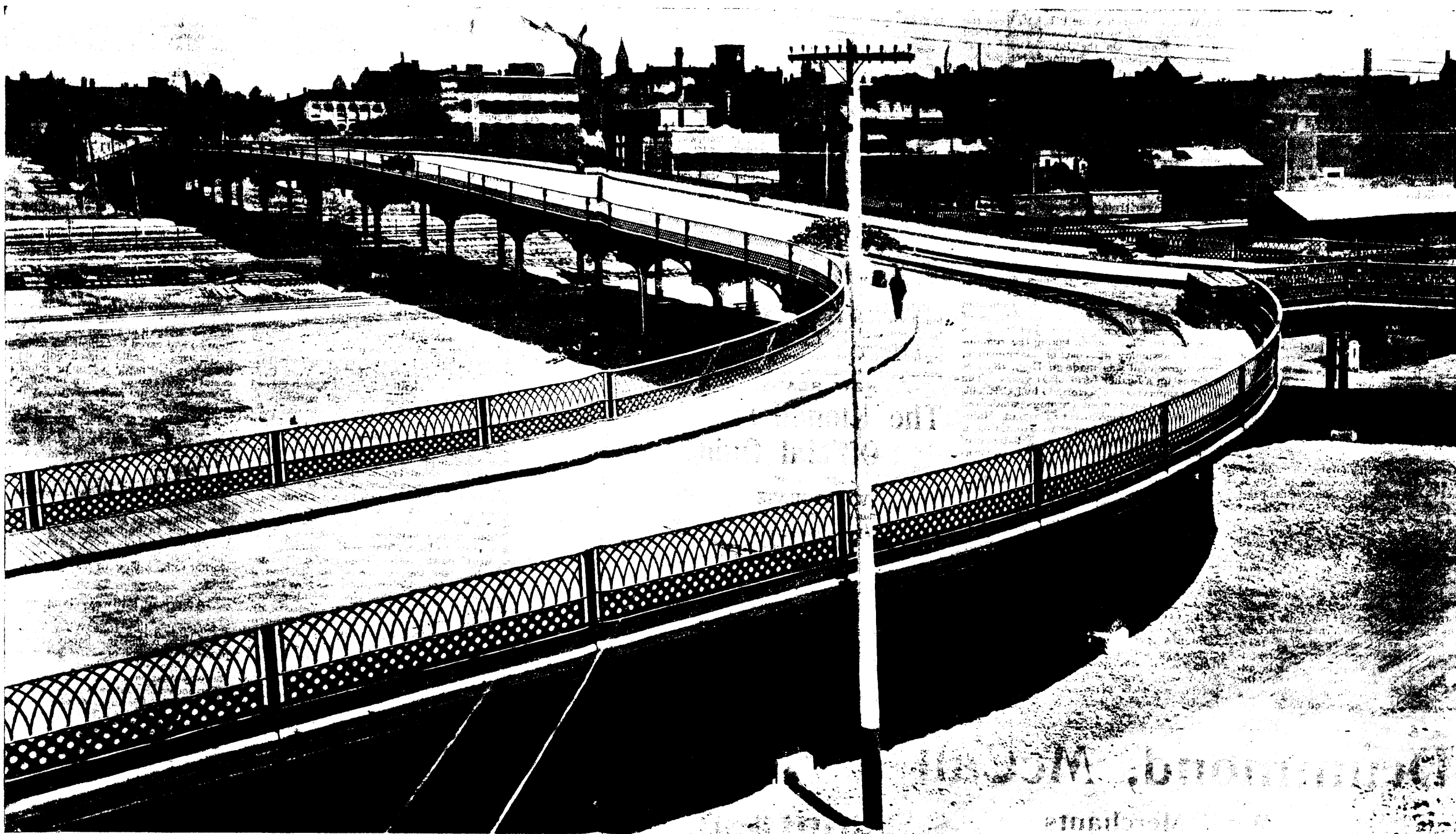
them. This drilling was done with a steam drill, half from each side of the stone.

The iron-work was erected during the winter of 1896-7, & was paid for at so much per lb. in the finished work. The bridge was designed to carry in addition to its own weight the following live loads, either singly or in any combination.

a.—100 lbs. per sq. ft. of roadway & sidewalk.

b.—One 32,000 lb. road roller, having a wheel base of 11 ft. 2 in. in length & 7 1/4 in. transversely.

c.—A string of electric cars 26 ft. long, each weighing 30,000 lbs. fully loaded, on each track, and all parts of the structure were proportioned so that maximum loads should produce no greater tensile strain upon the net section than 12,000 lbs. per sq. inch. A



wind strain of 400 lbs. for each longitudinal lineal foot, & 150 lbs. for each vertical lineal ft. if the trestle bents were allowed for. All steel had to come up to the following requirements.

Ultimate strength.....	58,000 to 65,000 lbs.
Elastic limit	33,000 lbs.
Elongation in 8" in.....	20%
Reduction of area.....	40%

& was made by the open-hearth process. Before leaving the shop it was thoroughly cleared of all loose scales & rust with steel scrapers & brushes, & was then given a good coating of red lead mixed with linseed oil, well worked into all joints & surfaces, & after erection the iron-work was given two more coats of paint.

All the timber in the deck of the bridge,

with the exception of the sidewalk planks & paving blocks, is southern yellow pine, creosoted with 10 lbs. of dead oil of coal-tar per cubic foot.

On top of the joists & 4-inch plank was laid 2 thicknesses of best tarred paper thoroughly sealed with roofing-pitch to the planking & each other. On top of this was laid the paving blocks, consisting of square cut white pine blocks 8x4x4 1/2 in. deep, grain upwards. These blocks were held apart at the cross joints by 3 specially made nails driven into each block up to the collar having the blocks 3-16" apart. All joints & vacancies were then filled in with best paving pitch, & the roadway covered 1/2 in. deep with gravel. A double-track girder rail for electric cars was laid across the bridge by the St. Ry. Co. before the paving was done, for possible use in