

The Triborough Artery

By Hon. ROBERT MOSES

Secretary and Chief Executive Officer of the Triborough Bridge Authority

THE TRIBOROUGH BRIDGE project consists of three and a half miles of bridge structures and 14 miles of arterial highway connections, either improved or newly constructed.

The bridge from Queens to The Bronx provides for the accommodation of a total of eight lanes of traffic while the bridge roadways to Manhattan are designed to accommodate six lanes. In Queens, the approach viaduct rises from street grade at Lawrence and Hoyt Avenues to the East River Crossing where the roadways are carried over Hell Gate by a suspension bridge. The bridge continues thence on plate girder viaduct structure across Ward's Island, Little Hell Gate and Randall's Island.

Bronx Kills Span

On the latter, a junction is formed between the Queens to The Bronx branch and the Manhattan branch of the bridge. From the junction, truss spans carry the roadways over the Bronx Kills and the Railroad Yard of the New York, New Haven & Hartford Railroad Co. The span



Robert Moses, the man whose energetic efforts made the Triborough Bridge possible.

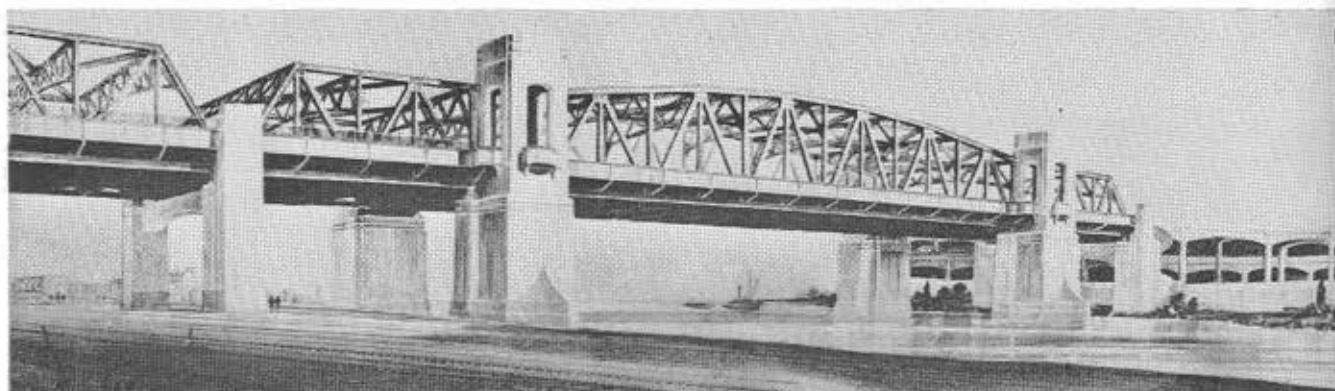
crossing the Bronx Kills is designed so that eventually, if that waterway becomes navigable, the truss may be converted into a lift span. North of the Railroad Yard, The Bronx

approach continues to grade at 134th Street and Southern Boulevard.

The Manhattan branch crosses Randall's Island and the Harlem River by means of plate girder viaduct structure and the truss spans of a vertical lift bridge, respectively. The approach viaduct in Manhattan separates into two branches; one terminating in a pair of ramps at Second Avenue on either side of 125th Street and the other curving around to come to the street grade near the waterfront at 122nd Street.

Queens Approach

The two roadways of the Queens approach structure are each 43 ft. 6 in. wide, are separated by a central traffic barrier and are flanked by sidewalks for pedestrians. As far as 23rd Street, the viaduct is flanked on the south by Hoyt Avenue south, and on the north by Hoyt Avenue north, a new marginal street. At 23rd Street, the approach deflects to the northward to the alignment of the East River Crossing. The struc-



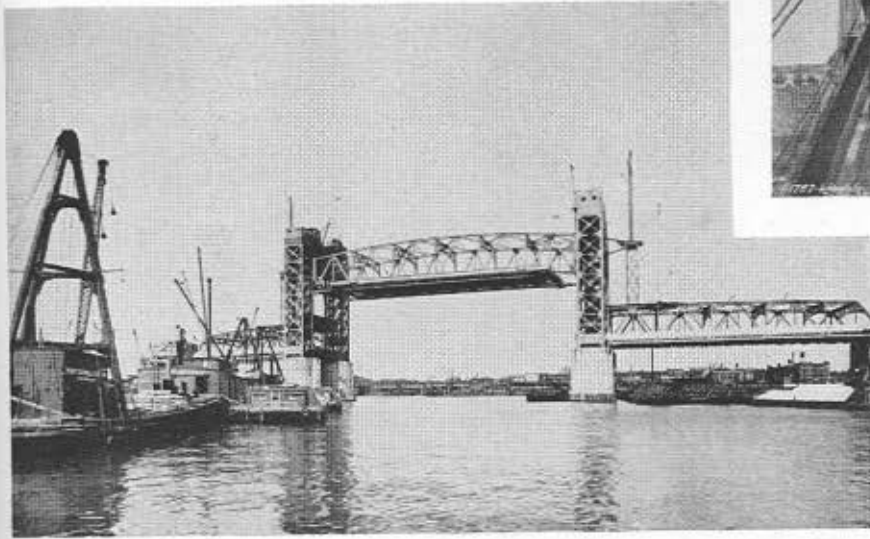
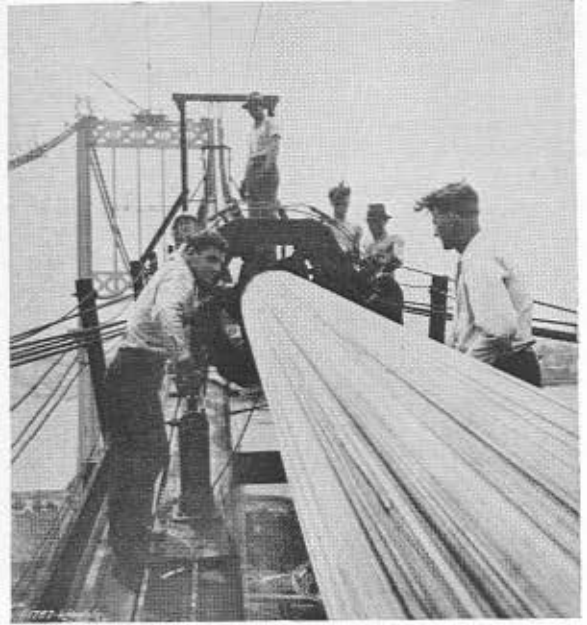
The Bronx Kills Crossing, designed for a lift span when the Kills becomes navigable. With a lift weight of 5,800,000 pounds and a deck area of 39,000 square feet, this is the world's heaviest lift span.

ture is of reinforced concrete with curtain walls from 29th Street to an abutment on the south side of 26th Street.

From the latter point to the anchorage, the viaduct is a series of plate girder spans varying from 62 ft. to 141 ft., supported on concrete piers of three shafts each. These piers vary in height from 18 ft. to 60 ft. and are supported on concrete pile foundations, except for the first six piers adjacent to the anchorage

Right: Compacting cables for the huge span across the East River.

Below: Harlem River Lift at high level.



which are on spread footings. The tops of the shafts of the higher piers are connected by reinforced concrete arched portals. Three plate girders carry the steel floor system in each span which in turn carries an 8½ in. reinforced concrete roadway slab.

East River Crossing

The suspension bridge over the East River, known as the East River Crossing, has a main span of 1,380 ft. and side spans of 705 ft. The deck is suspended at a clear height of 135 ft. above water level from two parallel wire cables of 20¾ in. diameter. The latter pass over the tops of two 300 ft. towers. The floor system is suspended from the cables by steel suspender ropes which pass over grooved cable bands, spaced approximately 29 ft. apart, measured horizontally.

The suspender ropes are attached to steel floor beams, 8 ft. deep, which span the full 98 ft. width of the deck. The floor system is made rigid by stiffening trusses 20 ft. in depth, provided on each side of the bridge while the entire floor system is stiffened against wind action by a system of bracing below the roadway

deck. The roadway itself, of the same width as the Queens approach, and thus providing for a total of eight lanes of traffic, is of reinforced concrete 7 in. thick. The sidewalks for pedestrians are above the roadway level, cantilevered out from the stiffening trusses at the level of the top chords.

The tower piers and the massive concrete anchorages for the cables are founded on rock. The Ward's Island anchorage contains approximately 70,000 cu. yds. of concrete and weighs 136,000 tons. The Queens anchorage contains even more concrete, 87,000 cu. yds., because of the greater depth to suitable rock foundation at that point. The anchorages have the general dimensions of 150 ft. width by 225 ft. length.

Ward's Island Anchorage

The viaduct structure on Ward's and Randall's Islands and over Little Hell Gate is of the same general design as that of the Queens approach. It consists of plate girder spans supported on concrete piers, the spans varying from 64 ft. to 125 ft. The latter dimension is used in the five

spans over Little Hell Gate where a clearance of 62 ft. is provided at Mean High Water.

The main viaduct between The Bronx and Queens is joined by the Manhattan branch on Randall's Island. At this location a structure has been designed which will permit the interchange of traffic passing in either direction between any of the boroughs without requiring the crossing of traffic lanes at grade and at the same time will provide direct access to the island from all three boroughs.

No Grade Crossings

The elimination of grade crossings is accomplished by a system of curving roadway connections of which that for traffic from Queens destined for Manhattan or Randall's Island and also the connection from either Manhattan or Randall's Island bound for The Bronx, passes under the main Queens to Bronx roadways. The two ramps to the island are located centrally on the Manhattan approach leading from either end of the toll collection area. The roadways at the junction have been carefully studied and developed to provide safe and easy divergence and convergence of traffic. The curved roadways to and from the Manhattan branch have been designed to accommodate three lanes of one-way traffic and are 35 ft. in width.

In addition to its features as a grade elimination structure, the junction has been designed to permit the collection of tolls. Two collection areas are provided. All vehicles between Queens and The Bronx pass

through a toll area where the two roadways of the main viaduct structure are combined to provide a total paved width of 137 ft. between curbs. Space is thus allowed for five toll booths and ten toll lanes.

All other vehicles, namely those between Manhattan and The Bronx or Queens, and all vehicles bound to Randall's Island, pay tolls in an area on the Manhattan branch of the junction where six toll booths, collecting from twelve lanes are provided. The total paved width at this location is 195 ft. including two free lanes for traffic passing from Randall's Island. These last named lanes make it possible to limit the cost of a visit by motor car to the Island to one toll which is paid upon entering.

Truss Spans

Continuing west from the junction, the Manhattan branch provides two 33 ft. 6 in. wide roadways of three lanes each and two sidewalks. These roadways cross the Harlem River by means of three truss spans, totaling 772 ft. in length of which the central vertical lift span, over the channel has a length of 310 ft. In its low position, a clear height of 55 ft. over the water permits the passage of tug boats and other ordinary river traffic. In its high position, for the infrequent passage of high masted vessels, a clearance of 135 ft. over the water is provided.

World's Largest Lift Span

The river piers and towers for this lift span are of unusual proportions. The tower legs extending to a total height of 210 ft. above the river are connected at their tops by deep arched bracing and are surmounted by steel machinery houses. The movable span is the largest lift span yet constructed, measured in terms of deck area, which totals about 29,000 sq. ft. It weighs 4,100,000 lbs. but is not, however, the heaviest span, every effort having been made to reduce its weight and cost by the use of a light weight floor consisting of asphalt plank pavement laid on steel plate. The lift span is suspended from the two towers by ninety-six 2 1/4 in. diameter steel ropes which pass over 15 ft. diameter sheaves located at the tops of the towers to connect with concrete counterweights. Power for the hoisting operation is supplied by four 200 horsepower motors located in the machinery houses at the tower tops.

This lift span will be exceeded in size by that of The Bronx Kills Crossing provided the latter is later converted into a lift span when and if The Bronx Kills is made navigable. The Bronx Kills crossing has been completely designed to the last detail to meet this ultimate condition and it will then have the largest and heaviest lift span ever built with a deck area of about 39,000 sq. ft. and a lift span weight of 5,800,000 lbs.

Mention should be made of the fact that The Bronx approach, as now completed to the south side of the plaza area between 134th and 135th Streets and Southern Boulevard, is intended to be an initial condition only. The center portion of the structure, left open between

the two two-lane ramps to ground level, has been so designed that later a central ramp may continue at a high level to join a westerly connection.

Highway Connections

Highway connections form an important part of the Triborough Bridge project because it has been realized that in order for the bridge structure to offer the maximum of service to the territories to be served, adequate means for uninterrupted approach to the structure are necessary.

The Bronx connection, over 6 1/4 miles in length, consists of an improvement of Southern Boulevard, Whitlock Avenue and Eastern Boulevard as far as Pelham Bay Park. From the bridge plaza at 135th Street

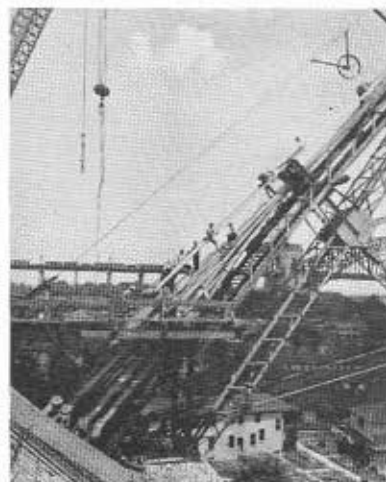
Summary of Cost of Triborough Bridge Project

Bridge	Estimated Cost to	
	T. B. A.	City
Construction	\$20,100,000	\$3,300,000
Real Estate	6,300,000	2,100,000
	\$26,400,000	\$5,400,000*
Connections		
Construction	\$13,200,000	\$
Real Estate	4,600,000	\$10,700,000
	\$17,800,000	\$10,700,000
Totals	\$44,200,000	\$16,100,000
Grand Total Cost to T. B. A. and City	\$60,300,000	

Note: * Indicates expenditures by City for land and construction prior to creation of T. B. A.

Schedule of Tolls for Triborough Bridge

Passenger automobiles, all types, taxicabs, ambulances, hearses and horse-drawn vehicles	25 cents
Trucks	
2 axle—Load capacity 2 tons and under	25 "
Load capacity over 2 to and including 5 tons	35 "
Load capacity over 5 tons	50 "
3 axle—Truck, or tractor and semi-trailer	60 "
4 axle—Truck and trailer, or tractor and trailer	75 "
Buses	50 "
Motorcycles	15 "
Bicycles	10 "



and Cypress Avenue, Southern Boulevard and Whitlock Avenue as far as Leggett Avenue, have a 60 ft. roadway with two 20 ft. sidewalks. Whitlock Avenue from Leggett Avenue to Hunts Point Avenue has been widened to provide two 40 ft. roadways separated by an appropriately landscaped mall approximately 60 ft. wide. Here the roadways are flanked by two 15 ft. sidewalks. Beyond Hunts Point Avenue, the connection continues along Eastern Boulevard to Middletown Road as a 60 ft. roadway with two 20 ft. sidewalks. Throughout the entire length, the roadway is surfaced with asphalt on a concrete base.

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The Queens connection has a total length of $6\frac{1}{4}$ miles. From the bridge approach, a distance of approximately one mile, the improvement consists of two 42 ft. wide depressed express roadways, separated by a safety aisle and flanked by Astoria Boulevard north and south. North and south surface streets are bridged over the depressed roadways. The latter are brought to grade at 70th Street opposite St. Michael's Cemetery where an interchange area is formed for traffic between the depressed roadways, the marginal roadways and the Grand Central Parkway Extension. Beyond this area, Astoria Boulevard has been widened, regraded and paved to provide two 42 ft. roadways which are flanked by 15 ft. sidewalks and separated by a 16 ft. mall, this improvement extending as far as Northern Boulevard.

Marginal Roadways

The Grand Central Parkway Extension starts from the aforementioned interchange area, passing under a ramp carrying the west-bound traffic of Astoria Boulevard. This parkway, consisting of two 32 ft. roadways separated by a safety aisle, skirts Flushing Bay to join with the Grand Central Parkway at Northern Boulevard. Marginal roadways are provided for a portion of the length and the entire section is being appropriately treated for landscaping and park purposes. The depressed roadways and a portion of the Grand Central Parkway Extension are paved with concrete. The balance, along Flushing Bay, is of bituminous macadam. Astoria Boulevard is paved with sheet asphalt on a concrete base.

The Manhattan connection, known as the East River Drive, parallels the waterfront from East 122nd Street to 92nd Street and York Avenue. The Drive is 125 ft. wide, having two 32 ft. roadways separated by a safety aisle, a 15 ft. sidewalk along the westerly roadway and a mall, approximately 40 ft. wide, appropriately landscaped along the riverside. From East 122nd Street to 92nd Street, the Drive has a length of over one and one-half miles.

Prior to the arrangement for Federal financing, the City had paid approximately \$3,300,000 for the construction of the anchorages and

tower piers of the suspension bridge and for the pier foundations on Ward's Island and for miscellaneous other work, and had invested \$2,100,000 in real estate, a total of \$5,400,000. The cost to the Triborough Bridge Authority to complete the project is approximately \$44,200,000 of which \$33,300,000 is being spent for construction and \$10,900,000 for land.

The Triborough's share is financed by the issuance of \$35,000,000 in bonds and by a Federal grant of approximately \$9,200,000. The Authority bears the entire cost of the

land required for the bridge and approaches, other than that previously purchased by the City. It bears not more than 35% of the cost of the land required for the connections. The City's cost for real estate for the connections approximates \$10,700,000. The total cost of the project is estimated at \$60,300,000.

Schedule of Tolls

A schedule of tolls has been established with rates somewhat lower than those on similar crossings. The basic passenger car rate is 25 cents.

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THE TRIBOROUGH ARTERY

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These rates are approximately equivalent to those charged on the Delaware River Bridge between Philadelphia and Camden and about one-half of those in force in New York at the Holland Tunnel and on the George Washington Bridge across the Hudson River. They are slightly less than the rates charged on the College Point and Astoria Ferries. Nine different sets of classifications have been set up.

Vehicle Rates

All types of passenger automobiles, taxicabs, ambulances, hearses and horse-drawn vehicles will be 25 cents. Trucks will be charged for according to axle and capacity load at from 25 to 75 cents. Buses will be 50 cents; motorcycles will pay 15 cents, and bicycles will be charged for at the rate of 10 cents. No charge is made for pedestrians on the Triborough Bridge.

The arrangement for collection of tolls from vehicles visiting Ward's and Randall's Islands is such that fares will be collected only upon entering, free lanes having been provided for vehicles leaving the islands. Thus the round trip charges between any one of the three boroughs and Randall's Island, or charges for a continuous trip via Randall's Island between any two boroughs will be the same as the one-way charge over the bridge without stop on Randall's Island.

Bus Service

Scheduled bus transportation has been inaugurated in order that the non-car-owning public can utilize the benefits afforded by this direct link between the three boroughs and also recreational facilities available on Randall's Island.

One route originates on Manhattan Island, serves Randall's Island and will continue to Ward's Island by a low level bridge across Little Hell Gate. This means of transportation to Ward's Island will supplant the ferry service from Manhattan.

A second route departs from Manhattan to The Bronx and returns discharging passengers at Randall's Island from both the terminals. The third route connects Manhattan and Queens, permitting the delivery of passengers to Randall's Island in both directions of travel. Another route connects the boroughs of The Bronx and Queens and likewise serves Randall's Island patrons.

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