CONTROL DESK

The traffic supervisor at the control desk. He has a good view of the toll plaza, he is in constant touch by radio or telephone with the men in the toll booths and those in the emergency vehicles, and his automatic equipment shows every vehicle—every accident—every breakdown or fire—in fact every unusual incident of any kind. At a second's notice, he can call out an emergency vehicle, call out extra men for the toll booths if the traffic becomes heavier—or even, by pressing a button summon a fire engine from the North Shore or city brigades. His desk is the nerve centre from which the bridge is run.

HOW THE HARBOUR BRIDGE IS OPERATED

KEY TO ILLUSTRATION

1 Closed circuit television
2 Radio telephone, hand set
3 Direct telephone from emergency phones on bridge and approaches
4 Ordinary telephone (P & T)
5 Direct telephone to toll booths
6 Indicator lights to show proposed lane control lights on overhead gantries
7 Indicator lights to show origin of emergency phone calls
8 Electronic calendar and clock
9 Digital counter total number of vehicles across the bridge
10 Daily traffic totals, for each 15 lanes and sub-totals for vehicles north/south
11 Binoculars
12 Speaker for vehicular radio telephone
13 Microphone, paging toll booths and plaza
14 Axle counters
15 Toll booth security alarms
16 Fault indicator lights
17 Selector switches for microphone
18 Fire warning lights for Administration Building and Workshop
19 Direct fire alarm to City and North Shore Stations
20 Indicator lights, showing toll booths in operation
21 Panel control for street lights, fog siren, service alarms, etc., and computer relay system

Bridge Operation

Toll facilities, like the Auckland Harbour Bridge, do not function by themselves. As well as their specific duties for the collection of tolls, the Bridge Control Officers employed by the Authority are required to undertake traffic control and are now well experienced in dealing with accidents, breakdowns and emergencies of all kinds. To carry out this work, the Bridge Authority uses eight light emergency vehicles, one heavy tow-truck, a traffic control car with officers available to man these 24 hours per day.

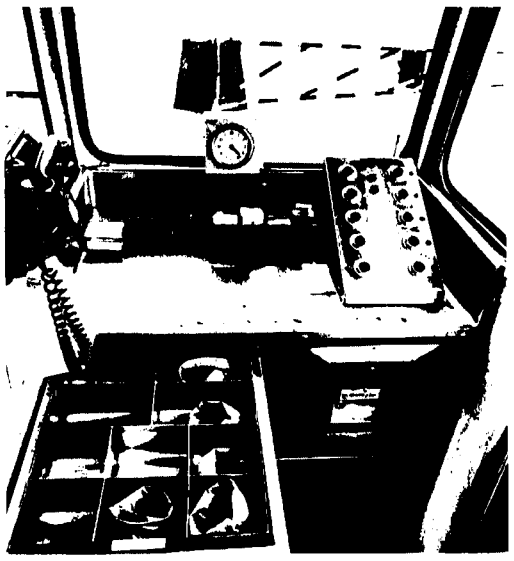
Overhead gantries to carry direction signs and a system of traffic lane light control for the ultimate "tidal flow" operation have been incorporated within the planning of the bridge and approach roading contracts. The whole area is under constant surveillance by closed circuit television. On the bridge and elevated viaduct approach between the original structure and the extensions, 8ft 6in emergency stopping strips have been built and these are valuable in dealing with vehicle stoppages and will be particularly so as traffic increases in future years.

Consequently upon the availability of additional traffic lanes, the Authority has replaced the original toll collection and registration machinery with more modern equipment. Briefly, this involves the initial registration of vehicles by a Bridge Control Officer operating a "button box" with supervision of the initial registration from overhead indicators and the visual patron fare indicator installed forward of the toll booth islands. Information is transferred from the toll booths electronically and stored within the complementary equipment housed in a specially allocated room in the Administration Building.

Punched paper tape is produced each time a Bridge Control Officer finishes a shift and this tape, bearing all the primary data relating to that shift, is fed into a table-top data processor which calculates and prints out the amount of cash from the values of vehicles registered by officers in the toll lanes. Equipment can be programmed to produce on demand varying types of statistics which are so important, particularly in respect to forward planning. The maintenance of the bridge requires considerable expenditure too. For example, there are over 2 000 000 square feet of steel in the bridge project and a large team of maintenance employees are needed to keep it in good condition.

COSTS

It was necessary to borrow $15 million to build the original bridge and approaches. The extensions to the bridge and approaches, new lighting and additional toll booths increased this debt by an additional $16,250,000. All this finance has had to be obtained by way of loans which will be repaid over a number of years from toll receipts and Government grants.



TOLL COLLECTOR'S BOOTH

View of the inside of a toll collector's booth. On the right is the toll registration button box. When the officer depresses one of the buttons (there is a different button for each class of vehicle using the bridge), the toll paid is then automatically recorded on equipment in the Administration Building which is directly connected to a data processor.

AUCKLAND HARBOUR BRIDGE

GROWTH - PAST and FUTURE

The Harbour Bridge was opened in July 1959 and within 10 years the volume of traffic using it had increased from an average of 13,000 vehicles a day to an average of 45,000 vehicles in 1970. This rapid growth is one of the highest recorded on a toll facility in the world—and is partly a reflection of the general economic growth, it is also due in a considerable measure to the rapid development of the North Shore—a development very much accelerated by the construction of the bridge itself.

The rate of traffic increase far exceeded all earlier forecasts and observing this the Bridge Authority in 1964 instructed their consulting engineers, Messrs Freeman Fox & Partners, of London, to report on the feasibility of the cost of duplicating the crossing on its existing general alignment. The eventual outcome of this commission was the bridge as it is seen today, two additional 12ft wide lanes on either side of the four original 10ft 6in lanes. The advantage of this solution over the more obvious one of providing an additional bridge is self-evident. Not only were constructional costs substantially reduced but property acquisition and amenity disruption on both sides of the Harbour Bridge were also far less.

A further advantage of the provision of all 8 lanes on the single bridge allows for the possibility of operating on a "tidal flow" basis, 6 lanes in the direction of the predominate peak traffic and 2 for the opposite direction.

CONSTRUCTION

The original bridge rests on six reinforced concrete piers sunk through the mud of the harbour bed and on to the solid rock below.

The largest pier measures 76ft by 46ft at the base and is 175ft high—about the height of a sixteen storey building. The bridge itself is 3,348 feet long. Joining it on the North Shore side is a steel viaduct 648 feet long, then a concrete viaduct 1,012 feet long. This makes a total distance from the toll booths to a point beginning at Fanshawe Street Approach on the southern side, about 2 miles. The main span or arch is 800 feet long and the top-most length of steel is 210 feet above high water.

The new traffic lanes (the bridge extensions) are carried on girders which are entirely separate from the superstructure from the original bridge, being supported on brackets attached to the sides of the original bridge piers. The ability for these to carry the additional load has puzzled many people, but it may not be generally realised that the size and strength of the bridge piers and foundations are frequently determined more by conditions during their construction than by their service conditions, leaving them with an inbuilt reserve of strength. This reserve is now being utilised on the bridge itself. In addition the girders carrying the new lanes are of hollow steel box construction, a form which has become widespread in recent years and which is much lighter than the original bridge superstructure.

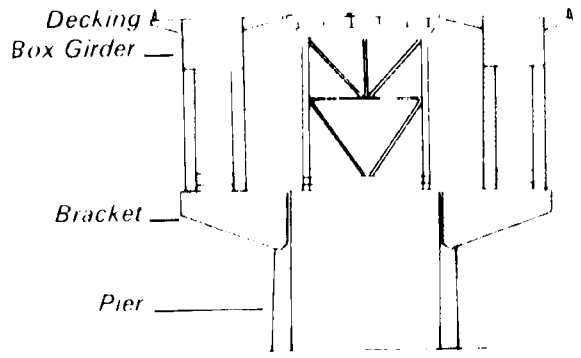
The overall measurements of the bridge as extended is

Length	3,597ft
Width of Main Span	800ft
Clearance under Main Span	139ft
Width of Bridge between Parapets	113ft
Gradient of Bridge Deck	1 in 20

ROADS

Planning of the widened approach roads to the bridge presented some problems. The addition of extra lanes might appear as a simple widening operation, but the bridge approaches were almost entirely composed of curved roads with the result that the original drainage levels and cross falls were all affected. As well as providing 4 additional lanes, practically the whole of the original roads had to be reconstructed and on the south side not a single square yard of the original surface remains.

On the north side the toll plaza had to be widened to accommodate traffic from the original lanes. Five toll lanes have been added to the original 10 with provision for a further 5 should this become necessary.



Drawing showing cross section of existing bridge and extensions beneath road level