

capacity" of a two-lane highway may be rated at 8,000 vehicles per day, while that of a four-lane highway may be rated at 28,000. With adequate traffic regulation, however, the capacity may be expected to be perhaps 50 per cent. greater—*i.e.*, 12,000 vehicles per day for two lanes and 42,000 vehicles per day for four lanes. This reserve capacity will be available to cope with short peak-load fluctuations in the volume of traffic. Assuming, as for this purpose we do, that the bridge will be opened in 1956, we estimate the total vehicular traffic in 1965 at 8,250 vehicles. That volume slightly exceeds the "practical or working capacity" of a two-lane highway. Our estimate of the ultimate volume of traffic is 26,800 vehicles, which is slightly below the rated "practical or working capacity" of a four-lane highway. We consider that these volumes clearly determine that a four-lane carriageway is appropriate for the bridge, and we have recommended accordingly. It follows, also, that until the traffic volume approaches the ultimate to be expected from the metropolitan area there need be no doubt as to the bridge having reserve capacity to cope with any additional traffic from extra-metropolitan areas—in other words, the bridge alone could meet the requirements of the far North as well as of the North Shore area. This consideration at once gives rise to a question regarding the necessity for another outlet via Whenuapai and Dairy Flat and this we propose to discuss in our concluding review.

(7) CONSTRUCTION OF BRIDGE AND APPROACHES

Judged by world standards, neither the superstructure nor the substructure presents any unusual problems of design or construction. Without citing numerous examples in more distant countries, we may compare the proposed Auckland bridge with the Story Bridge at Brisbane, which was completed in 1940 by an Australian organization. This has a main span of 924 ft., compared with the proposed main span of 800 ft. of the Auckland Harbour bridge; and the deepest pier of the former was founded at 132 ft. below ground-level, under conditions that necessitated pressure in the air-locks of 54 lb. per square inch, practically the same as may be expected in the case of the deepest pier of the Auckland bridge. Much longer spans and deeper piers than in the case of either the Brisbane or the Auckland bridge are relatively common in other countries. Nevertheless, the Auckland bridge will far exceed in magnitude, difficulty, and cost any bridge hitherto designed or constructed in this country, and very careful and detailed investigation and planning are called for before the final scheme is adopted. Regarding the substructure, the deepest piers are located at sites where, owing to the depth of water and the strong and variable tidal currents, the accurate positioning and sinking of caissons will call for considerable resource and skill. The founding of the deepest caisson will involve working by the pneumatic method under a pressure which is close to the limit for that method, and any increase in depth will add greatly to the difficulty and cost.

Although none of the five reinforced-concrete arch spans of the bridge is as long as the central span of the Grafton Bridge, they constitute in the aggregate a much greater work. However, the technique of arch design and construction has advanced very considerably since the Grafton Bridge pioneered the way.

The principal span of 800 ft. far exceeds in magnitude that of any highway bridge or railway bridge in New Zealand, but ample precedents are available for both design and erection procedures.

The proposed reclamation at the west end of St. Mary's Bay, on which the southern bridgehead is proposed to be located, should be one of the first works to be constructed, as it will form a spacious and conveniently situated construction depot readily accessible by road and water.

The approaches to the bridge constitute in volume a work comparable with the Auckland - St. Heliers waterfront road, though somewhat simpler to execute. Reference has been made to the advantages of dredging as a means of forming the embankments of the southern approach. The formation of the longer but generally shallower