# HOUSE . . . . No. 357

## The Commonwealth of Massachusetts.

REPORT OF THE DEPARTMENT OF PUBLIC WORKS RELATIVE TO THE NECESSITY AND COST OF THE CONSTRUCTION OF A NEW BRIDGE OVER LOBSTER COVE IN THE CITY OF GLOUCESTER.

Department of Public Works,
State House, Boston, Jan. 12, 1921.

*To the Honorable Senate and House of Representatives.*

Chapter 52 of the Resolves of 1920 is as follows: —

*Resolved*, That the department of public works is hereby directed to investigate the necessity and cost of the construction of a new bridge over Lobster Cove in the city of Gloucester, and to report thereon to the next general court, not later than the fifteenth day of January.

The present bridge was built about forty-five years ago, and is a pile and timber structure with a plank roadway and no sidewalks. It crosses Lobster Cove about one-half mile from the head of the cove and connects Washington Street on the easterly side of the cove with that part of the city of Gloucester known as Annisquam. The bridge is 22 feet wide and about 445 feet in length between stone abutments. There is an opening 30 feet wide near the westerly shore for the passage of boats, which is spanned by a two-leaf lift bridge raised by chains passing over posts to a hand gear under the floor of the bridge. The portion of the roadway occupied by the lift bridge is 15 feet wide.

At the easterly end of the bridge for a distance of about 150 feet the grade rises approximately $5\frac{1}{2}$ per cent to meet the approach which curves sharply to the south, and continues to rise for about 150 feet more on about a 10 per cent grade to Washington Street. This approach to Washington Street, which is the main highway from the center of the city around Cape Ann, creates one of the most important reasons for giving consideration to relocating and reconstructing this bridge.

The westerly approach also rises on a grade approximately $5\frac{1}{2}$ per cent to a street running along the shore of Annisquam, entering, at a grade of approximately $9\frac{1}{2}$ per cent, Leonard Street in Annisquam. It should be noted that the streets at either approach to the bridge are State highways.

The latest repairs on the bridge were made in 1908 and 1909, and these will probably suffice to keep the bridge in passable condition for the next year or two, provided some replacement of worn-out planks on the surface is made. Without question, extensive repairs will be in order within the next two years, as it is not to be expected that repairs made twelve years ago will hold the bridge in safe condition for a much longer period.

No traffic data is available regarding the use of the bridge, but the summer population in Annisquam, together with the natural attractions of the locality, must combine to attract a quite heavy traffic across the bridge in the summer months. So far as the requirements of the year-round population are concerned, it is quite likely that the present bridge will be adequate for some time to come. While heavy loads are now accustomed to use the road around the head of the cove in entering Annisquam, it is quite possible that this situation is due to the heavy grades at the curves on both sides of the bridge fully as much as to any question of the strength of the present structure. The road around the cove involves a detour of about 1 mile.

From an artistic and æsthetic standpoint, certain residents of Annisquam are opposed to the construction of any bridge along modern lines, the primitive design and appearance of the present structure having a definite appeal. So

far as it has been possible to learn the attitude of the city, the city authorities are also opposed to the construction of a new bridge, if the city is to be required to pay a substantial part of the cost.

There is no question as to the inadequacy of the present structure for heavy loads, and this is especially true of the lift span. Under the present conditions of traffic there is also need of some relief for foot passengers, as the bridge now has no sidewalks, and the narrow passageway must of necessity bring some elements of danger to be considered. This defect as to sidewalks, however, can undoubtedly be remedied without great cost in connection with the present structure.

If a new bridge is to be constructed a change should be made in the easterly approach, and it would seem best that the construction should be of the concrete arch type, in order that permanence may be secured and a lessened cost for maintenance brought about. Estimates have also been made for a pile structure, and the same are submitted herewith. In connection with both pile and concrete construction, the details of engineering, shown by the investigation but subject to some changes if the work is actually undertaken, are as follows: —

In the case of the pile bridge on the present site, the easterly abutment should be moved west about 147 feet to secure an easier curve and grade into Washington Street, but the best that can be obtained is a maximum rate of 7 per cent on a curve of 150-foot radius, with not much improvement in the connection from the north.

The easterly approach of the proposed new location will be about 150 feet south of the present easterly abutment, and the westerly end will be just south of the present bridge so as to connect on an easy curve with the existing approach at Curve Street. The easterly approach will connect with Washington Street on a curve with a radius of 300 feet, and the maximum grade will be 6.5 per cent. An easy connection can also be made for traffic from the north.

Both locations involve the taking of land and moving of buildings. For the proposed change in the easterly ap-

proach to the present bridge, 6,860 square feet of land is required, and a frame building used as a store and residence must be moved. For the new location of the bridge, 12,230 square feet of land is required for the easterly approach which is occupied by a small frame cottage that must be moved, and 1,465 square feet of land will be taken at the westerly end. The cost of these takings is not included in the estimates.

The proposed new pile bridge on the site of the present structure will be 291 feet between abutments and the total length, including both approaches, will be 830 feet. In all other details this bridge will conform to the design for a pile bridge on the new site as described in the next paragraph.

On the new location the pile bridge will be 303 feet in length between abutments, with a plank roadway 22 feet, 9 inches between guards, and a sidewalk 6 feet wide on the south side. A two-leaf lift span, 30 feet wide, is also provided for over the channel which is about 125 feet from the easterly abutment, although there is no use for it at present. Pile bents of bridge are spaced 16 feet on centers each side of the channel span and consist of six bearing piles and two spur piles. The abutments are to be built of concrete faced with granite with pile foundations, and the slopes of approaches in the water will be faced with riprap. This bridge will have a total length, including approaches, of 980 feet.

The concrete arch bridge will have three spans, one 75 feet and two 70 feet in length, which brings both abutments about 30 feet further into the Cove than the locations assumed in the pile bridge, and secures some saving in cost without detriment to the design, but the total length of bridge and approaches will be 980 feet. The piers and abutments will be faced with granite backed with concrete, and the foundations will be on piles. Slopes of approaches will also be faced with riprap below extreme high water. Rise of central arch is 8 feet and side arches 7.5 feet.

The roadway will be 26 feet wide between guards, with a sidewalk 6 feet wide on the south side. No provision is made for a draw or lift span, as the clearance under the

center of the middle arch is 9 feet at mean high water, which is ample for the present use of the waters above the bridge. If, however, a draw is required, it can be provided for at the westerly end between the shore and the abutment, although this will probably necessitate moving the bridge easterly to obtain room for a wider abutment and will materially increase the cost.

The estimates provide for a gravel surface to the roadway on the concrete bridge and on the approaches, to both types of bridge, for a width of 18 feet. While the taking provides for a sidewalk on the approaches, the cost of construction is not included in the estimate. The use of creosoted piles or timber was not provided for in the estimates, as it would increase the cost to nearly that of concrete.

No borings or soundings were taken, and therefore the provision for foundations in the estimates is more or less approximate.

There can be no comparison of the two types of construction on which the estimates are based, except on the grounds of expediency with reference wholly to the initial cost. The concrete arch is not only more sightly and more permanent, but it has reserve strength that will meet a probable increase in the weight of loads. In view, however, of the present excessively high cost of reinforced concrete, it may be wise to postpone the construction of a new bridge for a few years, inasmuch as the interest on the cost will no doubt maintain the present structure for that length of time.

The summary of the estimates of cost is as follows: —

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| Pile bridge on site of present structure, | $46,000 |
| Pile bridge on new site, | 49,000 |
| Concrete arch bridge on new site, | 109,000 |

These figures contain no allowance for engineering. Plans and details of estimates are on file in this Department.

Respectfully submitted,

JOHN N. COLE,
*Commissioner of Public Works.*