

HOUSE No. 1795

The Commonwealth of Massachusetts.

MASSACHUSETTS HIGHWAY COMMISSION,
15 ASHBURTON PLACE, BOSTON, June 10, 1910.

To the Honorable the Senate and the House of Representatives.

The Massachusetts Highway Commission has the honor to submit the following report of its investigation of the subject of causeways and bridges.

This investigation was authorized by chapter 136 of the Resolves of 1909, and was to include all causeways and bridges over ponds or lakes, together with all bridges over streams in the Commonwealth which have a span of fifty feet or more.

For the purpose of best studying the problem in its present, near future and more remote phases, the Commission has divided the report into four classes:

Class A — Causeways and bridges within the limits of State highway;

Class B — Causeways and bridges contiguous to State highway;

Class C — Causeways and bridges on roads likely to become State highways in the near future;

Class D — All other bridges, the spans of which are fifty feet or more.

It will be noted that the Resolve in question requires specifically first, a brief description of the present bridge and the approaches thereto; second, an estimate of cost; third, a detailed statement of condition; fourth, the present annual cost of maintenance; fifth, estimated cost of maintenance and of rebuilding during the next twenty years.

In preparing the tables the intention has been to obtain, as far as possible, the information specified, as well as any further data which might be of value. In many instances it was found to be impossible to obtain the original cost of the bridges, and in other instances the cost can only be obtained by separating items connected with the cost of constructing the bridges from other data which may have been filed in some town offices, and as the labor and expense thus involved would evidently have been beyond the intention of the investigation, the information in such cases is incomplete in this particular.

The same condition existed in connection with securing the annual cost of maintenance and the method of apportionment of cost. Concerning the cost of repairing or rebuilding during the coming twenty years, covered by the Resolve, approximate estimates are shown in the tables of the cost of repair and maintenance of the present bridge for twenty years, and in cases where it appears that the present bridge will need to be replaced at some time in the immediate future, estimates are given of the cost of constructing a new bridge of concrete, of steel trusses with a wooden floor and of steel trusses with a solid floor. Where it seems reasonable to rebuild with a pile structure, with a wooden floor, an estimate of the cost of such a structure is given.

It became apparent during the progress of the investigation that accurate measurements, soundings and borings would be needed to obtain correct data for designing and estimating the cost of new construction but it did not appear to be the intention of the Resolve that such complete information should be secured, involving as it would the employment of a large force of men and requiring a long period of time, therefore the estimates given are necessarily approximate, having been based, in most cases, upon general rules providing for definite costs per linear foot or per square yard of floor area with a superstructure, and on similar rules for the substructure.

The bridges designated by the Resolve are included in classes A, B and C, and in addition to these bridges, considerable data has been secured and included in Class D which

covers all other highway bridges in the State having a span greater than fifty feet.

CLASS A. CAUSEWAYS AND BRIDGES WITHIN THE LIMITS
OF STATE HIGHWAY.

There are in this class nineteen (19) bridges with openings aggregating eighteen hundred and eighty-five (1885) feet. There are causeways connected with these bridges aggregating about eleven hundred (1100) feet. All are in good condition with the exception of the bridge at Middleboro, which will need to be rebuilt soon, at an estimated cost of about six thousand (\$6,000) dollars. The estimated annual expense for maintenance of the bridges in this class is fourteen hundred (\$1400) dollars. The approximate cost of maintenance for twenty years, including the rebuilding of the Middleboro bridge as noted above, is estimated to be thirty-four thousand (\$34,000) dollars.

CLASS B. CAUSEWAYS AND BRIDGES CONTIGUOUS TO STATE
HIGHWAYS.

There are sixty-three (63) bridges in this class with openings aggregating sixteen thousand five hundred and ten (16,510) feet, and causeways of about thirty-eight hundred (3800) feet. Of these, twenty-one (21) ought to be rebuilt in the near future. The approximate cost to rebuild them is estimated at three hundred and eighty-five thousand (\$385,000) dollars. The estimated annual cost of maintenance is thirty-one thousand, five hundred and eighty-five (\$31,585) dollars. The approximate cost of maintenance for twenty years, including the rebuilding of the twenty-one bridges previously referred to, is estimated to be something over one million dollars.

CLASS C. CAUSEWAYS AND BRIDGES ON ROUTES LIKELY
TO BECOME STATE HIGHWAYS IN THE NEAR FUTURE.

There are fifty-six (56) bridges in this class with openings aggregating five thousand, four hundred and fifteen (5,415) feet and causeways of about sixty-six hundred (6600) feet.

Of these bridges, sixteen (16) must be rebuilt in the near future, at an estimated cost of one hundred and fifty thousand (\$150,000) dollars. The estimated annual cost of maintenance is fifty-three hundred (\$5300) dollars. The approximate cost of maintenance for twenty years, including the rebuilding of the before mentioned bridges, is estimated to be two hundred and fifty-six thousand (\$256,000) dollars.

CLASS D. ALL OTHER BRIDGES THE SPANS OF WHICH ARE
FIFTY FEET OR MORE.

The total number reported is five hundred and thirty-four (534). There are comparatively complete reports from 315 and incomplete or poor reports from 219. The total number of such bridges located in cities is one hundred and ninety-two (192).

Conditions as to traffic, location, type of bridge, etc., vary so greatly that it is at once apparent that no rule can be applied in estimating cost of maintenance that will even approach accuracy, therefore the Commission's engineers were instructed as follows: "Whenever data is unobtainable you are to use your best judgment in estimating probable cost of maintenance." As a result, they have returned to the Commission the following estimates:

For annual maintenance of bridges in Class D (exclusive of all expenses properly chargeable to draws),	\$304,235
Cost of maintenance, exclusive of probable replacement charges, for twenty years,	6,084,700

It will be seen from the foregoing that the total number of bridges reported is six hundred and seventy-two, as follows:

Class A — 19, or 2.8 per cent of the entire number.
Class B — 63, or 9.4 per cent of the entire number.
Class C — 56, or 8.3 per cent of the entire number.
Class D — 534, or 79.5 per cent of the entire number.

It is estimated that the total valuation of all classes of bridges now in good condition, plus the cost of rebuilding

those not in good condition is about twenty-nine millions of dollars.

The tables submitted herewith show how this valuation is divided as between *classes* and how maintenance and the cost of rebuilding bridges in Class D affects each *county*.

Respectfully submitted,

HAROLD PARKER,
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The Massachusetts Highway Commission.

Estimated Total Value of all Bridges at Present in Good Condition Plus Cost to rebuild those Not in Good Condition, to meet all Requirements of Traffic for the Next 20 years by Counties.

COUNTY.	Class A.	Class B.	Class C.	Class D.
Barnstable,	\$7,000	\$85,000	\$9,000	\$235,000
Berkshire,	20,000	73,000	46,000	634,000
Bristol,	6,000	1,171,000	40,000	1,619,000
Dukes,	—	27,000	5,000	10,000
Essex,	40,000	558,000	40,000	2,206,000
Franklin,	—	275,000	85,000	1,120,000
Hampden,	33,000	148,000	20,000	1,714,000
Hampshire,	6,000	81,000	108,000	418,000
Middlesex,	45,000	127,000	135,000	2,271,000
Nantucket,	—	—	—	—
Norfolk,	—	269,000	—	276,000
Plymouth,	26,000	102,000	28,000	355,000
Suffolk,	—	12,000	—	13,595,000
Worcester,	—	90,000	25,000	986,000
Totals,	\$183,000	\$3,018,000	\$541,000	\$25,439,000
Total for all classes,				\$29,181,000

Summary by Counties of Costs to rebuild Bridges reported in Class D.

COUNTY.	Number Reported.	Not to be Rebuilt.	Maintenance for 20 Years.	Cost of New Pile Bridges. ¹	Cost of New Concrete Bridges. ²	Cost of New Steel Bridges — Plank Floor. ³	Cost of New Steel Bridges — Solid Floor. ²
Barnstable,	21	1	\$56,500	13 Pile, \$91,500	14 Concrete, \$174,500 4 Pile, 41,000 2 Solid floor, 255,500	17 Plank floor, \$148,000 3 Pile, 31,000 \$179,000	17 Solid floor, \$199,000 3 Pile, 31,000 \$229,000
Berkshire,	64	2	114,500	—	62 Concrete, \$883,000	55 Plank floor, \$467,500 7 Concrete, 137,000 \$604,500	60 Solid floor, \$562,000 2 Concrete, 33,000 \$595,000
Bristol,	17	3	244,000	3 Pile, 115,000	9 Concrete, \$113,000 3 Pile, 115,000 2 Solid floor, 105,000 \$333,000	14 Plank floor, \$282,500	14 Solid floor, \$369,000
Dukes,	1	—	2,000	1 Pile, 10,000	1 Pile, \$10,000	1 Pile, \$10,000	1 Pile, \$10,000
Essex,	47	9	417,000	8 Pile, 215,500	27 Concrete, \$389,000 10 Solid floor, 1,136,000 1 Plank floor, 20,000 \$1,545,000	38 Plank floor, \$1,024,500	37 Solid floor, \$1,422,000 1 Plank floor, 20,000 \$1,442,000
Franklin,	43	—	120,000	—	40 Concrete, \$759,500 3 Solid floor, 360,000 \$1,119,500	43 Plank floor, \$761,000	43 Solid floor, \$1,012,000
Hampden,	45	11	512,500	—	31 Concrete, \$589,000 3 Solid floor, 482,000 \$1,071,000	34 Plank floor, \$691,000	34 Solid floor, \$948,000

Hamshire,	32	-	60,700	-	31 Concrete, 1 Solid floor,	\$392,500 25,000 \$417,500	30 Plank floor, 1 Solid floor, 1 Concrete,	\$194,500 25,000 20,000	31 Solid floor, 1 Concrete,	\$300,000 20,000 \$320,000
Middlesex,	98	19	344,000	6 Pile,	35,000	\$1,191,000 533,000 \$1,724,000	75 Plank floor, 4 Concrete,	\$986,000 198,000 \$1,184,000	75 Solid floor, 4 Concrete,	\$1,283,000 198,000 \$1,481,000
Nantucket,	-	-	-	-	-	-	-	-	-	-
Norfolk,	29	1	51,000	-	-	\$292,000	28 Plank floor,	\$179,500	28 Solid floor,	\$230,500
Plymouth,	24	1	56,500	1 Pile,	40,000	\$394,000 40,000 \$344,000	23 Plank floor,	\$211,000	23 Solid floor,	\$273,500
Suffolk,	37	17	4,019,500	-	-	\$130,000 5,730,000 \$5,850,000	2 Concrete, 18 Solid floor,	\$130,000 5,730,000 \$5,850,000	18 Solid floor, 2 Concrete,	\$5,730,000 120,000 \$5,850,000
Worcester,	77	17	258,500	-	-	\$792,500	60 Plank floor,	\$481,000	60 Solid floor,	\$621,000
Totals,	535	81	\$9,356,700	31 Pile,	\$507,000	\$14,511,000	417 Plank floor, 4 Pile, 14 Concrete, 19 Solid floor,	\$11,697,500	440 Solid floor, 4 Pile, 9 Concrete, 1 Plank floor,	\$13,382,000

1 Where practicable to erect that type.

2 This type not practicable in all cases. Hence other types as noted.

