GRADE CROSSING, ELIMINATION

OF

KALAMAZOO STREET & N.Y.C.R.R.

A THESIS

SUBMITTED TO THE FACULTY OF

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BY

Guy R. Bennett   Charles E. Brumm

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THESIS

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INTRODUCTION.

The abolition of the grade crossing at Kalamazoo Street and N. Y. C. R. R. in Lansing, has been a subject of agitation among citizens and tax payers. The city covers a large area in proportion to its population, and consequently has an unusual mileage of Railroad.

Only one grade crossing on the north side of the city has been abolished. The main thoroughfare of the city is Michigan Avenue. To relieve the congestion much of the traffic is forced to the next parallel streets north and south. Kalamazoo Street is the first parallel street south of Michigan Avenue. Persons journeying from one side to the other are in constant danger from the Express trains, and the greatest care of watchmen cannot avert occassional disaster. The subject herein treated is not a new one. It is not our purpose to design structures for this crossing, but to consider the possible methods of separating the street from the Railroad.

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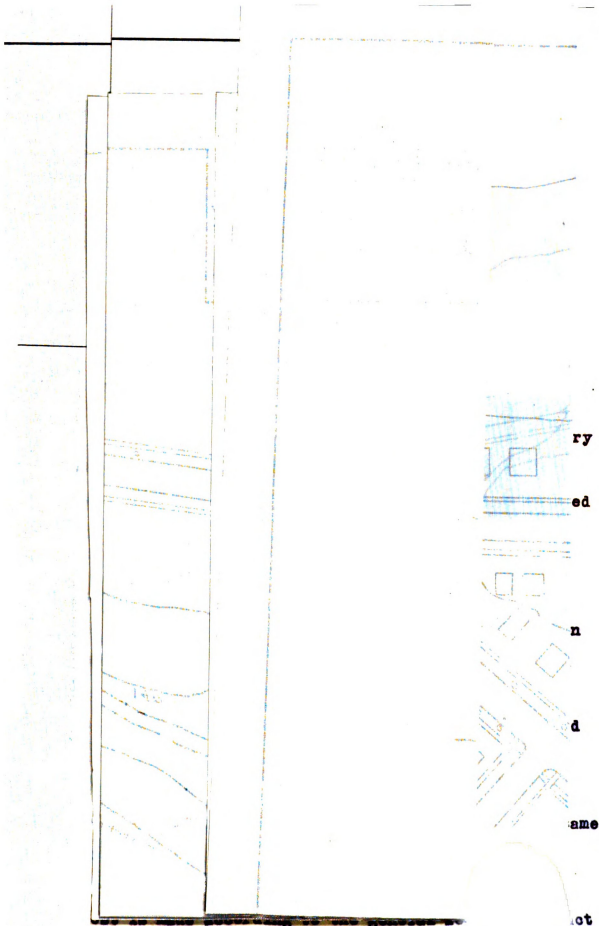
DISCUSSION.

Grade crossings should be eliminated when-
ever possible regardless of cost. The methods of
grade crossing elimination are as follows:

First: By depressing the tracks and
elevating the streets.

Second: By elevating the streets.

Third: By carrying the R. R. east, and
running it in on the M. C. R. R. tracks.

First: To sink the Railroad to the necessary
depth would not only be expensive, but there is an
uncertainty, as to the results that would be obtained
from a system of drainage that could be used.

Third: The relocation through a different
section of the city was discarded as impractical,
because of the radical changes in property valuation
which would result. This could not be estimated in
dollars and cents, but would undoubtedly work great
hardship and severe loss in one case, while it would
immediately benefit land owners in other cases.

Second: The method remaining is that of
elevating the street and leaving the R. R. on the same
grade as it is at present.

It is generally held that the division of
cost is made according to the general legislative act

on grade crossing; that is, the railroad pays 65%,
the city 10%, and the state 25%, of the accounts.

The grade of the street at the bridge was
determined by the 18 feet clear head room allowed
by the R. R. commissioners, to which was added one
foot for solid bridge floor, and two feet for girders,
making the street grade about 21 feet above the grade
of the rails. It is usually not economical to depress
the R. R. since it is limited to .57%, whereas the
street grade limits are 2 to 7%.

The order of doing work was as follows:

First: Established line,

Second: Levels,

Third: Making topographic map of land,

Fourth: Fixing grades,

Fifth: Making profile,

Sixth: Making picture of structure,

Seventh: Graphical analysis of 115 ft. arch,

Eighth: Estimate of cost.

DISCUSSION OF PROPOSED STRUCTURE.

The clear head room above the R. R. tracks
is 18 feet. The space above the arches to be filled
with earth. The roadway is made of 1-2-4 concrete
one foot thick; the surface to have a crosswise
crown of three inches. Drainage is provided through
cast iron scuppers placed each side of the roadway,
near the curb channels. The upper end of the scupper
is even with the surface of the roadway, and the lower
end is below the lower side of the concrete arch. The
sidewalk is carried on brackets and is connected to
the outside of the girder and in the same line with
it. This practically makes one floor beam from out
to out of sidewalks.

Gerson & Carey Foundry is located on the east
side of the river next to the R. R. A street entrance
to Kalamazoo Street can be obtained by means of a
short bridge from the second story of their building.
Ground entrance is provided for by means of an alley
beneath the structure. Kahns boat house will have to
be condemned and site purchased.

The vacant lot east of River Street and
directly opposite the intersection of Kalamazoo and
River Streets must be purchased to be used as an
approach for the west end of the structure.

GRAPHICAL ANALYSIS OF 115 FT. ARCH.

The dead load was taken as follows:

Earth filling ------------------------- 120# cu. ft.

Pavement ---------------------------- 150# cu. ft.

Masonry ---------------------------- 150# cu. ft.

The load was calculated as 100# per linear foot.

$$1 = 115 \text{ ft.} \qquad r = \frac{h}{l} = \frac{16}{115} = .72$$

$$To = 2.5 \text{ ft.} \qquad U = \frac{te}{to} = \frac{7.5}{2.5} = 3$$

$$te = 2.5 \times 3 = 7.5$$

Span = 115 ft. rise = 16 ft.

Filling at crown, 2 ft. earth weighing ------ 120# cu.ft.

Pavement 1 ft. thick weighing ---------------- 150# cu.ft.

Masonry assumed as weighing ---------------- 150# cu.ft.

Live load $\frac{100}{150}$ = 2/3 = .666 ft.

Earth filling equivalent =

$$2 \text{ ft. at } 120 = \frac{240}{150} = 1.6 \text{ ft.}$$

Thickness at crown = 1.6 + 1 = 2.6 ft. masonry equivalent.

LOADING I.

LIVE LOAD BETWEEN 2 - 6.

Wt. of Sec. 0 - 1	= 41,000#
Wt. of Sec. 1 - 2	= 26,400#
Wt. of Sec. 2 - 3	= 19,200#
Wt. of Sec. 3 - 4	= 14,500#
Wt. of Sec. 4 - 5	= 14,500#
Wt. of Sec. 5 - 6	= 18,100#
Wt. of Sec. 6 - 7	= 24,000#
Wt. of Sec. 7 - 8	= 35,000#
Total	=192,700#

LOADING II.
LIVE LOAD BETWEEN 0 - 4.

Wt. of Sec. 0 - 1	= 42,700#
Wt. of Sec. 1 - 2	= 28,200#
Wt. of Sec. 2 - 3	= 19,200#
Wt. of Sec. 3 - 4	= 14,500#
Wt. of Sec. 4 - 5	= 12,600#
Wt. of Sec. 5 - 6	= 16,200#
Wt. of Sec. 6 - 7	= 24,000#
Wt. of Sec. 7 - 8	= 35,000#
Total	=193,000#

LOADING III.

LIVE LOAD BETWEEN 0-8 and 6 - 8.

Wt. of Sec. 0 - 1	= 43,700#
Wt. of Sec. 1 - 2	= 28,200#
Wt. of Sec. 2 - 3	= 17,300#
Wt. of Sec. 3 - 4	= 12,600#
Wt. of Sec. 4 - 5	= 12,600#
Wt. of Sec. 5 - 6	= 16,200#
Wt. of Sec. 6 - 7	= 25,600#
Wt. of Sec. 7 - 8	= 37,200#

ESTIMATE OF COST.

5504 cu.yds. of concrete at $20. per cu.yd.	= $110,000
250 Tons Reinforcing steel at $100 per ton	= $ 25,000
Wet excavation 397 cu.yd. at $10 per cu.yd.	= $ 3,970
Dry excavation 150 cu.yd. at $2 per cu.yd.	= $ 300
Total	= $139,270

FEASIBILITY OF THE PROJECT.

FIRST: GRADES.

Grades as high as 10%, have been permitted in New York State. The grade on the approach from cedar is 4.8%. The grade on the approach from River Street is 5%. The intersection of the two grades is joined by a 100 ft. vertical curve.

SECOND: DAMAGE TO PROPERTY.

If the city pays for the cost of constructing the short bridge connecting the second story of Gerson & Carey Foundry to Kalamazoo Street, they would have no cause for damage.

Kahn's Boat house which is on the west bank of the River and directly in line of the proposed structure could be moved to a "V" shaped lot just north of the structure. Kahn expressed his willingness of doing this.

THIRD; BENEFITS.

Of the entire number of street crossings 50% are considered dangerous. From the increase in traffic and accidents which have occurred in the past few years, the writers of this thesis have concluded that this is

one of the 50% that is considered as dangerous. If
for no other reason a grade crossing should be
eliminated for the protection of human lives. The
elimination of the grade crossing also relieves the
necessity of having trains stop as they come to the
crossing.

Intersection of Kolamazoo St and Cedar St.
End of East Approach of Structure

Intersection of Kolamazoo St and River St.
End of West Approach of Structure.

Old Bow String Truss to be Removed
Dotted Line Showing Location of Proposed Structure.

Kahn's Boathouse That Must be Removed
Dotted Line Showing Location of Proposed Structure

Dangerous Point! Intersection of Kalamazoo St and N.Y.C. R.R. Tracks at Present Bridge Approach

View from West Side of River, Showing Kahn's Boat house, Present Bridge and Line of Proposed Structure.

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