

AMERICAN SOCIETY OF CIVIL ENGINEERS

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PAPERS AND DISCUSSIONS

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THE TWELFTH STREET TRAFFICWAY VIADUCT, KANSAS CITY, MISSOURI

Discussion.*

By L. R. ASH, M. AM. SOC. C. E.

L. R. ASH,† M. AM. SOC. C. E. (by letter).—There are few cities in the United States where the freight-house and manufacturing districts are so sharply isolated from the business center as in Kansas City. In addition to this division between the sections of Kansas City, Mo., Kansas City, Kans., with a population of nearly 100 000 and its large and varied manufacturing interests, is also separated from the business center of Kansas City, Mo., by the bluffs which extend along the north and west sides of the city. The traffic between these districts is extremely heavy and, for a number of years, it has been seriously handicapped by bad grades and indirect routes. Mr. Ash.

The apparent need of a trafficway between Kansas City, Mo., and Kansas City, Kans., and to the West Bottoms, was great enough to enlist private capital in the enterprise of building the Sixth Street or Inter-city Viaduct some 8 or 10 years ago. This structure was built as a toll viaduct, and although it has proved to be a failure, from a financial standpoint, this failure in no way indicates that such a structure was not needed, but demonstrates the reluctance of the American public to pay tolls. During the times that the Inter-city Viaduct was open for traffic without charge, the structure was crowded with travel, both to and from Kansas City, Kans., as well as to and from the West Bottoms.

The question of building a viaduct at 12th Street, connecting with the West Bottoms, has been discussed for the last 15 years, and although every one realized its great need, it seemed almost impossible

* Discussion of the paper by E. E. Howard, M. Am. Soc. C. E., continued from October, 1915, *Proceedings*.

† Kansas City, Mo.

Mr. Ash. to harmonize the various interests which in one way or another were affected by the building of the structure. The old viaduct at 12th Street provided only for street-railway traffic. All vehicular traffic between the West Bottoms and Kansas City, Kans., and the business center of Kansas City, Mo., had no thoroughfare from 6th Street on the north to 24th Street on the south, a distance of more than $1\frac{1}{2}$ miles. When, in addition to this, we consider the fact that neither Sixth Street nor 24th Street led in the direction of the terminus for this large traffic, we see more clearly the great need of a trafficway leading to the heart of the business portion of the city.

Numerous meetings were held with representatives of the various organizations, such as the Team Holders Association, Real Estate Board, Commercial Club, etc., in an attempt to determine the most practicable structure, both as regards the requirements of traffic and the elimination of damages. These discussions were frequently very acrimonious, and politics cut no small figure in the handling of the proposition. The management of the whole enterprise was a shining example of the need of a more responsible and centralized authority in municipal affairs.

One of the great problems which confronted the promoters of the 12th Street Viaduct was that of grades. About 5% seemed to be the only practicable grade on 12th Street, and, in the minds of a great many people, this grade was prohibitive when heavy vehicular traffic was considered. The grade, as originally established, was 5.09%, and this would have necessitated a cut of about 17 ft. at the top of the hill, which would have resulted in a very heavy property damage estimated at about \$250 000. This matter came up while the writer was City Engineer of Kansas City, Mo., and he suggested the elimination of this property damage by raising the grade to within about 4 ft. of the established grade at Washington Street. This increased the viaduct grade to 5.52%, a very slight change from the old one; and the opposition to the structure, thus avoided, abundantly justified the change.

The advent of the motor truck has decreased the necessity for lower grades, except where reasonably attainable, but, as a concession to the demand for a low-grade trafficway between the Bottoms and the business section, a lower deck was provided on the viaduct with a maximum grade of about $2\frac{1}{2}$ per cent. It is expected to utilize this portion of the viaduct by building roadways along the bluff leading to the north and to the south from the east end of this lower deck. In the writer's opinion, the building of these roadways will not be justified, as they will lead to the old trafficway at 6th Street on the north, or to 17th Street on the south, neither of which points is in the line of travel, and from which there will be bad grades and other conditions not inviting to heavy vehicular traffic. It would seem that

a better solution of the problem would be to tunnel from the east end of the lower deck to about 14th and Wyandotte Streets, thus insuring a very easy grade and a direct route for the distribution of the traffic from the West Bottoms. Mr. Ash.

Now that the structure has been completed and thrown open to the public, the great need of it is proved by the very great traffic both vehicular and by street cars, using it; and this is drawn to the structure in spite of the fact that the approaches to the viaduct have not been paved, as they await the settlement of the embankments at each end. The structure saves several minutes to each of the many people who go each day from the eastern portion of the city to the West Bottoms, and the 5.52% grade has proved to be no serious handicap, either to motor or horse-drawn vehicles.

It is interesting to note that the building of the viaduct has resulted in enhancing real estate values and rentals on East 12th Street and the adjacent streets for a distance of 3 or 4 miles eastward from the structure. This is because the opening of 12th Street provides a direct way to the West Bottoms for the large number of people employed there, without having to transfer or travel several blocks out of their way. The 12th Street cars, although greatly increased in number, are crowded with passengers, and the building of the viaduct has fixed 12th Street as the principal east and west artery of the city.

Mr. Howard has gone very fully into the design and construction features, and there is no additional comment to be made except to remark on the very satisfactory result, as shown by the finished structure. The surface finish of the concrete is not all that could be desired, but it is believed that it is in keeping with the character of the structure and, when conditions in the neighborhood are considered, it is thought that the more expensive methods of treating concrete surfaces would not have been justified in this case.

The specifications as drawn would permit the engineer to require the contractor to put a cement-gun surface on all columns and cantilevers, as well as on the outside surfaces of the longitudinal girders, but, in the writer's opinion, the attempt to place this finish on surfaces of the character in this structure, would not result satisfactorily, and it is believed that the surface as produced by the forms, with the rough places smoothed off with hammer and chisel and in certain places filled with mortar, has been the best treatment practicable.

The treatment of concrete surfaces is receiving a great deal of attention, and various methods have been advanced for producing a surface which is smooth and, at the same time, does not present the expressionless effect of a smooth mortar surface. The writer believes that specifications can most easily provide for the finish of concrete

Mr. surfaces by requiring the bidders to tender on two or three different kinds of treatment at a stated price per unit of surface, leaving the engineer to choose that method which, in his opinion, most nearly suits the condition when the forms are removed. Of course, all specifications should require forms to be built of smooth lumber, with tight joints and true to line.

The character of surface desired should be determined by the general characteristics of the structure, its location, type of construction, etc. No attempt should be made to give the concrete the appearance of stone or other material, and it is thought that, with a few exceptions, a reasonably smooth surface which is produced by good forms and well-spaded concrete, is better than can be secured by special treatments.

On the 12th Street Viaduct 22 ft. of the upper deck is set aside for street-car tracks, and a roadway, 30 ft. wide on the south side, is left for vehicles, a sidewalk 5 ft. wide extending along the south side of the structure. Although this arrangement has some advantages over that of placing the street railway in the center of the roadway, it would seem that the space between the hand-rails would be used more efficiently with the tracks in the center, as is the case in an ordinary city street. About the only justification for placing the tracks in a space independent of the roadway, is the length of the structure and the grade. It is believed that a sidewalk, 8 ft. wide, and a clear roadway of about 50 ft. between the curbs, with street-railway tracks in the center, would have resulted in a structure which would have cost somewhat less and would have been better suited to the general traffic conditions. As it is, vehicles on the north side of 12th Street, at each end of the viaduct, must cross the street railway tracks.

The use of wood blocks for paving the roadway portion has proved entirely satisfactory. It was feared that the grade would cause the pavement to be slippery, but the blocks were laid with a lath between each row, and the remaining space was well filled with broken stone. The blocks are 3 in. wide, and the resulting surface undoubtedly provides a better footing for horses than stone block, asphalt, or brick. The writer has observed heavily loaded teams turning out of the street railway portions of certain streets where there is stone block pavement, to the wood block pavement at the sides, because of the better footing secured on the latter.

The laying of the wood blocks on the viaduct without a sand cushion has been entirely satisfactory, and demonstrates the wisdom of omitting one of the great sources of trouble with pavements of this type. With care in finishing the concrete base, the surface can be brought to true crown and grade without serious trouble, and

when this is done there is no justification whatever for the use of a sand cushion. Mr.
Ash.

The structure represents a great amount of careful study of the architectural treatment as well as the engineering features, and it is becoming more and more apparent that engineers should give consideration to matters pertaining to the appearance of structures of this character. There seems to be little excuse for absolutely neglecting the esthetic treatment of engineering structures, and although the Profession has been prone to do this, it is gratifying to note a marked change in its attitude in this matter.