Cleveland Again Bridges Cuyahoga Valley

Lorain-Carnegie bridge of thirteen cantilever truss spans, and fill and trestle approaches supplements two existing crossings—Copper-bearing silicon steel used

THE OPENING to traffic Dec. 1 of the new Lorain-Carnegie high-level bridge over Cuyahoga Valley in Cleveland provides an important traffic connection between the western and eastern parts of the city and serves as a bypass for through traffic south of the main business section. It will also relieve the traffic on the Detroit-Superior bridge as well as on the Central Viaduct whose eastern terminus practically coincides with the eastern terminus of the new bridge.

Although the bridge was planned for two decks, only the 60-ft. wide upper deck has been installed. The lower deck when built will carry street railway tracks and two 18-ft. trucking lanes. The total length of the bridge proper is 4,490 ft., of which that part over the valley comprises 2,886 ft. and consists of thirteen steel cantilever truss spans, alternate spans carrying suspended trusses. Four lines of trusses are used, inasmuch as it was desired to separate the future lower roadway into three distinct lanes, the street railway to occupy the space between the two center trusses. Not only the Cuyahoga River but Canal Road, an important street, and the tracks of the Wheeling & Lake Erie, the Baltimore & Ohio, the Big Four and the Erie railroads are crossed. Location of the piers for the new bridge was dictated largely by consideration of property damage to these facilities and to contiguous industrial plants. The final placing of the piers was fairly uniform, however, spans gradually increasing in length as the river is approached. Thus the eastern span is 132 ft. and the river span 299 ft. Shipping clearances over the river are 93 ft. vertical and 180 ft. horizontal.

The eastern terminus of the bridge being at the intersection of Central Ave. (a continuation of Carnegie Ave., a major east-west artery) and Ontario St., one of the most important north-south streets in the city, presented a most difficult problem. The future lower deck caused further complications. A two-stage development was the solution. The first stage, which will be adequate for the present, involved moving one of the curbs of Central Ave. about 80 ft.

Fig. 2—Erecting the 299-ft. span over the Cuyahoga River. All trusses are cantilevers carrying suspended portions.

Fig. 1—Lorain-Carnegie bridge over Cuyahoga Valley in Cleveland provides a bypass for through traffic south of the business district, relieving traffic on the Detroit-Superior bridge, whose arches are visable in the distance to the right of the monumental pylons.

to the north, making this roadway wide enough to accommodate, without interference, traffic from the new bridge and from the existing Central Viaduct. In the second stage a traffic circle is contemplated to serve all traffic from the two bridges and the intersecting streets, with all street railway tracks underground.

The cantilever trusses of the Lorain-Carnegie bridge differ from the usual design in that the lower chords are curved to give a more pleasing appearance—at a cost of 6 per cent more steel than would have been required by

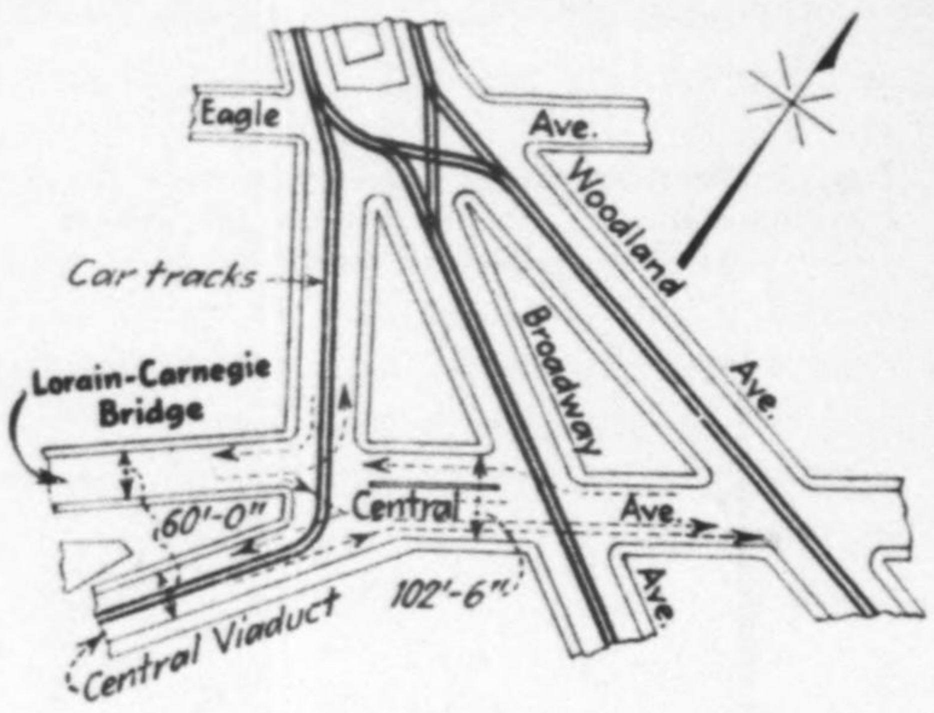


Fig. 3—East plaza, showing how Central Ave. has been widened to handle traffic from both Lorain-Carnegie bridge and Central Viaduct without interference.

straight chords. Other architectural expedients included carrying the piers up to the roadway by means of concrete fascia walls and pedestals between the trusses, the use of stone and aluminum-grill railings and the building of two massive stone pylons at either end of the main bridge.

Foundation conditions encountered were typical of the Cuyahoga River valley and consist of alternate layers of river muck, fine and coarse sand, some gravel and much clay. All piers are carried on 16-in. square precast concrete piles with the exception of the river piers, for which timber piling was driven, and one pier that was founded on a concrete mat on the clay. These timber piles for the river piers were driven to practical refusal in lengths of 32 ft., with their tops at El. —37.5. On top of the timber piles a concrete mat, 33½x100 ft. in plan and 7 ft. thick, was poured. Hollow shafts 16x20 ft. at the base, tapering to about 8½x17 ft. under the coping, are carried on the mat. These shafts have walls 3 ft. thick at the base, 2 ft. thick at the top and are 114 ft. high. During construction steel sheetpiling cofferdams 38x104 ft. in plan and about 60 ft. deep were driven, permitting all concrete to be placed in the dry. Driving the concrete piles for the other piers proved a difficult task, and water jets were extensively used. These piles were also capped with a mat from 6 to 8 ft. thick.

In designing the superstructure, live loads were used based on eight lines of vehicular traffic, two electric railway tracks and two 6-ft. sidewalks, giving a load equivalent to 83.2 lb. per sq.ft., exclusive of wind. The total dead load on the bridge when the lower roadway is completed will be about 34,000 lb. per lin.ft., and the total live load about 13,500 lb. per lin.ft.

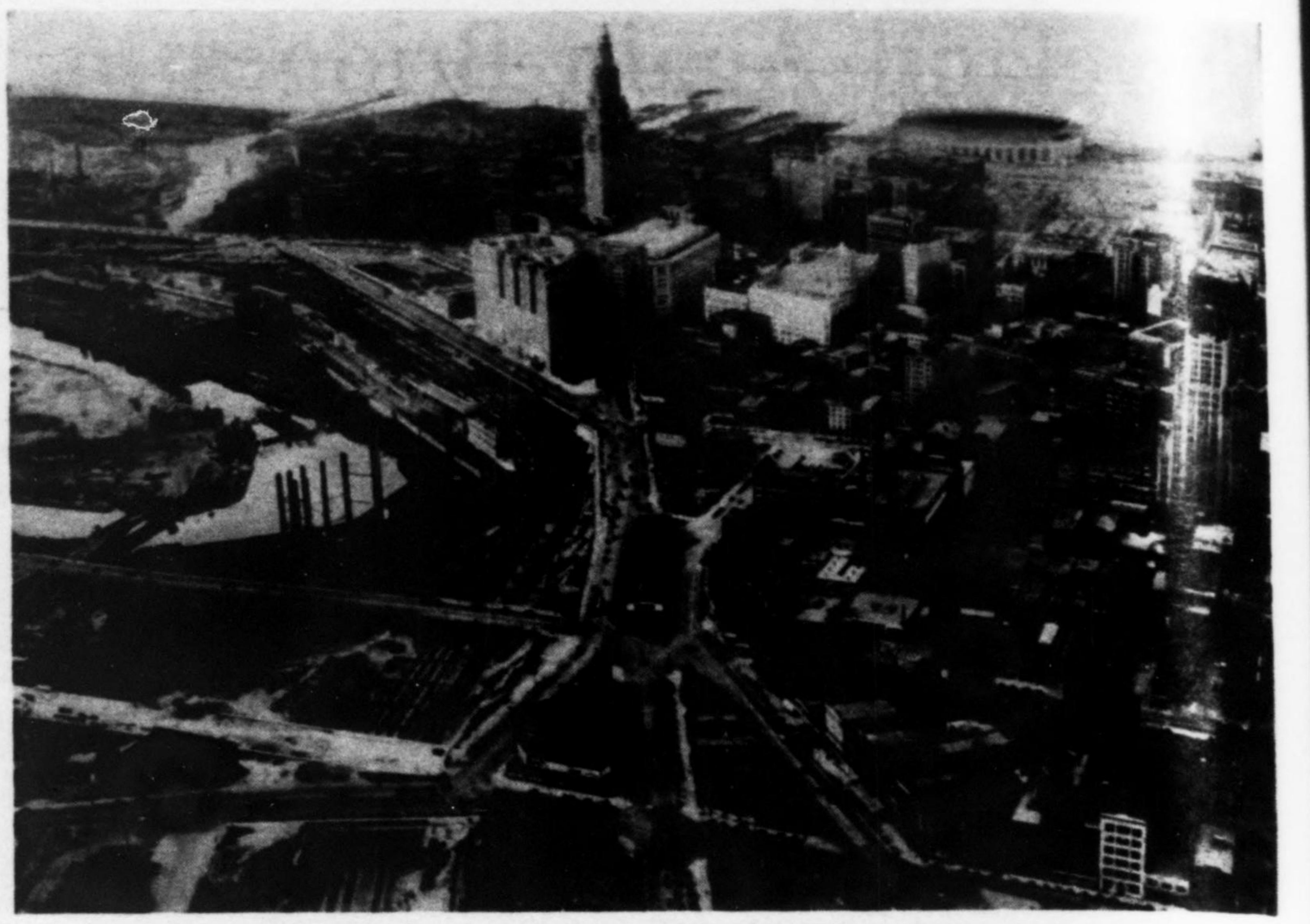


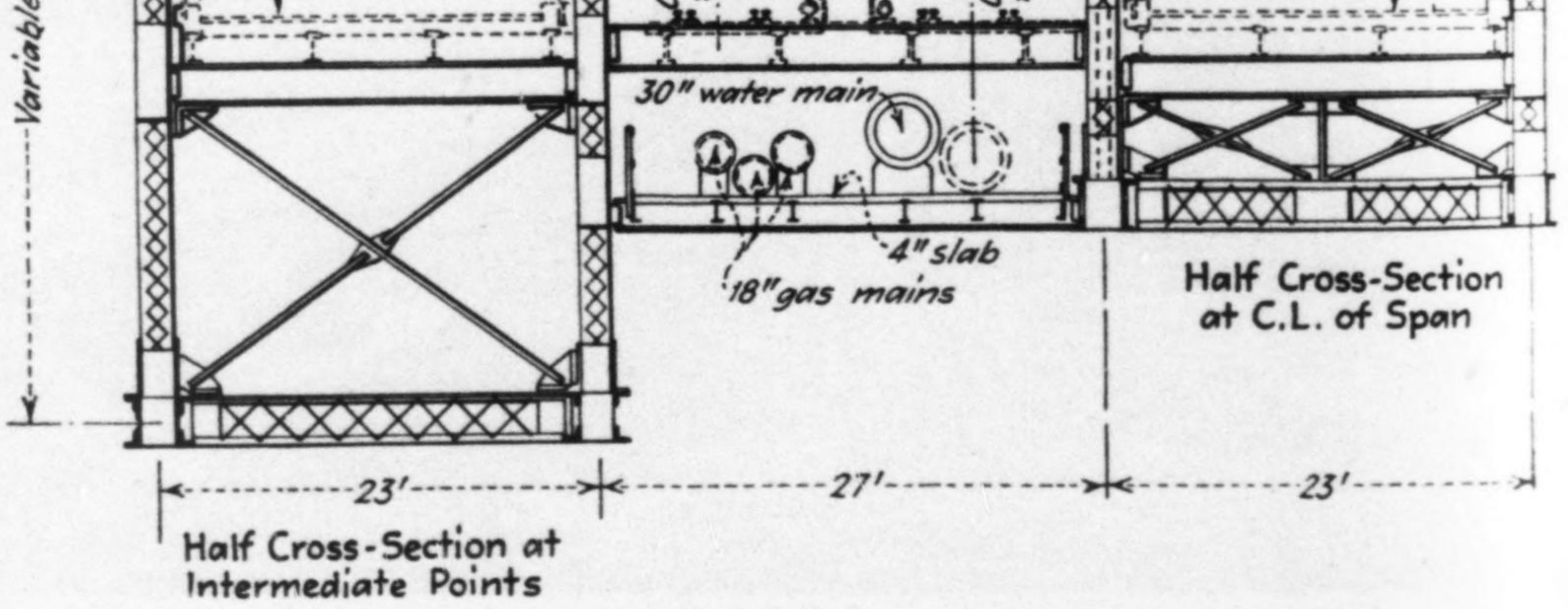
Fig. 4—East plaza of Lorain-Carnegie bridge before widening of Central Ave., showing location of bridge with relation to Cleveland business section.

Copper-bearing silicon steel

The main trusses are 25 ft. minimum depth to about 50 ft. maximum. In general, the lower chords are composed of two 30-in. plates and four angles; the upper chords of two 24-in. plates and four angles, while web members are two plates 16 to 24 in. wide and four angles, all double-laced. Material in main members is silicon steel, and all other members are carbon steel. Both carbon and silicon steel conform to standard A.S.T.M. specifications except that 0.2 per cent of copper was added for corrosion resistance. Working stresses on carbon steel were 18,000 lb.; on silicon steel, 25,000 lb. Suspended spans, of which the longest is in the river span, comprising six out of twelve panels, are secured to the upper chords of the cantilevers; between the lower chords a strut is inserted useful for lateral loads only.

The roadway steel consists of I-beam stringers on 6 ft. 10-in. centers framing into transverse I-beams resting directly upon the top chords. The roadway is paved with 3 in. of asphalt carried on a concrete slab, reinforced with fabricated units and using lightweight aggregate. The curb has a total height of 17 in., the face toward the roadway being offset 4 in. at a height of 10½ in. above the gutters, forming a 6-in. step. This provides sufficient depth of face under

Fig. 5—Cross-section of Lorain-Carnegie bridge. Lower deck for trucks and street cars is deferred for future construction.



the sidewalks to take care of necessary conduits. The curbs are of granite.

Contractors were as follows: river piers, Walsh Construction Co.; other substructure, Lowensohn Construction Co.; superstructure, Mount Vernon Bridge Co. Wilbur J. Watson & Associates designed the bridge and supervised its construction for Cuyahoga County, of which F. R. Williams is county engineer and A. M. Felgate bridge engineer. The construction cost of the bridge proper was practically $4,000,000. Real estate and property damage amounted to about $1,400,000. In addition to these amounts, about $1,000,000 has been expended on approaches west of the river, which include separation of grade of Lorain Ave. and Columbus Road, both main thoroughfares. About $1,000,000 of the total $8,000,000 bond issue remains for construction of the traffic circle at the east end of the bridge.

Reinforced Brick Masonry on Dearborn Sewer System

Regulator chamber and dam in old storm sewer, made necessary to fit it for combined flow, are built of brick reinforced with steel rods

By Charles H. Fork
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REINFORCED brick masonry was used on the Dearborn, Mich., sewer system for some special construction required to divert the sewage from an existing sewer to an interceptor connecting with the disposal plant. This old sewer had been used for stormwater only but was to be converted to a combined storm and sanitary drain by the new work. During dry weather all of the sanitary flow will be diverted to the disposal plant. Stormflows will be flushed over a dam in the sewer into a river outlet.

The work, located on Michigan Ave. opposite the engineering laboratories of the Ford Motor Co., consisted essentially of replacing 30 ft. of the existing 4-ft.-9-in.-diameter brick sewer with a rectangular sewer section 5 ft. wide, varying in depth from 4 ft. 9 in. to 6 ft. 10 in. and with invert about 26 ft. below the street; of building a regulator and float chamber at one side of the sewer with bottom at 37 ft. maximum below the street level; of installing a dam and baffle wall in the new section of the

Details of reinforced brick masonry used in a diversion and regulating chamber on the Dearborn, Mich., sewer system.