Girders on a Horizontal Curve

1. RECENT PROJECTS

Today, it is accepted practice to design and fabricate plate girders with horizontal curves when necessary. Several such bridges or freeway overpasses have been built within the past several years.

• A series of 4 lines of curved welded plate girders with 90′ spans are a part of the Pasadena-Golden State Freeway's interchange in the Los Angeles area, Figure 1. These have a curve radius of 400′. They were fabricated in Kaiser Steel's plant at Montebello.

• One of Milwaukee's new expressways has a section of 4 continuous spans with a total length of 345′ in which the two outer girders have a 9° horizontal curve and the 2 inner girders are straight.

• Bristol Steel & Iron Works, Bristol, Tennessee, recently fabricated several curved girders for the Southwest Freeway-Inner Loop in Washington, D. C.

2. DESIGN AND FABRICATION

Although there are torsional stresses within the curved girder, usually the degree of curvature is not overly high and these additional stresses are offset by the diaphragms connecting the girders. The number of diaphragms has occasionally been increased for this reason, and sometimes the allowable stresses have been reduced slightly.

Curved flange plates are laid out by offsets and flame cut from plate. By cutting both edges at the same time, there is no bowing from any unbalanced shrinkage effect of the flame cutting. The web plates do not have to be preformed, usually being easily pulled into alignment along the centerline of the flanges.

Caution must be used in placing attaching plates for the diaphragms to the webs and flanges. The proper angle for these plates may vary along the length of the girder. Shear attachments are added mainly to accomplish composite action between the concrete deck and steel girder, and thereby increase torsional rigidity. During erection, a pair of curved girders is usually attached together by means of the diaphragms and then hoisted into position as a unit.

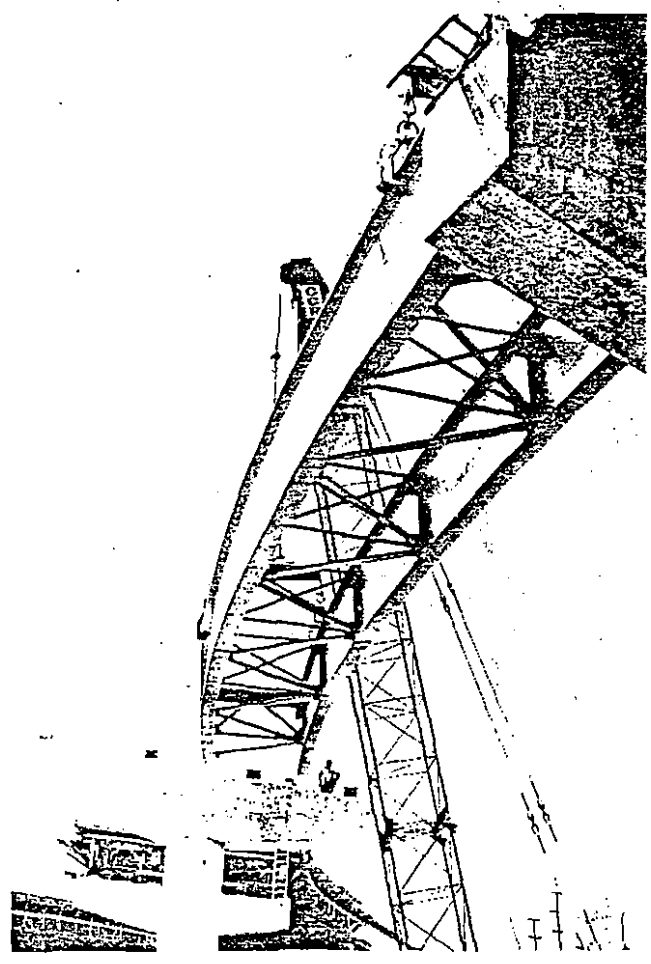

FIG. 1 Welded plate girders, having a 400′ radius of curvature, dominate the interest in Los Angeles interchange of Pasadena-Golden State Freeway. Curving girders permit economies in deck system by keeping overhangs uniform from end to end of curve.

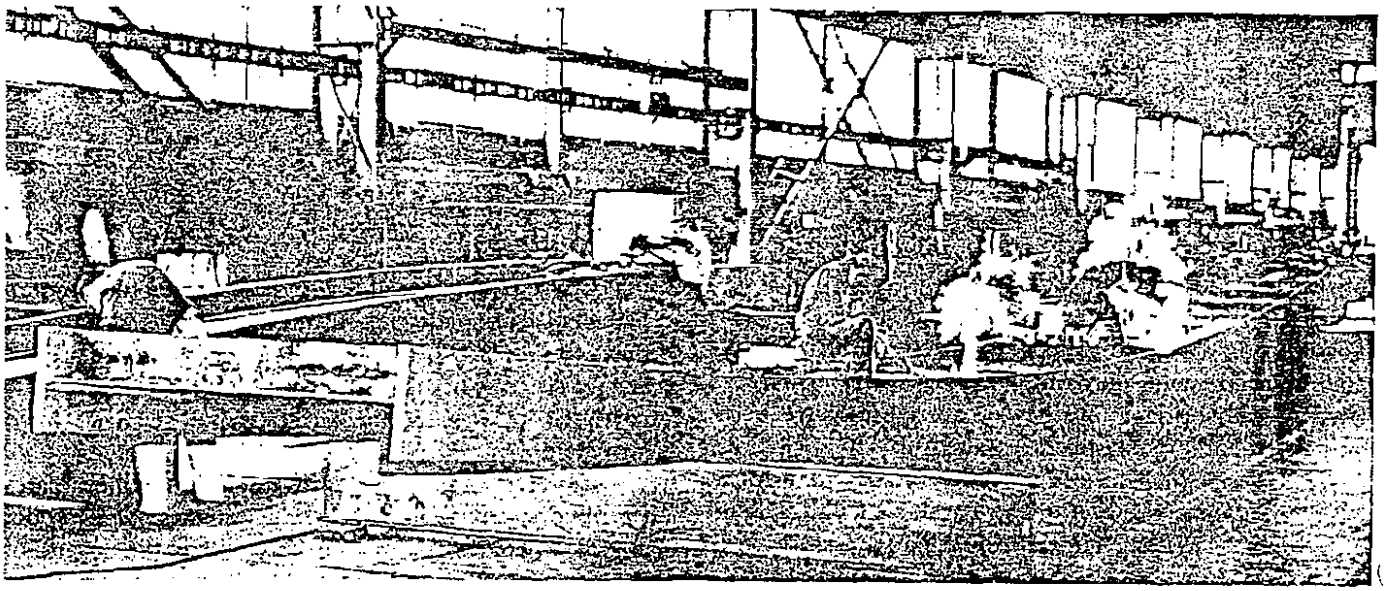

FIG. 2 Bridge plate girders being weld fabricated. With flanges flame-cut on a curve, weight of the rolled web is utilized in making it conform to desired radius.

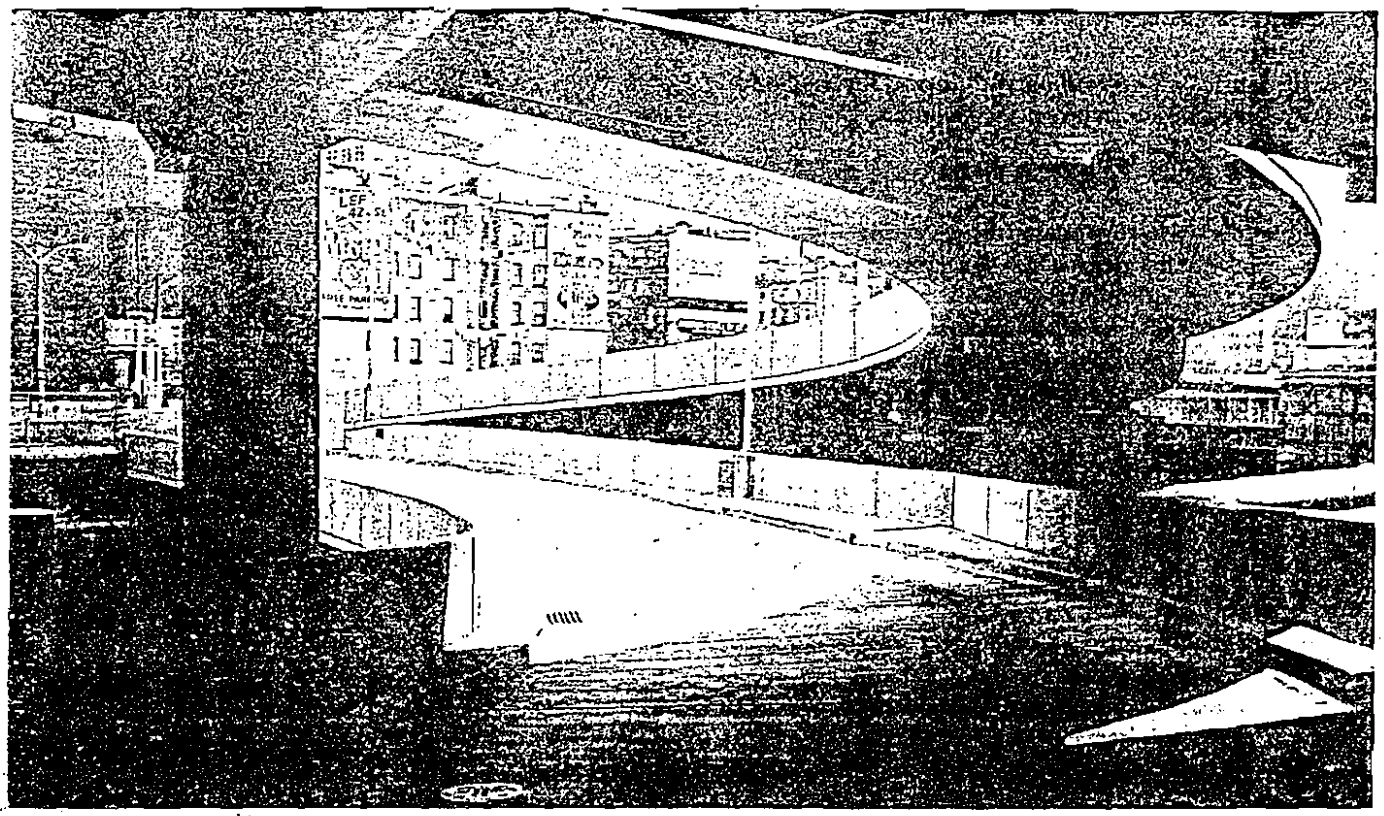

FIG. 3 A two-span continuous box girder and curved ramp construction provided the answer to space limitations in reaching elevated parking area at busy New York terminal complex. Smooth, clean lines, without outside stiffeners, demonstrate aesthetic possibilities inherent in welded design.