Section VI—Design Procedure for T-Girder Bridges

When studying the design procedure for T-girder bridges presented here, it is suggested that reference be made to Design Problem No. 3. To do so will aid in becoming familiar with each step of the procedure.

1. Select r Values

As in the case of slab bridges, *r* values can be chosen at the outset which will result in a satisfactory design and which will automatically determine the depth of girders for definite girder spacing and width of stem.

For all continuous girder units having span ratios of 1:1.37 . . . :1 as recommended in Section II—Layout: *r* for outer ends of end spans may be zero, or if haunched, 0 to 1.3 as desired; for a three-span unit, *r* at each side of the two intermediate supports may be taken as 1.3; for a four-span unit *r* for each side of center support may be 1.5 and at the first interior supports may be assumed as 1.3. It may be necessary to modify these values for designs based on dead load to live load ratios or span length ratios greatly different from those used in this booklet.

2. Draw Influence Lines

The procedure outlined under Step 2 for slab bridges applies to girder bridges as well.

3. Maximum Live Load Moments at Critical Sections

Determination of live load moments is essentially the same as outlined for slab bridges in Step 3.

4. Dead Load Moments

As for slab bridges, Step 4, dead load moments can also be found for girder bridges in terms of the yet unknown uniform dead load w lb. per lin.ft. and W_{BA}, W_{BC}, etc., the haunch load.

5. Select Girder Spacing, Determine Girder Width and Design Slab

Spacing of girders will depend upon over-all width of deck and to some extent upon available headroom. Economical spacing depends largely on slab thickness and it will usually be found most economical to select a spacing between 7 and 10 ft.

Having decided on the spacing of girders, choose the width of girder stem, b'. In reality, width of stem is dependent upon girder spacing, slab thickness, and length of span, but usually it is even more dependent upon the arrangement of reinforcement than upon moment and shear stresses. A fair approximation can be had in terms of two variables, such as $b' = 0.0025 \sqrt{b} \times L$, where b = spacing center to center of girders and L is the length of the end span. For example: Spacing b = 8 ft. 6 in. and end span of a unit is 55 ft. 0 in.; then required $b' = 0.0025\sqrt{102} \times 660 = 16.7$ in. A width of 16½ in. will provide for four 1¼-in. square bars in each layer of reinforcement at points of critical positive moments. It is often desirable to place a considerable area of steel in each layer so as to avoid an arrangement of bars that would place reinforcement too near the neutral axis.

Now determine slab thickness required. The bending moment in 6 and 7-in. slabs due to wheel load concentrations may be taken from Fig. 45*. The assumed thickness can then be checked to see if allowable stress requirements are satisfied.

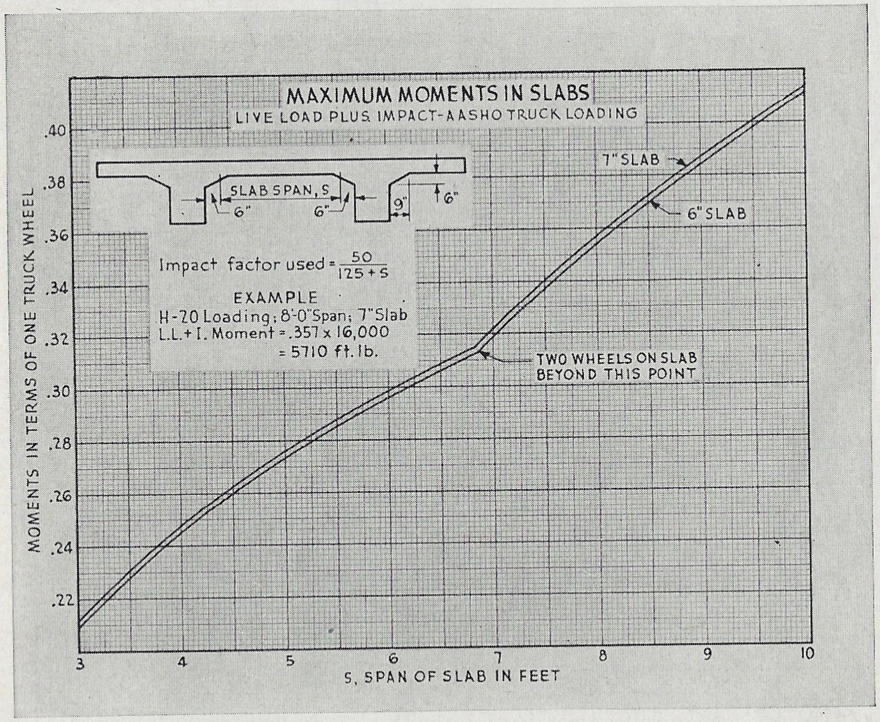

Fig. 45

6. Assume Trial Depth at Supports

Having selected the girder spacing, determined the width of stem and found the required slab thickness, compute and plot a moment of inertia curve for the gross T-section center to center of girders. Since the only variable in girder section is the depth, h, the moment of inertia curve, should be plotted for values of h between $0.04L$ and $0.12L$; L being the length of the end span. Coefficients for moment of inertia of T-sections may be taken from Fig. 46.

*"Computation of Stresses in Bridge Slabs Due to Wheel Loads" by H. M. Westergaard, *Public Roads*, March 1930, pages 1—23.