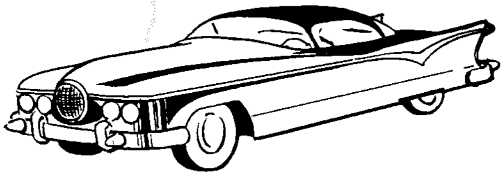
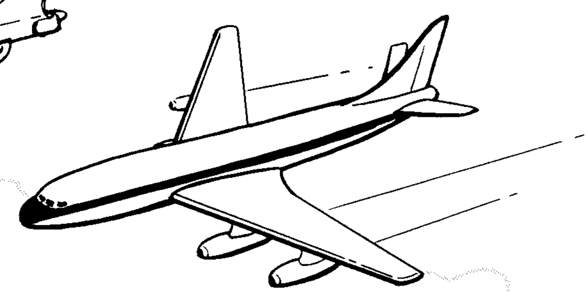
HOW TO FIGURE STEEL WEIGHT IN BRIDGES





BY HENSON K. STEPHENSON

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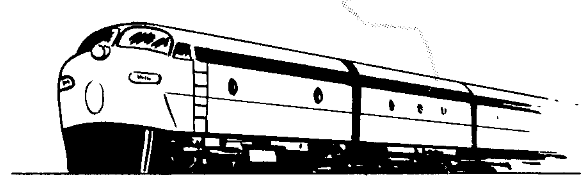

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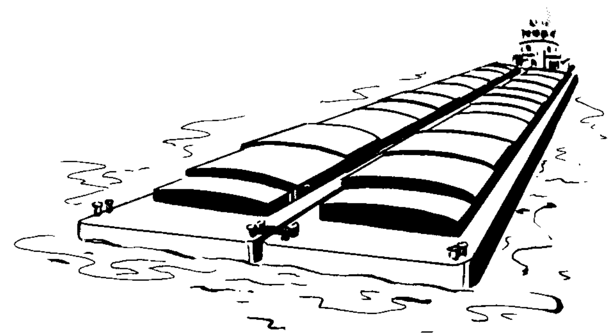

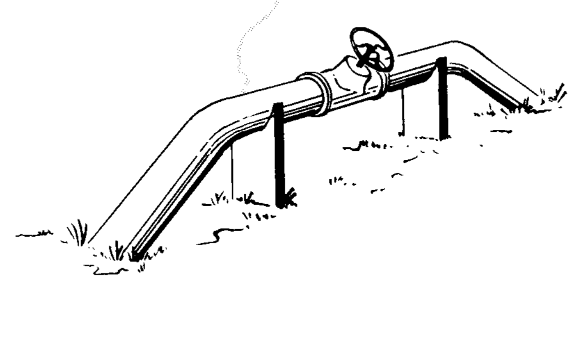

How to Figure Steel Weight in Bridges

By Henson K. Stephenson

Engineers and contractors can use data in graphical form to determine minimum weights of steel in highway bridges. Such information is useful in estimating the dead load to be used in designing such bridges and in determining the weights of steel required for estimating construction costs.

The chart gives the minimum weights of steel per sq ft of roadway required for interior stringers in simple span bridges of various lengths and loading designs based on the use of rolled beams or welded plate girders. These weights include no allowance for beam supports, such as bearing plates or rockers, but do include a small allowance for diaphragms or lateral bracing.

The minimum steel weights indicated are those required for bridges consisting of a 6-in. non-composite concrete deck supported by steel stringers, designed according to the 1953 AASHO (American Association of State Highway Officials) Standard Specifications for Highway Bridges. However, if the design is made according to the 1957 AASHO Specifications, the minimum steel weights will be about 6% less than those given in the chart. The steel weights indicated also may be adjusted for variations in thickness of the concrete deck. For example, an increase in thickness of the deck from 6 to 7 in. will result in increases in the indicated steel weights varying from about 3% for the shorter spans to about 5% for the longer spans.

For purposes of either estimating or design, it may be assumed for any given steel beam bridge that the exterior stringers will be the same size and weight as indicated by the chart for the interior stringers. Although the exterior stringers in certain cases may weigh a little less than the interior ones, the difference would ordinarily be so small as to have but little, if any, influence on a given design or estimate.

The following examples illustrate use of the data:

Example 1: A two-lane, 50-ft beam bridge (49.0 ft c-c supports) designed for an H15 loading according to the 1953 AASHO Specifications is to consist of a 6-in. concrete deck supported by two inside and two outside steel stringers spaced at 8.0 ft on centers. It is desired to know the minimum weight of steel required for each interior stringer. For this case the chart shows the steel weight to be 15.5 psf of roadway tributary to each interior stringer. The minimum steel required would be 15.5 x 8.0 = 124.0 lb per ft; or a total weight of 124.0 x 50.0 = 6,200 lb for each interior stringer.

Example 2: For the two-lane, 50-ft bridge of H15 design described in Example 1, suppose it is desired to know the total weight of steel required for the four supporting stringers. Since each outside stringer will weigh about the same as each interior stringer, the total weight required for all four stringers would be about 4 x 6,200 = 24,800 lb.

Example 3: For the two-lane, 50-ft bridge described in Example 1, suppose it is desired to know how much additional cost would be involved for the superstructure if the bridge were designed for H20 instead of H15 loading. For the H20 loading and a 49.0-ft span, the chart shows the interior stringer weight to be 18.2 psf of roadway tributary to each interior stringer. Therefore, each interior stringer would weigh 18.2 x 8.0 x 50 = 7,280 lb; or a total weight of 4 x 7,280 = 29,120 lb for the four stringers. This represents an increase of 29,120 − 24,800 = 4,320 lb. If the unit cost of steel in place is assumed to be 15 cents per lb, the increase in cost of the H20 as compared with the H15 design would be about 4,320 x 0.15 = $648.00.

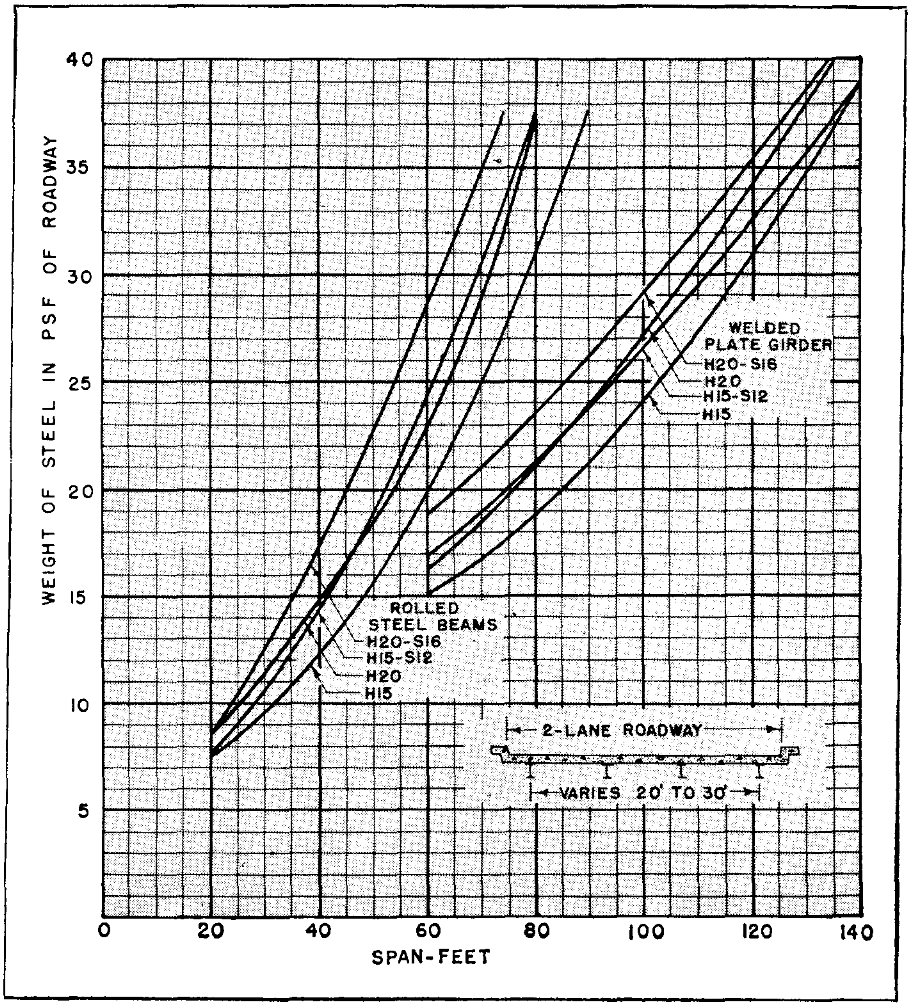

CHART gives minimum weight of steel in highway bridges and aids in estimating design dead loads and construction costs.

Texas A&M's H. K. Stephenson has been research engineer and professor of civil engineering at that institution since 1943. He is a specialist in highway bridge loadings and design.

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