

3.3 METAL SMALL STRUCTURES

Historical Overview

It is likely that the earliest metal beam (or girder) bridges in Maryland were built for the railroads (Spero 1995: 126). Spero noted that because girder bridge construction technology was not difficult and became readily standardized, few descriptions of nineteenth century girder construction in Maryland have been located (Spero 1995: 126).

The 1899 Report of the Maryland Geological Survey noted that “there are comparatively few I-beam bridges, one of the cheapest and best forms for spans less than 25 or 30 feet” (Johnson 1899: 206). That same report stated that repairs were underway to county roads and that “some of the small wooden bridges have been replaced by steel-beam bridges with wooden flooring” (Johnson 1899: 253). In 1906, Walter Crosby, Chief Engineer of the Highway Division, discussed eliminating wood structures and replacing them with concrete. He added that “in but two instances has the State approved the use of other materials. There the conditions required the approval of the use of a steel bridge with a wooden floor” (Crosby 1906: 379). This statement indicates, that at least on the state level, concrete was favored over steel, although steel was still used for bridge construction.

Between 1900 and 1930 concrete-encased, rolled I-beam structures were commonly built. According to Spero, numerous steel beam, steel girder and steel stringer and girder varieties were constructed on state and local roads between 1900 and 1930, including steel culverts (Spero 1995: 127). Spero also surmised that “metal girder bridges in Maryland between 1900 and 1930 were second in popularity only to reinforced concrete bridges” (Spero 1995: 127). The earliest extant datable girder bridge in the SHA bridge inventory dates to 1909. In the 1920s, the use of metal girders appears to have increased but the structure was not among the designs recommended for small structures in the state’s Standard Plans of that decade.

The 1933 State Standard Plans included a design for “steel beam bridges,” for structures ranging from 10 feet to 59 feet in length. For small structures, specifications were provided for lengths of 10 feet to 14 feet and 15 feet to 19 feet. These steel beam structures were specified for an H-15 load⁶ and for use on “secondary roads”.

According to Spero, until World War II interrupted major bridge building, steel spans continued to be built in Maryland under county, municipal and state auspices” (Spero 1995: 128). The shortage of critical materials, such as metals, during the war often resulted in the use of concrete as opposed to steel for new construction. Some small steel beam structures continue to be built today in Maryland.

Description

There are several types of metal structures.⁷ Generally, the type of metal structure utilized for small structures is the I-beam. The I-beam is comprised of longitudinal metal

⁶ An H-15 load carrying capacity assigned to a structure means it is capable of supporting a 15-ton truck; an H-20 load capacity can support a 20-ton truck.

⁷ Metal pipes are discussed in Section 3.5.

beams (stringers) that span the area between the abutments. Atop the beams is a wood deck or concrete slab deck (Figures 3.13 and 3.14). Through girders or deck girders are rarely, if ever, used for small structures. These structures feature a deck supported by floor beams running perpendicular to the roadway; the girders frame into the main longitudinal girders along the structure's outer edges.

Another type of metal small structure is the metal arch or the structural plate arch, composed of sheets of metal welded together (Refer to Figure 3.18 for drawing of structural plate arch). Although this type is listed on the SHA Office of Bridge Development's Small Structures Inventory as a small structure type, there are no extant examples in the 90% complete inventory. Most of these structures would date to 1960 or after.

There are few metal beam structures listed in the SHA's Small Structures Inventory. Examples of metal beam construction of small structures on state and county roadways are:

B0051 Windsor Mill Road over Unnamed Stream, Baltimore County 1930
single span, steel beam bridge with concrete deck.

CD394B Grand Valley Road over Unnamed Stream, Carroll County ca. 1940
13.5-foot single span, steel beam with concrete deck and part stone and part concrete abutments.⁸

15040XO MD 195 over Long Branch, Montgomery County N.D.
14.75-foot single span, steel beam, extended with concrete slab.

16043XO MD 382 over County Line Creek, Prince George's County 1963
19.75 foot single span, steel beam on 18-foot wide roadway.

15008 MD 124 over Branch of Goshen Branch, Montgomery County 1989
12-foot single span, steel beam on 23-foot wide roadway.

Tips for Dating Metal Beam Small Structures

Preliminary research has not revealed any extant metal beam small structures that date to the first quarter of the century. By 1930, the state's Standard Plans included a steel beam structure for use on secondary roads (Figure 3.14 and Appendix A, page A-42). A comparison of extant steel structures to the Standard Plans could provide dating assistance. Some elements that can be compared to the Standard Plans are the size of the beams and diaphragms (compare structure length to table on plans) and the size and spacing of the posts of the bridge rail (i.e. 6-inch by 8-inch posts spaced 5 feet center to center).

⁸ Often, replacement structures were built using the old abutments. That appears to be the case with this structure.

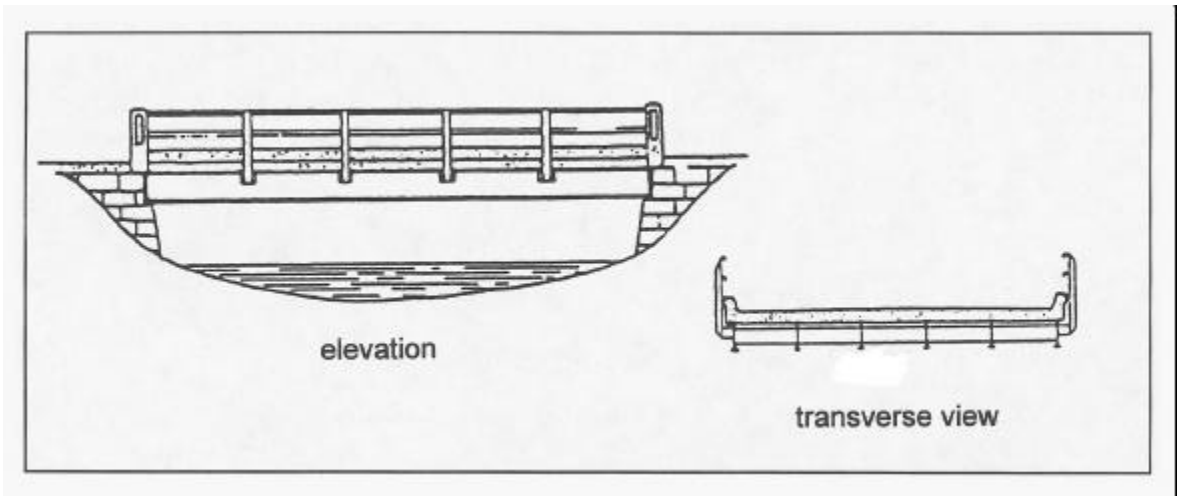


Figure 3.13 Steel beam, elevation and transverse view (Source: Carver N.D.).

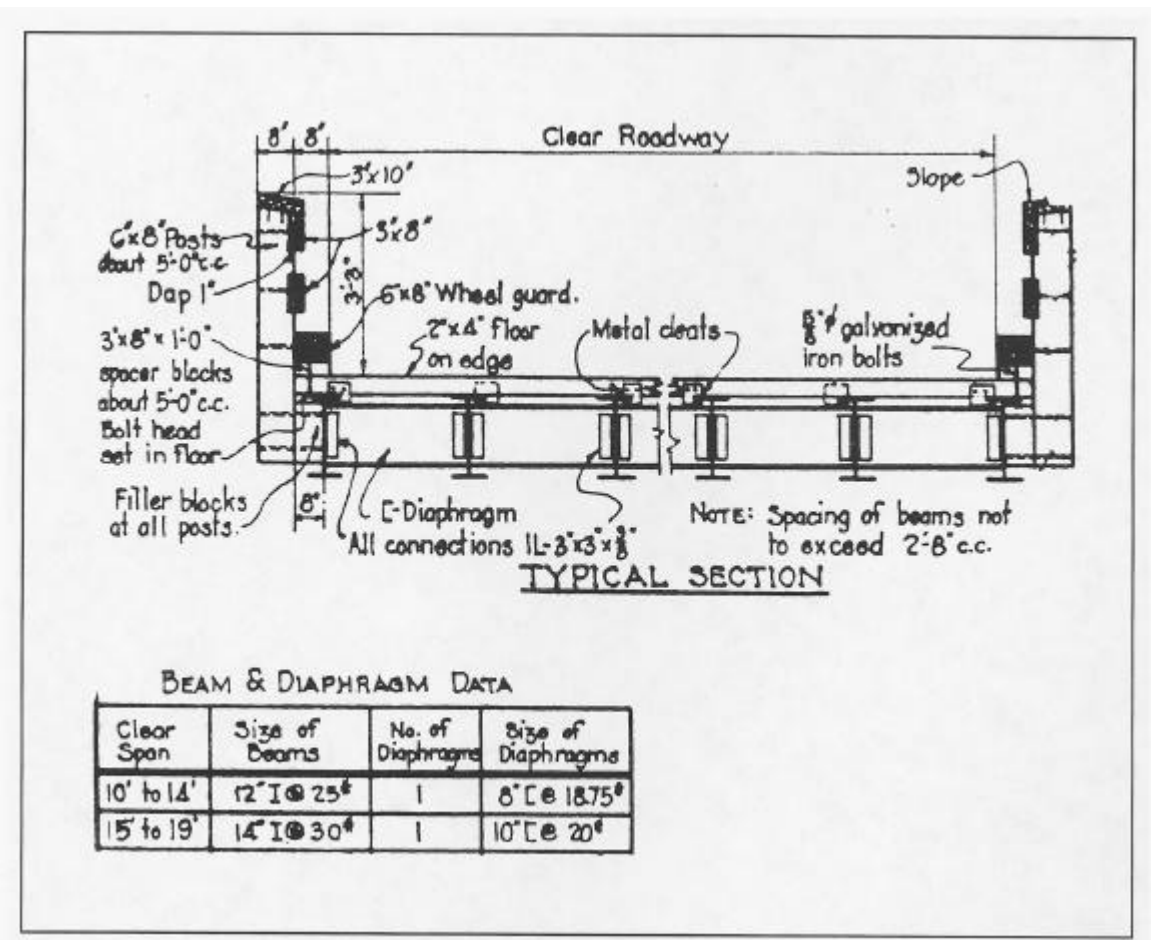


Figure 3.14. Standard Steel Beam Bridges for Secondary Roads from 1933 Standard Plans (Source Maryland State Roads Commission 1933).