Bridge Design - Loads and Load Combinations

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PDH: 4

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1. INTRODUCTION

Properly identifying bridge loading is fundamental to the design of each component. Bridge design is iterative in the sense that member sizes are a function of loads and loads are a function of member sizes. It is, therefore, necessary to begin by proportioning members based on prior experience and then adjusting for actual loads and bridge geometry.

This course summarizes the loads to be applied to bridges specified in the *AASHTO LRFD Bridge Design Specifications,* 6th Edition (AASHTO, 2012) and the *California Amendments to the AASHTO LRFD Bridge Design Specifications* (CA) (Caltrans, 2014). It is important to realize that not every load listed will apply to every bridge. For example, a bridge located in Southern California may not need to consider ice loads. A pedestrian overcrossing structure may not have to be designed for vehicular live load.

1.1.1 Load Path

The Engineer must provide a clear load path. The following illustrates the pathway of truck loading into the various elements of a box girder bridge.

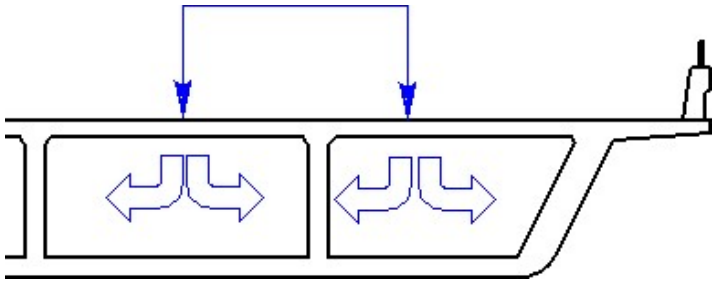

Figure 3.1-1 Truck Load Path from Deck Slab to Girders

The weight of the truck is distributed to each axle of the truck. One half of the axle load then goes to each wheel or wheel tandem. This load will be carried by the deck slab which spans between girders, see Figure 3.1-1.

Once the load has been transferred to the girders, the direction of the load path changes from transverse to longitudinal. The girders carry the load by spanning between bents and abutments (Figure 3.1-2).

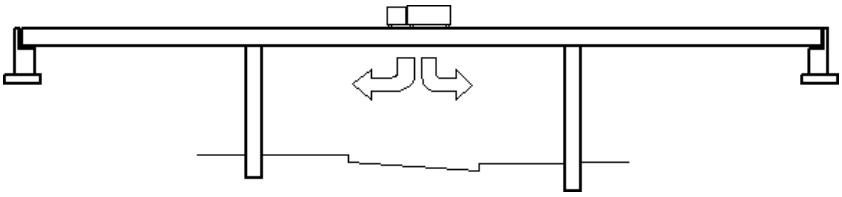

Figure 3.1-2 Truck Load Path from Girders to Bents

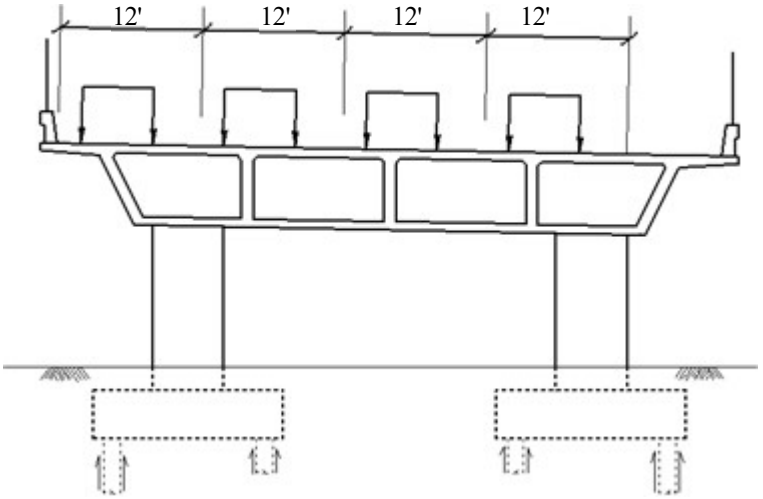

Figure 3.1-3 Truck Load on Bent Cap

When the girder load reaches the bent caps or abutments, it once again changes direction from longitudinal to transverse. The bent cap beam transfers the load to the columns. Load distribution in the substructure is covered in Section 3.5.3. The columns are primarily axial load carrying members and carry the load to the footing and finally to the piles. The piles transfer the load to the soil where it is carried by the soil matrix.

Load distribution can be described in a more refined manner, however, the basic load path from the truck to the ground is as described above. Each load in Table CA 3.4.1-1 has a unique load path. Some are concentrated loads, others are uniform line loads, while still others, such as wind load, are pressure forces on a surface.

Purchase this course to see the remainder of the technical materials.