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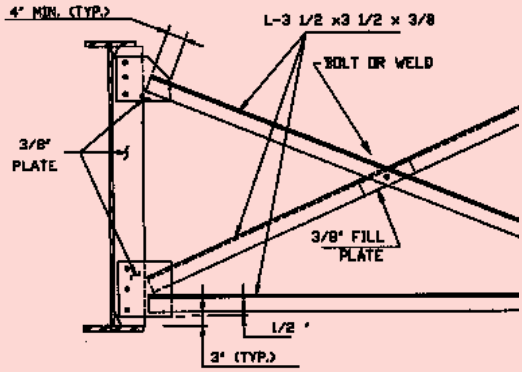
Practical Information For The Bridge Industry



Transportation Issues In Steel Bridge Erection

(This article is excerpted from H003:*Steel Erection for Highway, Railroad and Other Bridge Structures, Vol. I, Chap. 14 of the Highway Structures Design Handbook. To order this or other chapters of the Highway Structures Design Handbook, call 800/644-2400.)*

Highway

Steel bridge components are most commonly transported by trucks on public highways. This is particularly true for beam and girder bridges, which represent more than 90% of the steel bridge tonnage. Construction of the Interstate system has greatly increased the distance that fabricated structural steel can be trucked economically. It also has increased the size of the pieces that can be transported by truck. If truck transportation to the site is planned, then truck accessibility to the site on temporary or access roads should be evaluated.

The transportation departments of the various states set the weight and size limitations. While there are limits to the size and weight of loads that can be transported without permits or escorts, applications for permits to transport oversize loads are common and, within the guidelines of the various states, are commonly granted. States vary significantly in the sizes of oversized loads permitted. However, the states allow a great deal of latitude when escorts are used or when loads are moved during light traffic periods. Of course, large sizes can be more easily accommodated in areas with less urban congestion and in areas with straighter roads, such as the Great Plains and southwestern states. A growing industry devoted to the transportation of oversized loads of all kinds has emerged.

Some guide limitations for truck shipment are:
Length—Shipping pieces (field pieces) up to 150' are possible, and most states allow up to 80' without restrictions.
Height—Bridge or power line clearances govern the height of the load. A 12' load height is a usual clearance limit, but 14' is often possible.
Width—The normal unrestricted load width limitation is 8'. Widths up 16' may be possible with permits, escorts, and limits on the time of day or the day of the week of travel. Shipments 20' wide have been known to be accomplished in open country on the Interstate system. However, states would restrict the time of day for transit of a load this size.
Weight—Piece weights of 20 tons are normal, and transportation of loads up to 40 tons are commonly accomplished with permits. Weights up to 100 tons are possible but require close cooperation with the state.

Rail

Rail transportation is often advantageous from the standpoint of sizes and weights that can be moved. Heights may be as much as 16', depending on available routing, and 100 ton weights are possible. The usual width limitation is 8' but widths up to 12' are possible with a review of routing. Long lengths are possible using three or five car units. However, rail access directly to the erection site is seldom available, and, as a result, pieces must be off-loaded and trucked the final distance.

Waterways

When available, waterways offer considerable potential for transporting structural steel, particularly if the fabricator's plant and the erection site have easy access to water on the same or contiguous navigable waterway. The larger weight and size possibilities, and the potential for subassembly make this method desirable. It is most often used for major river crossings. In terms of dollars-per-ton mile, water shipment is the most economical way to ship. Actual size limitations will vary. It may even be feasible to fabricate and assemble entire bridge spans, float them into position and erect them onto their bearings.

Site Conditions and Accessibility

Site conditions usually dictate the bridge type

and as a result have a significant effect on the erection procedures or transportation modes. Special site conditions may additionally affect the options available for erection. Ecologically sensitive areas or the presence of industrial facilities under the bridge would be examples of these special conditions. The bridge design engineer should familiarize himself with the site and the conditions that might affect construction, such as power lines, access roads, navigable channels, ecology, etc. However, there is no location that is unsuitable for a steel superstructure because of erection considerations.

Coordination

The optimum situation for an erection procedure, and the most common for girder and beam bridges, is for the steel pieces to be loaded onto a truck and shortly after arrival at the bridge site be lifted directly into place on the bridge substructure from the truck bed. Should it be necessary to offload the pieces form the truck for temporary storage prior to erection, considerable expense will be incurred. In addition, field storage requires the preparation of a yard and runs the risk of damage or misplacement.

Once the erection scheme has been finalized, the erector must determine the order of preferred delivery of the fabricated pieces to the job site. However, on complicated projects the order of fabrication cannot always follow the order of erection, particularly if there is shop assembly. It therefore becomes imperative that the erector be consulted when planning the loading and shipping sequence.

The fabricator can also assist the erector by clearly noting the center of gravity on a fabricated piece when he has determined it in his shop to eliminate the duplication of this work by the erector.

While bridge design engineers may try to anticipate transportation and erection opportunities or limitations, they should consult qualified erectors and fabricators for assistance in evaluating the limitations for piece sizes and the opportunities for subassembly.

NATIONAL STEEL BRIDGE ALLIANCE
1405 North Lilac Dr., Suite 212
Golden Valley, MN 55422
ph: 612/591-9099 • fax: 612/591-9499

The mission of The National Steel Bridge Alliance (NSBA), which was formed in 1995, is to enhance the art and science of the design and construction of steel bridges. Its activities include organizing meetings, conferences and national symposia, conducting the Prize Bridge Awards competition, supporting research, developing design aids, and providing assistance to bridge owners and designers. The NSBA membership includes representatives from all aspects of the steel bridge industry.