

# High-Performance Steel: New Horizon in Steel Bridge Construction

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The Snyder South Bridge in Nebraska is the first U.S. bridge constructed from high-performance steel.

As a result of a cooperative research program carried out among the U.S. Navy, the Federal Highway Administration, and the American Iron and Steel Institute (AISI), a new grade of high-performance steel (HPS)—70 ksi—is now commercially available. The Navy, AISI, and FHWA received the Civil Engineering Research Foundation's Charles Pankow Award for Innovative Applications for the development of this steel. This new HPS, referred to as HPS-70W, has superior weldability and toughness characteristics. Although 70-ksi steel has been available for years, potential problems during fabrication prevented its use. The new HPS-70W is a weathering steel and has much higher toughness (as much as three times higher) than the old 70-ksi steel. Additionally, HPS-70W may require no preheat at all during welding, a characteristic that makes field welding a real possibility.

Nebraska and Tennessee have taken the lead in the application of HPS to bridge construction. Construction of the Snyder South Bridge was initiated in Nebraska in May 1997. This bridge was opened to traffic in October 1997, making it the first HPS bridge in the United States. The Snyder South Bridge is a simple span—150 feet long with five I-girders constructed from HPS-70W steel.

A two-span continuous HPS bridge in Tennessee with a total length of 573 feet is scheduled to be open to traffic in the near future. The use of HPS-70W steel in the design of the plate girders for this major bridge has resulted in at least a 20 percent savings in material by weight. The construction of plate girders for both

this and the Snyder South Bridge proceeded without a problem.

The state of Nebraska is moving ahead with a three-phase project to implement HPS-70W steel in bridge construction. This project is a cooperative effort with FHWA, the Nebraska Department of Roads, and the University of Nebraska-Lincoln. Phase I of the project, which is nearing completion, consisted of construction of the Snyder South Bridge and research studies to remove current limitations in the American Association of State Highway and Transportation Officials' bridge design manuals that prevent full utilization of HPS-70W steel in bridge construction. The bridge site for Phase II of the project has been selected in an urban area. This bridge will be a major structure and will be two-span continuous, each span being approximately 250 feet long. The preliminary plan is to use hybrid plate girders, employing HPS-70W steel for the superstructure.

Phase III of the Nebraska project involves the design and construction of an innovative steel bridge system that will exploit the advantages of HPS-70W steel. Several innovative bridge systems have been developed by J. Muller International and Modjeski and Masters, Inc. In Phase III, one of these innovative systems (or a modified version) will be used in the construction of a continuous steel bridge.

The effort to remove current limitations in AASHTO bridge design manuals involves the conduct of full-scale tests at the University of Nebraska-Lincoln, FHWA, and Lehigh University. In addition, analytical studies are being conducted at Georgia Institute of Technology. It should be noted that these limitations in the AASHTO manuals are merely the reflection of a lack of test data. The main thrust of these ongoing research activities is to assess the inelastic rotational capacity of steel plate girders constructed from HPS-70W and HPS-100W (steel with 100-ksi yield strength). Preliminary results obtained from testing I-girders constructed with HPS-70W have been very encouraging.

The state of Pennsylvania will also be constructing a steel bridge using HPS-70W steel and an innovative superstructure system. FHWA is organizing several regional workshops to share knowledge gained in using HPS in bridge construction.

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