U.S. Department of Transportation
Federal Highway Administration

Federal Highway Administration
RESOURCE CENTER

STRUCTURES

High Performance Steel

Problem:
Use of conventional materials in the design, construction and rehabilitation of highway structures is a factor in limiting service life of bridge superstructures.

Background:
There are approximately 595,000 bridges located on public roads in the United States. A large number of these are substandard or deficient in one or more ways, even after 25 years of federal, state and local improvement programs. This large number of deficient bridges can impede national mobility and productivity goals. Fatigue and deterioration gove rn the service life of these structures.

Unless there is a fundamental change in the methods and materials used in bridge construction, the number of substandard or deficient bridges and other structures is likely to increase. This is due, in large part to (a) current projections for increasing traffic growth; especially trucks, (b) the fact that bridges built today with conventional technologies will deteriorate at, or even above, the rate of bridges built 20 years ago, and (c) an average life span for all bridges of only slightly more than 40 years.

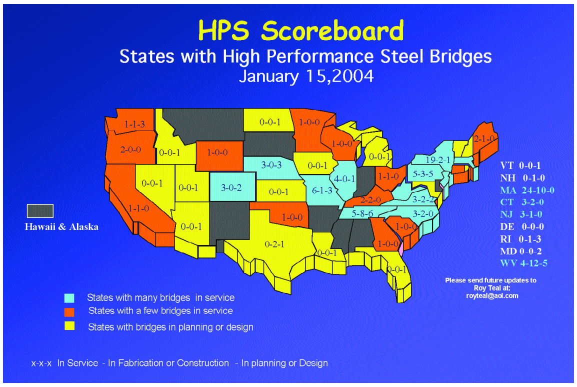
One Solution:
Fully implement the use of High Performance Steel for all structural steel bridge elements where the high strength of HPS leads to fewer lines of girders, shallower beams and longer spans.

What is HPS?
All steels possess a combination of properties that determines how well a steel performs its intended function. Strength, weldability, toughness, ductility, corrosion resistance, and fo rmability are all important to determine how well a steel performs. HPS can be defined as having an optimized balance of these properties to give maximum perfo rmance in bridge structures while remaining cost-effective.

HPS has low levels of carbon and carbon equivalents to provide good weldability. It is weldable with reduced or no preheat and without expensive welding techniques. I t has a high level of fracture toughness (Zone 3 minimum) to minimize the potential for brittle failure and improve s t ructure reliability. It provides better than adequate material ductility. It has much higher tolerance of cracks. It has slightly higher atmospheric corrosion resistance characteristics than that of conventional steel.

Where are the successes?
Implementation of HPS in the U.S. has been an overwhelming success story due to the model partnerships formed between FHWA, the State DOTs, the steel industry and academia. In under three years the HPS 70W steel went from the research and development phase to the first HPS bridge in service.

Results were touted as "the fastest ever technology transfer within the bridge construction industry in North America." Per the scorecard below, today over 200 HPS bridges are either completed and in service, are in fabrication or under construction, or are in the planning or design phases. The effort has blossomed in the mid-Atlantic and northeastern states, as well as the center of the country.



What are the expected benefits (in addition to the definition above)?

- Longer span lengths and fewer piers
- Lower foundation and superstructure costs
- Wider beam spacing and fewer beams
- Increased vertical clearance without expensive approach roadway work
- Fewer maintenance requirements and longer service life
- Lower initial and life-cycle costs

Additional Resources
To learn more, visit:
www.steel.org/infrastructure/bridges/index.html or
www.fhwa.dot.gov/bridge/hps.htm

For more information, contact:
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