

How Are We Doing? Learning from the National Bridge Inventory

by Hank Bonstedt

Mayor Ed Koch of New York City during his tenure in the 1980s famously used to ask “how are we doing?” to get feedback from his constituents. As marketing managers in the prestressed concrete industry we always want to know the same thing: are we making progress?

But rather than simply ask people their opinions, I wanted to bring a more measurable analysis to this question. Since good and reliable market and trend projections rely on the appropriate selection of information, we need to ensure that sample size and design, as well as useful information items (that is, base data), are taken into account.

For analyses of highway bridges, the Federal Highway Administration compiles a significant amount of data on all of the nation's bridges in the National Bridge Inventory (NBI) database, which is prepared by the states according to a standard Recording and Coding Guide. For each bridge, this results in more than 115 items that are organized on a Structure Inventory and Appraisal sheet.

While the purpose of this effort is to have a “...complete and thorough inventory, so that an accurate report can be made to Congress” and to provide the data necessary to “...produce Defense Bridge and Federal Emergency Management Agency (FEMA) reports” it also contains the answer to our question.

We were interested to learn from the National Bridge Inventory database the number of bridges built each year and the distribution of the total number of bridges among the various road systems (Fig. 1).

We only considered bridges constructed or reconstructed after 1950. The reason for this limitation is that not all material alternatives were available prior to that time (Fig. 2).

We also can see how prestressed concrete bridges, since their first use in the United States, which happened in 1950 with the Walnut Lane bridge in Philadelphia, Penn., have been playing an ever-increasing role in meeting the bridge construction needs of the public.

The gains of prestressed concrete bridges become especially notable when seen as a percentage of the total bridge construction and reconstruction market (Fig. 3).

Such continuous market penetration over 65 years could not happen solely on the basis of low initial costs; it must also be explained in terms of the quality and durability of this type of bridge design and construction.

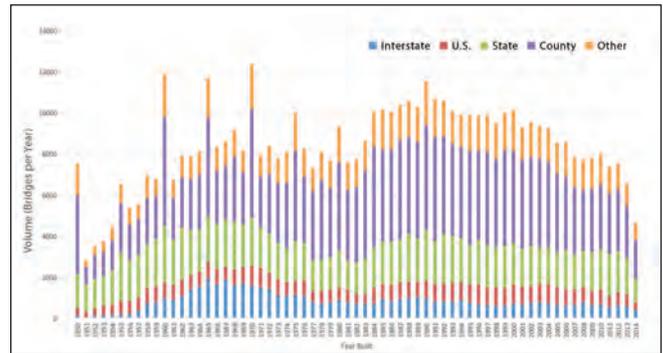


Figure 1. Number of bridges constructed by road system and year completed. All Figures: Hank Bonstedt.

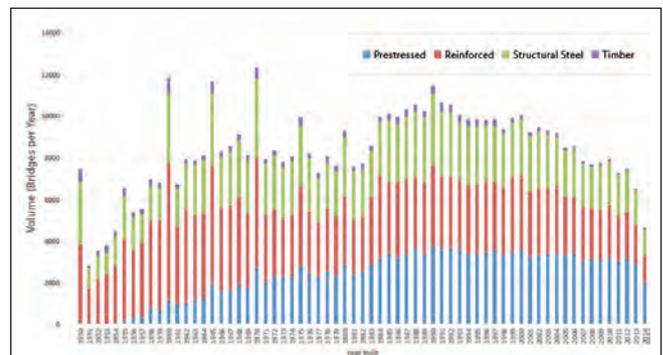


Figure 2. Number of bridges constructed by material and year completed.

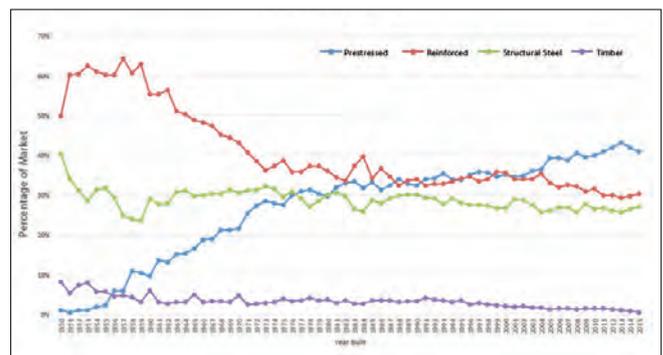


Figure 3. Percentage of bridges constructed by bridge type. Percentage is calculated based on the number of reported bridges completed in a given year.

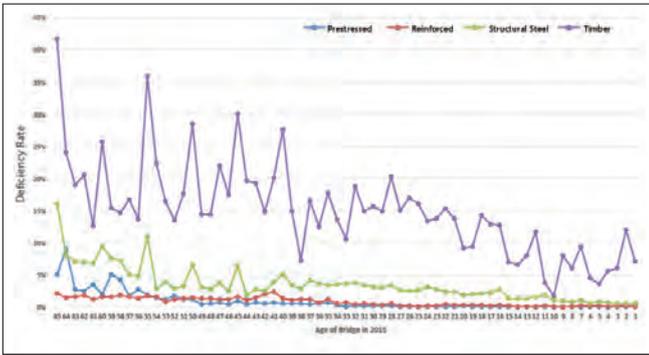


Figure 4. Overall rates of deficiency for all road systems by material and age of bridge.

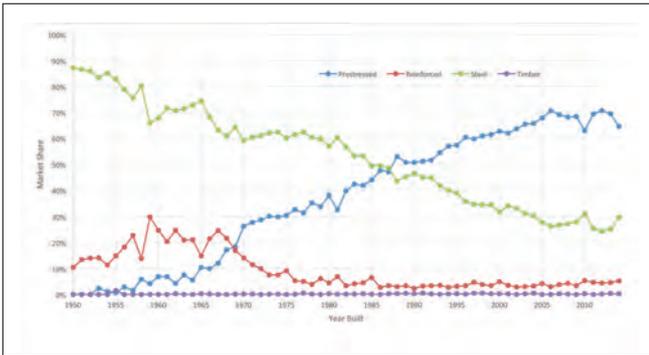


Figure 5. Percentage of bridges constructed by bridge type for bridge spans between 100 and 150 ft.

For this exercise we considered only bridges that have deficiencies (Fig. 4) as the result of condition ratings of 4 or less for deck, superstructure, and substructure, or an appraisal rating of 2 or less for structural condition. Deficiencies resulting from waterway adequacy or approach roadway alignment were not considered. These levels were established because a uniform level of urgency for remedial action is necessary.

With the development of more efficient beam sections, innovation in steel strands, and developments in high-performance concrete, it was also of interest to see how we are doing on the basis of market share for the main spans of a variety of bridges (Fig. 5).

So, to answer our question: the prestressed concrete industry is indeed making progress! **A**

Hank Bonstedt is the former executive director of the Central Atlantic Bridge Association.

EDITOR'S NOTE

The analysis of National Bridge Inventory (NBI) data to compare the performance of different bridge materials was first considered in a master's thesis by Claude Napier, formerly with VDOT and FHWA. Drs. Kenneth Dunker and Basile Rabbat built on this work in an article published in the PCI Journal in 1992. The Portland Cement Association then produced several reports characterizing market share and performance using NBI data that were written by Drs. Reid Castrodale and Shri Bhide. Finally, Hank Bonstedt published an article in Concrete International in October of 1998.

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