Durability of Concrete Segmental Bridges

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With the collapse of the I-35W bridge in Minneapolis last year, the durability of bridges has become a national issue. In a report[1] sponsored by the American Segmental Bridge Institute (ASBI), the durability of segmental bridges is addressed in comparison to all structure types listed on the National Bridge Inventory (NBI). This article provides a summary of the ASBI report.

The information was based on the December 2006 Federal Highway Administration (FHWA) NBI data base, which documented the condition of 597,479 bridges in the United States. The majority of these bridges were constructed during two bridge-building booms—one during the post-depression era and the second during the interstate construction boom. Many of these bridges are, therefore, 40 to 70 years old and are beginning to show their age, with 73,798 bridges (12.4%) rated as structurally deficient. An additional 80,317 bridges are listed as functionally obsolete. The discussion in this article focuses exclusively on structurally deficient bridges.

Figure 1 shows the proportion of bridges by material type compared to Figure 2, which shows the proportion, by type, for structurally deficient bridges. A discussion of structurally deficient bridges was provided in *ASPIRE*,™ Winter 2008. The purpose of the ASBI durability report is to assess the condition of concrete segmental bridges, with service lives approaching 40 years in the United States, along with their ability to provide long-lasting structures.

In Figure 1, the categories of steel bridges represent about 32% of the overall bridges in the FHWA survey,[2] but they are responsible for about 54% of the structurally deficient bridges as shown in Figure 2. Reinforced, prestressed, and post-tensioned concrete bridges represent 63% of the overall bridges but only represent 32% of the structurally deficient bridges, with 6% of the prestressed concrete bridges and 0% of the segmental bridges classified as structurally deficient. This means that the ratio of structurally deficient bridges to the total number of bridges is 5.8 times greater for steel bridges than for prestressed concrete bridges and 2.7 times greater for concrete bridges. Timber bridges, while representing only 4% of the entire number of structures, represent 14% of the structurally deficient bridges.

The most frequent reason that steel and timber bridges are classified as structurally deficient is a low structural adequacy rating. This means the bridge has a lower load-carrying capacity.

The information for the ASBI survey identified over 400 segmental bridges with 275 inspection reports and condition ratings obtained. All segmental bridges were rated as "fair" or better. Of the 273 bridges, over 97% had superstructure ratings of "satisfactory" or better, 85% had superstructure ratings of "good" or better and 25% had superstructure ratings of "very good" or better. On average, the 275 segmental bridges, built over the last 35 years, with inspection data gathered averaged a superstructure rating of "good."

The NBI inspection data[2] summarized in the ASBI report shows that concrete bridges continue to perform well. No structural deficiencies in segmental concrete bridges were noted. Other bridges constructed during the past 35 years using other materials have experienced varying levels of structural deficiency.

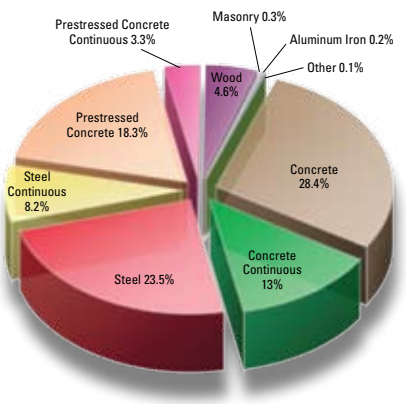

FIGURE 1
Proportion of bridges by material type.

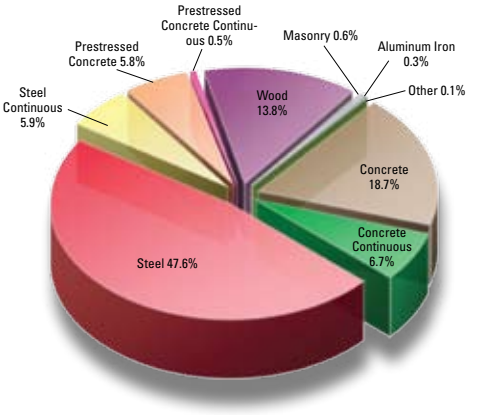

FIGURE 2
Proportion of structurally deficient bridges by material type.

REFERENCES

1. Pielstick, Brett, *Durability Survey of Segmental Concrete Bridges*, Third Edition, September 2007, available from ASBI.

2. Ann Shemaka, FHWA Bridge Technology "Tables of Frequently Requested NBI Information," updated May 1, 2007, at http://www.fhwa.dot.gov/bridge/britab.htm.