Bridges in Ohio are crucial components that make up one of the largest transportation systems in the United States. Ohio’s economy is directly linked to its ability to move goods and services through the 5th largest interstate highway system, 2nd largest inventory of bridges, and 10th largest highway network in the nation. Many of the state’s bridges have reached their expected service life and are in need of rehabilitation or replacement. State and local agencies are now dealing with the problem of programming this needed work in the wake of the downturn in the economy and the sharp increase in cost of construction materials. On top of this, many sources of revenue have become stagnant, which puts even more stress on fragile budgets. It is estimated that it would cost $3.6 billion to replace all the structurally deficient bridges, as well as rehabilitate the most urgent two-thirds of the functionally obsolete bridges in Ohio. The estimate does not include any design, roadway nor right-of-way costs associated with these projects.

Background

In 1967, the Silver Bridge (U.S. 35) over the Ohio River collapsed and killed 46 motorists. This brought attention to the need for National Bridge Inspection Standards (NBIS). Ohio was instrumental in establishing its own standards in the wake of this catastrophe. NBIS states that a bridge, defined as a structure with a length of at least 20 feet, needs to be inspected at least once every two years. The Ohio Revised Code (ORC) defines a bridge as having a span length of at least 10 feet with a requirement that the bridge be inspected annually. Generally the agency that owns the bridge is responsible for having the structure inventoried and inspected by a professional engineer and must submit the results, which is called a general appraisal (GA), to the state. This is then reported to the Federal Highway Administration (FHWA).

Ohio has the second largest inventory of bridges in the United States, 27,999, based on the federal definition of a bridge and 2007 data. Based on the ORC definition of a bridge, the inventory in the Ohio Department of Transportation (ODOT) Bridge Management System as of February 2009 is 44,245 bridges. These structures are owned and maintained by the state, counties, municipalities, townships, and other state and local agencies.

NBIS also requires every bridge to have a load rating performed to determine its safe live load-carrying capacity. The safe live load-carrying capacity is the additional amount of load from vehicles, pedestrians and other forces a bridge can withstand above the weight of the bridge
itself. NBIS also requires an underwater inspection be performed every five years to check structural integrity and/or potential scour problems.

The inspections, evaluations, and inventory of data are also used to determine if a structure is deficient. Deficiency is divided into two categories: bridges considered structurally deficient (SD) or functionally obsolete (FO). A structurally deficient bridge is one that has inadequacies which may limit its ability to carry legal loads. These structures may have a reduced vehicle weight limit. A functionally obsolete bridge is one that does not meet current geometric requirements such as shoulder widths and clearances, or one that has roadway approach inadequacies. It should be noted that a bridge defined as SD or FO does not necessarily indicate that the bridge is unsafe, but merely acts as an indicator for the agency to consider programming a project to upgrade the bridge to meet current guidelines. These factors, along with the GA rating, are used to determine the sufficiency rating of the bridge. Again, a low sufficiency rating (0 is low, 100 is high), does not necessarily indicate an unsafe condition, just that the bridge has inadequacies in structural soundness and/or geometrics.

Ohio Bridge Facts and Issues

Ohio is a crucial link for moving goods and services across the country and region because of its large highway network, which includes over 44,000 bridges. Logistical distribution centers along the Ohio River, at the Ports of Toledo and Cleveland, and the Rickenbacker Global Logistics Facility in central Ohio, rely on a safe and efficient highway system.

Ohio has the second largest inventory of bridges in the country. While the overall condition of bridges in Ohio is slightly better than average, Ohio has the fifth highest number of deficient local bridges in the country.8

The following tables indicate the condition of bridges in Ohio based on primary maintenance responsibility as defined by the ORC:9

<table>
<thead>
<tr>
<th>Maintenance Responsibility</th>
<th>Total number of Bridges</th>
<th>SD</th>
<th>Percent SD</th>
<th>FO</th>
<th>Percent FO</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOT</td>
<td>14,001</td>
<td>761</td>
<td>5.4%</td>
<td>1,784</td>
<td>12.7%</td>
</tr>
<tr>
<td>Other state agencies (i.e. Ohio Turnpike)</td>
<td>559</td>
<td>16</td>
<td>2.9%</td>
<td>204</td>
<td>36.5%</td>
</tr>
<tr>
<td>County</td>
<td>26,061</td>
<td>3,098</td>
<td>11.9%</td>
<td>2,838</td>
<td>10.9%</td>
</tr>
<tr>
<td>Municipalities and other local agencies</td>
<td>2,375</td>
<td>281</td>
<td>11.8%</td>
<td>212</td>
<td>8.9%</td>
</tr>
<tr>
<td>Railroads</td>
<td>714</td>
<td>17</td>
<td>2.4%</td>
<td>17</td>
<td>2.4%</td>
</tr>
<tr>
<td>Other</td>
<td>535</td>
<td>40</td>
<td>7.5%</td>
<td>26</td>
<td>4.9%</td>
</tr>
<tr>
<td><strong>Total in Ohio</strong></td>
<td><strong>44,245</strong></td>
<td><strong>4,213</strong></td>
<td><strong>9.5%</strong></td>
<td><strong>5,081</strong></td>
<td><strong>11.5%</strong></td>
</tr>
</tbody>
</table>

Table 1.
From tables 1 and 2, the number of bridges listed as SD or FO is 21.0% based on number of bridges and 26.7% based on deck area. The biggest deficiency for the bridges maintained by ODOT is the percent of deck area for bridges classified as FO, 22.7%. The challenge for counties, who maintain almost 60% of the bridges in Ohio by number, is the high percentage of SD and FO bridges by number and deck area.

As stated earlier, a bridge classified as either SD or FO does not necessarily indicate a safety concern. The state uses the annual inspection by a professional engineer that results in the GA to assess the condition of the bridge. Bridges are given a GA rating from “9”, excellent condition, to “0”, failed condition. A “6” rating, satisfactory condition, indicates that structural elements are showing signs of minor deterioration. A “4” rating, poor condition, indicates advanced deterioration and section loss of structural elements. A rating of “4” or less is classified as SD if the bridge carries highway traffic.

Table 2.

Table 3 lists bridges by number and deck area that are classified as having a GA of “4” or less and those with a GA of “5” or “6” and that are rated as FO for each of the agencies with primary
maintenance responsibility. The information in this table eliminates all of the FO bridges with a GA of “7”, good condition or higher, and focuses more on bridges that would receive a higher probability of being programmed for replacement or rehabilitation. If you assume that bridges that are SD or have a GA of “5” or “6” and are FO should be programmed for replacement or rehabilitation, the percentages are 17.1% (9.5% Table 1 and 7.6% Table 3) for number of bridges and 19.5% (7.3% Table 2 and 12.2% Table 3) for deck area.

One final piece of information to consider is the sufficiency rating (SF) of a bridge. This is important because for any agency to receive federal funding for a project, a bridge has to meet certain criteria for replacement (SF<50 and SD or FO) or rehabilitation (SF< 80 and SD or FO). Sufficiency ratings can range from a high of 100% to a low of 0%. The sufficiency rating is calculated based on numerous factors, which include the general condition of the bridge, the geometrics of a bridge and other elements. States are required to submit annually to the Federal Highway Administration all required information based on general condition and inventory. The FHWA then uses this number to determine the sufficiency rating. This rating does not necessarily indicate that a bridge cannot support certain loading conditions. Table 4 lists the number of bridges based on SF ranges:

<table>
<thead>
<tr>
<th>Maintenance Responsibility</th>
<th>SF &lt; 50</th>
<th>50&lt;= SF &lt; 80</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOT</td>
<td>300</td>
<td>3,319</td>
</tr>
<tr>
<td>Other state agencies (i.e. Ohio Turnpike)</td>
<td>10</td>
<td>229</td>
</tr>
<tr>
<td>County</td>
<td>2,631</td>
<td>6,543</td>
</tr>
<tr>
<td>Municipalities and other local agencies</td>
<td>170</td>
<td>559</td>
</tr>
<tr>
<td><strong>Total in Ohio</strong></td>
<td><strong>3,111</strong></td>
<td><strong>10,650</strong></td>
</tr>
</tbody>
</table>

* Does not include railroads or other agencies

Table 4.

Many counties and local agencies do not have the manpower to perform the annual inspections and load ratings that are mandated by the state. As a result, they are forced to hire consultants to help them meet these requirements. This takes away valuable funds from their capital improvement programs (CIP) which could be used to replace or repair deficient bridges.

With project costs continuing to rise, more and more agencies are applying for funding. Most of the time, to receive federal funds requires the local agency to provide a 20% match of the funds received. For every $1 million in federal funds received for a project, a county would have to match it with $200,000 in local funds. For many smaller counties and municipalities, 20% of the project cost could exceed their entire CIP budget for the year. In addition, the process to assemble bid documents is very costly in terms of effort and time. This results in higher fees for right of way acquisition and design fees by consultants. Many agencies cannot afford to apply for federal aid. The County Local Bridge Program (LBP), Highway Safety Improvement Program, County Surface Transportation Program (STP), Regional Planning Commission Bridge Programs, and Ohio Public Works Commission (OPWC) Programs are a few other sources for agencies to acquire funding. When applying for federal funds, most projects are scheduled for five years out or more. Since a bridge has to have a lower SF rating and be
defined as SD and FO to qualify for federal funding, agencies are left with the often expensive task of maintaining these structures in the interim.

According to the County Engineers Association of Ohio, Ohio has one of the lowest base license plate fees in the country that has not been adjusted for decades. This is an important source of revenue for counties and municipalities.

According to information in an ODOT report, only 6.2% of local bridges, which include counties and municipalities, with a GA of “4” or less, have programmed federal aid through 2013. The amount of funding programmed for federal aid through 2013 is $208.3 million.

ODOT has budgeted $1.4 billion each year in 2010 and 2011 on all construction projects. This includes repairs and replacements of roads and bridges.

The 88 county engineer budgets in Ohio range from $2.5 to $40 million each year. The county budgets include all costs associated with personnel, maintenance, administration, and construction of roadways and bridges.

While counties have a majority of the maintained bridges in Ohio, ODOT has over 66% of the total deck area to maintain in the entire state. This means that ODOT maintains the large majority of bridges considered “Major, High Cost”. These are bridges at least 1000 feet long, have a deck area over 81,000 square feet, or are a suspension or draw-type bridge. Currently only 38% of “Major, High Cost” bridges with a GA less than “4” that ODOT maintains are programmed for replacement or rehabilitation. Current projects that are challenging ODOT’s budget include the I-90 Cleveland Central Viaduct, the I-71/I-75 Brent Spence Bridge in Cincinnati, and the Ironton-Russell Bridge over the Ohio River.

- ODOT has recently reduced the number of traffic-carrying lanes on the I-90 Cleveland Central Viaduct Bridge and re-routed truck traffic through the city. The addition of a new westbound span, the first step in the viaduct replacement, is estimated to cost approximately $400 million.
- The Brent Spence Bridge over the Ohio River in Cincinnati is a crucial Interstate link where I-75 and I-71 convene. The bridge is classified as FO. Construction costs for all the necessary work to reconstruct the bridge and approach work were estimated at $1.2 to $1.8 billion in 2008 dollars. Work is not expected to begin until 2015, which means costs could increase by an estimated 50-60%.
- The Ironton-Russell Bridge was recently bid for replacement. The low bid was $110 million, which far exceeded the budgeted amount. Bids were rejected and the project will be reprogrammed for 2014.

Policy Options

Ohio’s economic future depends on maintaining and improving its aging transportation infrastructure. Sources, such as SAFETEA-LU, Federal Highway Trust Fund, OPWC, STP, and LBP, are critical in providing funding for state, county, and local agencies. Ohio’s elected officials at all levels must constantly look for ways to fund and improve one of the largest highway networks and bridge inventories in the country. Government transportation agencies should focus their attention on replacing all of their structurally deficient and most critical functionally obsolete bridges. Many transportation departments, however, are left with the
challenge to maintain their existing bridges while trying to balance budgets based on existing funding levels for all of their expenditures.

Specific ASCE Ohio Council Recommendations

- Increase funding levels for federal aid programs, such as the Local Bridge Program, Highway Safety Improvement Program, Surface Transportation Programs, and Regional Planning Commission Programs
- Congress must enact the National Highway Bridge Reconstruction and Inspection Act
- Increase funding for “Major, High Cost” bridges
- Allow counties to increase their permissive license plate fees, which have not been adjusted for decades
- Support environmental streamlining of transportation projects
- Increase funding for long-term fundamental highway research efforts at the national level
- Provide funding sources to assist local agencies in performing annual bridge inspections
- Encourage the use of life-cycle cost analysis principles to evaluate the total cost of projects

Sources


2 Ohio Department of Transportation, Ohio’s Road and Bridge Infrastructure, A Report on Conditions, Condition Trends and Funding Requirements, September 1, 2007

3 Federal Highway Administration, Code of Federal Regulations [23 CFR 605.305]

4 Federal Highway Administration, Code of Federal Regulations [23 CFR 605.311]

5 Ohio Revised Code, Section 5501.47

6 Ohio Revised Code, Sections 5501.47, 5543.20 and 723.54


8 County Engineers Association of Ohio, Legislative Program for the 127th Ohio General Assembly, 2008

9 Ohio Department of Transportation, Bridge Management System Data, updated February 9, 2009

10 Ohio Department of Transportation, Testimony on the 2010-2011 State Transportation Budget, February 12, 2009

11 Brent Spence Rehabilitation Project Website, www.brentspencebridgecorridor.com