

Smart Bridge Technology

Wireless sensors provide real-time update of bridge's structural conditions.

The Massachusetts Port Authority (Massport) has announced that a new structural monitoring system will be put in place on the Tobin Bridge over the next 18 months. Massport's board approved a permanent high-tech monitoring system, which will make the Tobin the state's first



Strain gauges provide real-time information about the loads and stresses on the Tobin Memorial Bridge.

“smart bridge.” The Tobin Bridge connects the Charlestown section of Boston with Chelsea.

The monitoring system technology will allow Massport engineers to better understand the causes of stresses on the bridge. Investing in this innovative tech-



Wireless tilt sensors are attached to the Tobin Memorial Bridge, providing data that will be calibrated against actual conditions.

nology enhances—but will not replace—Massport's schedule of inspections, which are done every two years and an in depth inspection every four years. The technology will allow the authority to address any concerns immediately. Massport is acting proactively because the technology is available and it will buttress Massport's efforts to maintain the bridge in good overall condition.

The main structure over the Mystic River is a three-span, cantilevered truss 1,525 ft in length. Its center span is 800 ft and the maximum truss height is 115 ft. It provides a navigable waterway opening 700 ft wide by 135 ft high. A smaller, simply supported warren truss spans the Little Mystic. It reaches a maximum truss height of 65 ft and is 439 ft long. Its navigable waterway opening measures 340 ft wide by 100 ft high.

The approaches comprise 36 spans on the north and 32 spans on the south. These spans are built-up plate girders of variable lengths (average length is 100 ft). On the 12-span toll plaza—set



Piers in the Mystic River are anchored as deep as 85 ft below sea level. The tallest measures 339 ft from top to bottom.

between the Little and Big Mystic trusses—the roadway widens to 102 ft to accommodate seven collection lanes.

The monitoring system was included in an amended \$21.7-million project budget for the Tobin Bridge. The amendment will fund a contract worth roughly \$1 million with Fay, Spofford & Thorndike (www.fstinc.com). The contract calls for the firm to conduct a finite element analysis of forces and strains on the bridge using a three-dimensional computer engineering model of the



A major link between Boston and northern New England, an estimated 26 million vehicle trips are taken over the Tobin Bridge annually.

entire 2 1/4-mile long bridge.

The model will be calibrated against actual conditions and then wireless sensors will be attached to areas of the

bridge. The sensors' continuous stream of data will provide important real-time information about stresses and loads on the bridge, as well as environmental

conditions and corrosion. The computer modeling, calibration, and installation of the sensors should be complete by 2010.

Some 80,000 motorists use the Tobin Bridge each day. Massport has developed a carefully phased maintenance program—including painting and redecking—to ensure the long-term viability of the bridge.

Massport operates Boston Logan International Airport, the Port of Boston, Tobin Memorial Bridge, Hanscom Field, and Worcester Regional Airport. Massport is a financially self-sustaining public authority whose premier transportation facilities generate more than \$8 billion every year and enhance and

enable economic growth and vitality in New England. For more information go to www.massport.com.



The Tobin Memorial Bridge

■ At 2.25 miles long, the 58-year old cantilever bridge was built in 1950. The Tobin Memorial Bridge formally known as the “Mystic River Bridge” is half a mile longer than the famous Golden Gate Bridge in San Francisco and is twice as long as the Brooklyn Bridge in New York.

■ In 1967, spanning the same Charlestown to Chelsea crossing that was served by the Winnisimmet Ferry 400 years ago, the Mystic River Bridge, was renamed the Maurice J. Tobin Memorial Bridge after Massachusetts' 56th Governor. The Tobin Bridge was built for \$27 million by a specially created public agency with bonding authority known as the Mystic River Bridge Authority, an arrangement ahead of its time.

■ Between 1948 and 1950, 18,000 yards of concrete and 4,500 tons of steel were used in construction. Great steel sections of the bridge were pre-fabricated in Pennsylvania and shipped to Boston on barges. Some sections as large as 45 tons.

■ The Tobin Bridge stands 254 ft tall at its highest point and the lower deck is 135 ft above mean high tide. The piers in the Mystic River are anchored as deep as 85 ft below sea level, the tallest measuring 339 ft from top to bottom.

■ Today, an estimated 26 million vehicle trips are taken over the Tobin Bridge each year, which serves as a major arterial link between Boston and northern New England.

■ The Tobin Bridge provides three travel lanes northbound on its lower level and three lanes southbound on the upper level. As a convenience to the bridge's roughly 80,000 daily vehicle trips, tolls are only collected one way, in the southbound lanes.

■ Keeping traffic moving smoothly and safely across the bridge is a vital part of Massport's strategy for promoting economic growth throughout the region. Advertising fees paid by BankNorth and others supplement toll revenues that are used to improve and maintain the bridge.

■ Recent enhancements include a new toll plaza, overhead electronic message boards, a fire-suppression system, and a new maintenance garage in nearby Chelsea that services and stores the snow plows used to keep the bridge open in winter, as well as other equipment essential for the upkeep of the bridge.

■ And as part of its state-of-the-art plan for the Tobin of the future, Massport has invested nearly \$2 million to equip the bridge with a FastLane electronic toll collection system.