

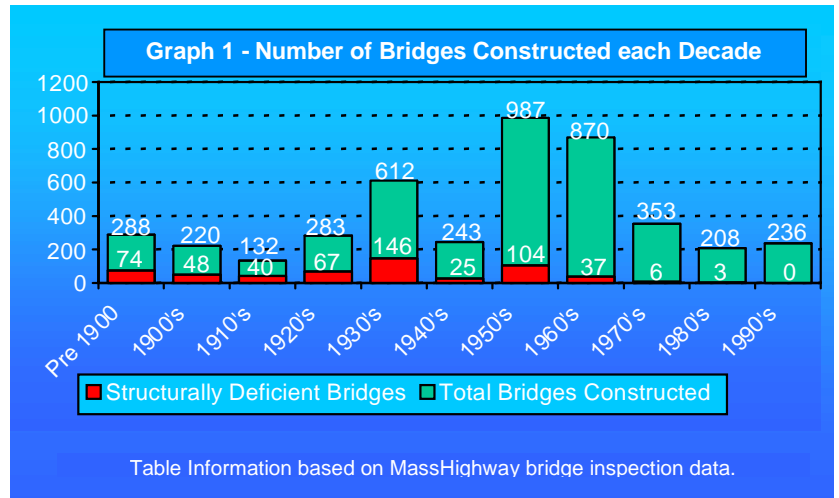
Bridge Facts and Terminology:

- ✓ There are over 4,900 bridges in the state. MassHighway is responsible for inspecting and maintaining approximately 4,400 of these bridges.
- ✓ More than 40% of the Massachusetts bridges were constructed between 1950 and 1970. These structures are also known as the “Baby Boom Bridges.”
- ✓ More than 60% of Massachusetts bridges are more than 43 years of age.
- ✓ Approximately 12% of the 4,400 bridges maintained by MassHighway currently rate as structurally deficient.
- ✓ Massachusetts has over 4,900 bridges. Of those, 1,288 bridges are on the Interstate Highway System and carry 30% of all Massachusetts traffic.
- ✓ 385 (30%) of 1,288 bridges on the Interstate System will fall into the structurally deficient category over the next eight years.
- ✓ The useful life expectancy of a bridge can be cost-effectively extended if repaired or rehabilitated before becoming structurally deficient. It becomes much more expensive to rehabilitate a bridge after it rates below structurally deficient.

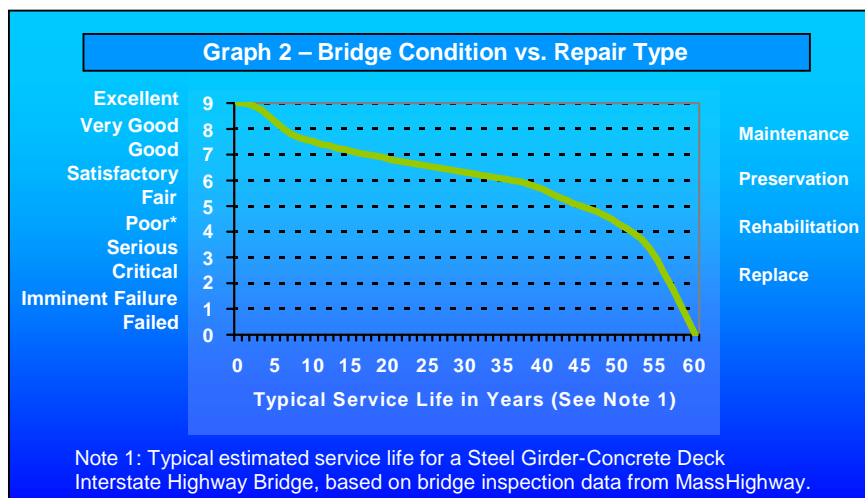
Massachusetts faces a serious fiscal and a public safety crisis in the next 10 to 15 years if sufficient budget is not allocated over the next five years to repair and rehabilitate Massachusetts’s bridges. This crisis will occur as both Baby Boomers and Baby Boom Bridges begin to retire.

The term “Baby Boom Bridges” refers to bridges constructed during the 1950s and 1960s. Graph 1 identifies the number of bridges constructed in each decade for the past 100 years.

More than 40% of all Massachusetts’ bridges were built between 1950 and 1970. Delaying adequate funding for bridge repair and rehabilitation now means the state will have to fund bridge replacements, just as money is needed for the dramatic increase in health care and retirement costs caused by the retirement of the Baby Boomers.



Maintaining safe bridges is a critical public safety issue; therefore, the federal government requires all bridges in the United States to be inspected every two years. Engineers who inspect bridges rate each component of a bridge from 0 (failed) to 9 (excellent). The green line on Graph 2 represents the typical deterioration of a bridge over time. The corresponding levels of **maintenance**, **preservation**, or **rehabilitation** required for each rating are shown on the right side of Graph 2. Bridge components (bridge deck, beams, abutment walls, etc.) that are rated as *excellent* to *good*, require **maintenance or minor repair**. Bridge components rated as *satisfactory* or *fair* require **preservation**, and components rated as *poor* to *serious* require **major rehabilitation**. Items rated as *critical* to *failed* usually require complete **replacement** of the bridge. A bridge is classified as **structurally deficient** when it has a poor (or worse) rating, or when its load-carrying capacity is significantly below minimum standards.

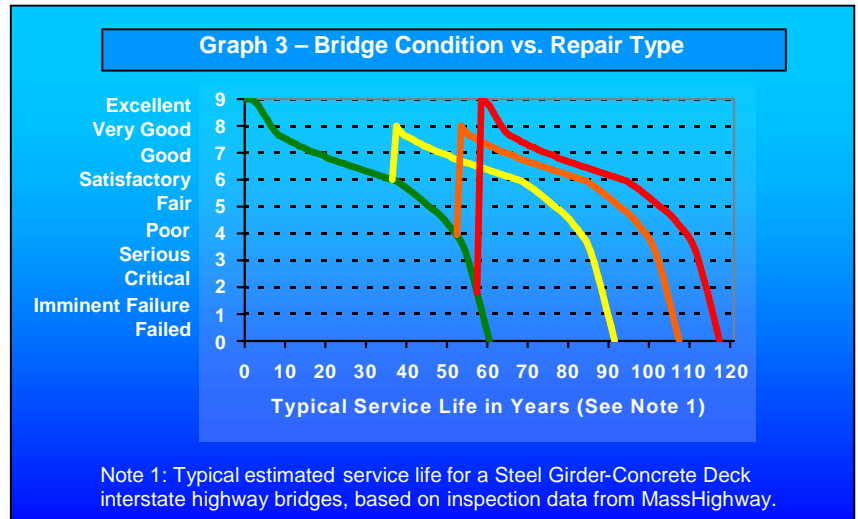


Preserving or rehabilitating a bridge before it becomes structurally deficient can cost-effectively extend the life of the bridge. It becomes expensive to rehabilitate bridges after they are rated below structurally deficient.

Bridge Facts and Terminology:

- ✓ **Bridge Deck:** *The railings, sidewalk, asphalt, and concrete (or steel) deck of a bridge that acts as the roadway surface for the bridge.*
- ✓ **Bridge Superstructure:** *The steel (or concrete) support beams, and bearing devices that support bridge deck.*
- ✓ **Bridge Substructure:** *The abutment walls and bridge piers that support the bridge superstructure.*
- ✓ **Bridge Bearing Devices:** *The devices on the abutment walls and piers that connect the support beams to the substructure.*
- ✓ **Abutment Walls:** *The concrete walls at each end of a bridge that support the superstructure.*
- ✓ **Bridge Pier:** *The structure between the abutments that supports the bridge superstructure. Usually bridge piers are concrete columns located in the median of the roadway below.*
- ✓ **Bridge Deck Joint:** *The mechanical/rubber joint along the width of the bridge between the bridge and the approach roadway that allows the bridge to expand and contract with changes in temperature.*
- ✓ **Reinforcing Steel:** *The reinforcing steel bars in concrete that increase the strength of concrete.*

The green line in Graph 3 represents the typical deterioration of a bridge over time (the same line/information as Graph 2). The yellow, orange and red lines in Graph 3 represent the improvement and subsequent deterioration of the bridge once it has been preserved (yellow), rehabilitated (orange), or replaced (red).



The cost to preserve or rehabilitate a bridge is significantly less than the cost to replace a bridge. Table 1 defines the work required to maintain, preserve, and rehabilitate a bridge.

Table 1 – Summary of Repair Work	
Bridge Maintenance	
Bridge Deck	Seal minor cracks in the wearing surface or sidewalks
Drainage Devices	Clean dirt and debris from inlets and down spouts
Bridge Railing	Repair any damaged railing
Deck Joints	Clean dirt and debris from deck joints
Support Beams	Clean dirt and debris, remove surface rust and repaint
Bearing Devices	Clean dirt and debris from bearing devices
Abutments & Piers	Seal minor cracks in concrete, patch small concrete spalls
Bridge Preservation	
Bridge Deck	Repair deteriorated deck, replace wearing surface, repair concrete sidewalk
Drainage Devices	Clean dirt and debris from inlets and down spouts, replace damaged drainage devices
Bridge Railing	Repair damaged railing, remove surface rust on railing and repaint
Deck Joints	Clean dirt from joints, replace sections of joint material that are damaged
Support Beams	Remove surface rust or severe rust and repaint
Bearing Devices	Remove surface rust and repaint
Abutments & Piers	Clean and patch spalled concrete, including reinforcing steel with severe rust.
Bridge Rehabilitation	
Bridge Deck	Demolish and replace concrete bridge deck, sidewalks, and wearing surface.
Drainage Devices	Demolish and replace drainage devices on the bridge deck
Bridge Railing	Replace sections of severely deteriorated railing
Deck Joints	Replace bridge deck joints
Support Beams	Remove severe rust, repair areas with section loss, and repaint beams
Bearing Devices	Repair and/or replace severely deteriorated bearing devices
Abutments & Piers	Repair major concrete spalls, replace reinforcing steel with section loss
Bridge Replacement	
All Elements	Complete replacement of the existing bridge
See "Bridge Facts and Terminology" for an explanation of bridge repair terminology.	

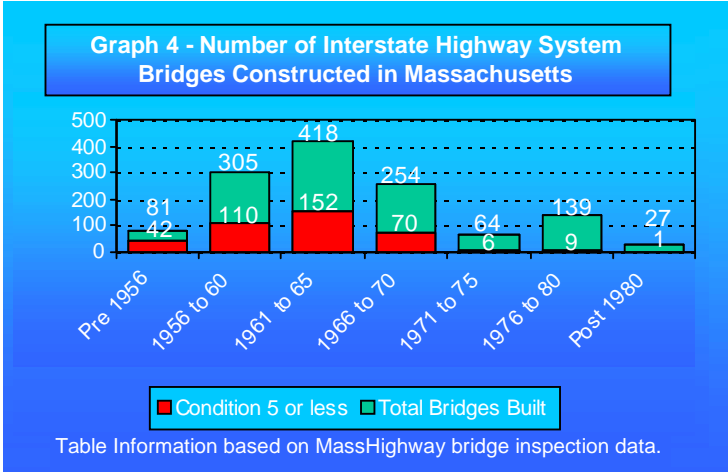
Bridges that require rehabilitation are deteriorated to the point they can no longer support the weight they were originally designed to carry. The bridge weight posting for these bridges are reduced until the rehabilitation can be completed. Large trucks, including fire department vehicles, can no longer use these bridges. Reducing the bridge weight posting usually increases the response time for fire department vehicles and it increases the traffic on other bridges. The Commonwealth needs to make a significant capital investment over the next few years to reduce the number of structurally deficient and weight restricted bridges.

Bridge Facts and Terminology:

- ✓ **Surface Rust:** *The minor rust on steel that forms when steel is exposed to the elements for a short period of time.*
- ✓ **Section Loss:** *Long exposure of steel to the elements results in the severe corrosion of steel and the reduction in the size of the reinforcing steel or steel beam, thus reducing the strength of the steel.*
- ✓ **Concrete Crack:** *Cracks in concrete abutments, piers, and decks are usually caused by the rusting of the reinforcing steel near the surface of the concrete.*
- ✓ **Concrete Spall:** *When pieces of concrete flake (or fall) away, exposing the reinforcing steel in the concrete.*
- ✓ **Bridge Weight Posting:** *The amount of weight a bridge can safely support. If a bridge becomes deteriorated, then the amount of weight a bridge can support is reduced and heavy trucks are restricted from using the bridge.*
- ✓ 385 (30%) of 1,288 bridges on the Interstate System will fall into the structurally deficient category over the next eight years.
- ✓ \$200M will be needed annually for six years to reduce the number of structurally deficient bridges from 542 to 443 by 2010.

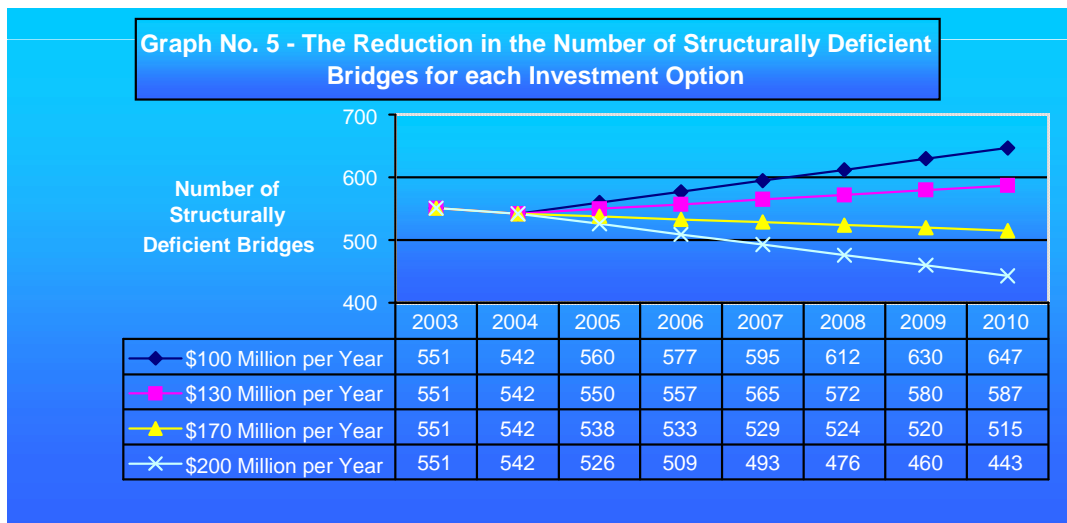
The Bridge Facts are based on data obtained from MassHighway.

Massachusetts has nearly 4,900 bridges, but the 1,288 bridges that are part of the Interstate Highway System carry 30% of all traffic in the state. Graph 4 identifies when the Interstate Highway bridges were constructed. Most of the interstate bridges are “Baby Boom Bridges” and are nearing the end of their useful lives. Graph 4 also identifies bridges that are currently rated as condition 5 (fair) or less. More than 385 Interstate Highway bridges will fall into the structurally deficient category (Condition 4 – Poor) over the next eight years. Interstate Highway bridges are critical to public transportation and the Massachusetts economy; they simply cannot be allowed to deteriorate to the point that they are closed to traffic. To minimize the cost to maintain the interstate highway bridges in safe condition, a significant capital investment must take place over the next few years to preserve and rehabilitate these bridges.



MassHighway has developed multiple annual investment options to both reduce the number of structurally deficient/weight-restricted bridges, and to preserve and rehabilitate the Interstate Highway bridges. Graph 5 identifies the annual investment options. About \$150 million per year is required to keep the current number of structurally deficient bridges in the Commonwealth at current levels. Funding less than \$150 Million will result in an increase in the number of structurally deficient bridges. Investments greater than \$150 Million will decrease the number of structurally deficient bridges. The State Legislature and the Governor need to support an annual investment of \$200 Million per year to avoid an even greater financial burden if the bridges are allowed to deteriorate to the point they must all be replaced. Adequate investment now will avoid the need for a costly bridge replacement program in 10 to 15 years, just when the money will be needed for the dramatic increase in health care/retirement costs caused by the retirement of the Baby Boomers. The investment program will also save the taxpayers money, because bridges will be preserved instead of being replaced.

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Massachusetts Infrastructure Investment Coalition – Infrastructure Status Report

Massachusetts Bridges:

Massachusetts “Baby Boomers” and “Baby Boom Bridges” Compete for Shrinking Funding

The **Massachusetts Infrastructure Investment Coalition** is identifying the long-term needs for infrastructure investments to support economic development and improve the quality of life for the citizens of Massachusetts. The Infrastructure Status Report for **Massachusetts Bridges** was prepared to provide information about the investment requirements for Massachusetts Bridges. The coalition is currently preparing status reports for other infrastructure elements including: **Aviation, Dams, Drinking Water, Energy, Hazardous Waste, Homeland Security, Housing, Navigable Waterways, Ports and Harbors, Railroads (Freight), Roads and Highways, Schools, Transit (Rapid/Bus/Commuter Rail), and Wastewater.**

Massachusetts Infrastructure Investment Coalition

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Aviation – Bridges – Dams – Drinking Water – Energy – Hazardous Waste – Homeland Security – Housing - Navigable Waterways –
Ports and Harbors – Railroads (Freight) – Roads and Highways - Schools – Transit (Rapid/Bus/Commuter Rail) - Wastewater

The Massachusetts Infrastructure Investment Coalition is supported by:

- American Council of Engineering Companies of Massachusetts
- American Public Works Association of New England
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