

A New Landmark for Norridgewock

Maine Town to Replace Historic Arch Bridge

By Pam Hetherly, P.E., and Keith Wood, P.E.

For the townsfolk of Norridgewock, Maine, the 80-year-old Norridgewock Bridge was more than just a transportation link. The 600-foot, four-span, tied arch structure was named one of Maine's most significant 20th century bridges by the Maine Historic Preservation Commission. But more importantly, the bridge was a visible landmark – renderings of it can be found on the town's logo and letterhead – and an integral part of Norridgewock's identity.

Replacing such a unique structure would call for a similarly unique planning approach. Fortunately, that is what occurred, as the Norridgewock community aptly honored its beloved bridge by becoming prominently involved with the planning and design of its replacement. The end result will be a bridge that employs the classic design of the original structure, as well as duplicating its sophistication and charm. Most important of all, the new bridge will give Norridgewock another landmark and source of town pride.

The old Norridgewock Bridge was constructed in 1929. Over the years, the 80-year-old landmark had begun to slowly deteriorate. Courtesy of John Poisson.

Creating a 'Modern' Historic Bridge

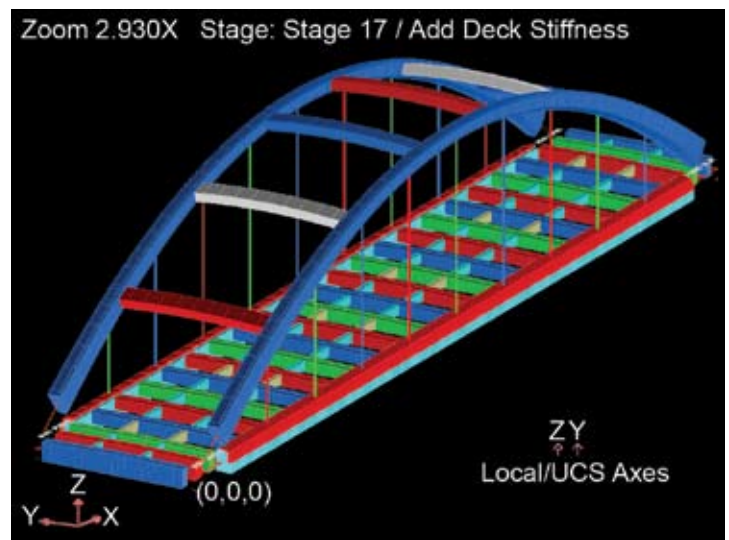
The Norridgewock Bridge was constructed in 1929 to replace a 600-foot covered bridge that ranked as the second longest of its kind in Maine (after the 792-foot Bangor Covered Bridge). However, over the years, the 80-year-old landmark had slowly begun to deteriorate. A September 20, 2008 event to commemorate the structure, called "The Last Walk Across the Bridge," featured a parade of locals and opened many eyes regarding the extent of the damage. The townspeople had driven across this structure countless times before, but had never walked across it. Seeing the damage was surprising for many: the bridge's concrete was crumbling in spots, leaving the steel inside exposed; the pier cap had suffered damage; and thanks to the many logging trucks that travel over the structure each day and the lack of necessary clearance, many of its overhead cross members had been damaged.

Such damage was cited during the early planning stages, when state and local officials debated whether to rehabilitate the current structure or construct a new bridge. It was also determined that the structure was functionally obsolete due to its narrow travelway width and inability to handle increasing traffic, roughly 11,000 vehicles per day, and that rehabilitating the bridge would require additional repairs years down the road.

Once it was determined that constructing a new bridge was the preferred option, numerous local groups and individuals became involved in the planning process. Besides S E A Consultants of Augusta, Maine, who would design the new structure, a 10-person committee was formed, including the Norridgewock town manager, various appointed individuals from the community, the Maine Department of Transportation, and the Maine Historic Preservation Commission. The committee considered the amount of sentiment attached to the 80-year-old bridge and resolved to build another landmark-type structure.

Meetings were held every few months, at which renderings and photographs were frequently presented. Local residents were invited to attend and offer suggestions. Every facet of the new bridge's design was reviewed – even the seemingly trivial details of the project, such as how the cable attachments would look from downstream.

Ultimately, the final design strongly reflected the community's desire to create a "modern" historic bridge. This was accomplished by incorporating key aspects of the old structure, particularly the old bridge's arch design consisting of four concrete tied-arch spans. The new bridge will retain the same concept, but transform it into one 300-foot arch that will rise 60 feet high. When completed, the new Norridgewock Bridge will be only the second modern concrete tied arch bridge in the United States; the Depot Street Bridge in Oregon is the other.



A computer model created with a software package called Larsa 4D.



The new Norridgewock Bridge will incorporate key aspects of the old structure, particularly the old bridge's arch design, which consisted of concrete tied-arch spans.

The new Norridgewock Bridge is a somewhat unconventional structure from a design standpoint. Conventional arch bridges are commonly anchored into bedrock at either end. The new bridge arch will rest on piers in the river, with the arch thrust supported by a tie underneath the roadway. The tie will be a cast-in-place concrete member that will be post-tensioned in stages as additional load from other structural components is added.

The bridge was designed using powerful software that accounted for time-dependent effects due to creep and shrinkage. The computer model was built in the same stages that will be used to construct the bridge, to allow the designer to visualize the effect on the other members of adding each new member as construction proceeds.

Compared to the old bridge, which consisted of eight spans – four arches and four conventional spans – the new structure will include two 135-foot approach spans on either end of the main 300-foot concrete tied arch span. The new bridge will feature 41 feet of roadway width, more than double the prior width for vehicles, as well as 25 feet of vertical clearance, as opposed to 14 feet on the old structure.

Innovative Design Elements

The new Norridgewock Bridge will also feature a number of innovative design elements. For starters, the design eliminated deck joints. Most bridges consisting of two different span types include deck joints between the spans. The new bridge removes these joints, which will virtually eliminate the possibility for water and salt to flow onto the bearings. A second innovative design feature will be the bridge's elastomeric bearings. By utilizing this more durable and elastic material, less maintenance will be required than for pot bearings or disc bearings.

The new Norridgewock Bridge will utilize precast floor beams and precast deck panels, at the urging of the Maine Department of Transportation. This will set it apart from the Depot Street Bridge in Oregon, which was entirely cast-in-place. The design also calls for replaceable steel cable hangers that can easily be removed and replaced when needed. These hangers will be the only parts of the new structure that are made of steel. Concrete main members were chosen as the primary material in the bridge for consistency with the design elements and overall aesthetic of the original historic structure.

Another innovative feature of the new Norridgewock Bridge will be its sidewalk and separate multi-use lane. The old bridge featured two pedestrian sidewalks, each located outside the four arches. The new structure will feature a five-foot-wide sidewalk, as well as a seven-foot-wide multi-use lane, both located within the lone arch. This unique multi-use lane will be wide enough for horseback riders and bicycles. It will also remain unplowed in the winter to allow the use of snowmobiles. The bridge lies along the Interconnected Trail System, a series of snowmobile trails throughout Maine.

Challenges to Face

According to newspaper reports, other bridges existed on this same bend in the Kennebec River, with many falling victim to an annual spring phenomenon that occurs when ice builds up in the river and breaks with a burst of flood water. It will also provide the contractor with a major challenge, because the project requires erecting the bridge's arch span in one construction season. The entire project is expected to be completed by the fall of 2011, at a construction cost of about \$21 million.

The first major phase involved constructing a temporary span across the Kennebec River, which opened to traffic in December 2008. The next phase involved removal of the original 1928 bridge, with expected completion by February 2009. Construction of two cofferdams, one for each pier, began in March 2009.

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The new Norridgewock Bridge is the result of a strong collaboration between the designer, transportation officials, historic preservationists, and the community. All those involved with this project appreciate the deep connection between the Norridgewock Bridge and the town itself, and agree that constructing a new landmark is a top priority.

Project Team

Owner: *Maine Department of Transportation, Augusta, Maine*
Engineers: *SEA Consultants, Augusta, Maine*
Contractor: *Reed & Reed, Inc.*

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