APWA MINNESOTA CHAPTER
PUBLIC WORKS PROJECT OF THE YEAR NOMINATION FORM

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Submission Deadline: October 1, 2022

All nomination and supporting data are to be submitted as a PDF to Sarah at sarah.lloyd@bolton-menk.com with a maximum page size of 5 pages, including photos.

Project Nominated: 10th Avenue SE Bridge Rehabilitation

Managing Agency: City of Minneapolis
Contact Person: Meseret Wolana, PE
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Project Design Firm: Short Elliott Hendrickson Inc. (SEH®) and Olson & Nesvold Engineers (ONE)
Project Construction Administration Firm: Short Elliott Hendrickson Inc. (SEH®)
Project General Contractor: Lund Construction Co.

Name of Person Making Nomination: Mark Maves, PE
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Criteria for Nomination

- Project must be substantially completed by October 31, 2021 or October 31, 2022.
- Includes use of innovative construction management techniques and completion of the project on schedule.
- Maintained excellent safety performance and safety program throughout construction.
- Evidence of strong community relations during all project phases.
- Consideration given to the environment. Sustainable design techniques involved.
- Unusual accomplishments given adverse conditions.
- Provides future value to the public works profession and perception by the public.
- Additional considerations such as value engineering, innovative project financing, multi-agency coordination and participation.

Reasons for Nomination: Describe the project with the aspects and features of the project that fulfilled any of the applicable criteria listed. (Include description on a separate page.)

10th Avenue SE Bridge Rehabilitation

CITY OF MINNEAPOLIS, MINNESOTA

Project Overview

The 10th Avenue SE Bridge in Minneapolis is a critical transportation element that crosses over the Mississippi River and is near the University of Minnesota. Each day, the bridge carries approximately 10,000 motor vehicles as well as hundreds of bicyclists and pedestrians over the river. Built in 1929 and serving the City for more than 90 years, the bridge is listed on the National Register of Historic Places.

The bridge is one of the highest (115 ft. above the river) and longest concrete arch bridges in the Midwest.

The 10th Avenue SE Bridge is 2,163 ft. in length, nearly 70 ft. wide and features 21 spans (seven main concrete arch river spans and 14 approach spans).

For this project, Short Elliott Hendrickson Inc. (SEH®) and Olson & Nesvold Engineers (ONE) led a team to work with the City of Minneapolis and provide a crucial rehabilitation project on the 10th Avenue Bridge. In the years leading up to these efforts, leaking expansion joints and drainage elements had led to deterioration of critical concrete components on the seven-span concrete arch segment. This deterioration was a mixture of freeze-thaw damage and corrosion from years of de-icing chemical use.

THE PRIMARY SCOPE OF THE PROJECT INCLUDED THE FOLLOWING:

- Removal and replacement of the entire deck of the concrete arch span portion of the bridge
- Reduction in the number of strip seal joints in the bridge deck
- Removal and replacement of 44 spandrel columns and 38 cap beams
- Repairs to deteriorated concrete at arch span piers, spandrel columns, cap beams and arch ribs
- Cathodic protection of the arch ribs by means of a thermally sprayed metal anode system
- An ornate concrete railing at the edge of sidewalk replicating the bridge's original railing
- Historic consultation with Minnesota State Historic Preservation Office (MnSHPO)

The City's goal was a thorough rehabilitation that would add upwards of 50 years to this bridge's useful life. In partnership with the City, SEH provided project management, preliminary design, public outreach, agency coordination and final design services. The team also provided construction support and drone filming to share progress with the public and stakeholders. ONE provided structure design and analysis. The project was completed in November 2021.

FEATURES

- 2,163 ft. by 68 ft. bridge rehabilitation
- Historic integrity of 90-year-old bridge preserved
- 7 open spandrel concrete arch spans fully rehabilitated
- Arch span deck replacement and reconfiguration
- North and south approach span deck repairs and reconfiguration
- Repairs to deteriorated concrete at arch span piers, spandrel columns, beams and arch rib
- 12 ft. sidewalk added, existing sidewalk widened, 2 protected bike lanes added
- 50+ years of useful life added to the bridge
- Lighting design and decorative lighting
- Navigational lighting added underneath the bridge to direct boat traffic

Innovative Construction Management

The need for innovative construction management on this project started with the challenges of rehabilitating the 10th Avenue SE Bridge over the Mississippi River. Typically this type of rehabilitation project would be constructed using a barge with cranes. However, turbulence and unpredictable river conditions made this a suboptimal option. The team instead recommended the use of tower cranes for construction.

The use of tower cranes was an innovative solution for this project, a technique that is not typically used for bridge construction.

This limited the impact that the turbulence from the river would have on the project. It allowed the construction team to more efficiently remove large concrete segments of the bridge, bring in materials such as concrete and reinforcement, and assist in the reconstruction of the columns, cap beams and deck, and with the arch rib repairs.

Sequencing was another key consideration for construction management. The concrete arches were the main supporting element between spans, so analyzing and modeling every situation was critical. The team evaluated scenarios to determine how the arch would react as structural elements such as the deck and spandrel columns were removed and then replaced. This ensured that the site was safe and that the arch did not become cracked due to imbalanced loads.

The foresight and careful analysis that went into these construction techniques and staging were key to completing the project on schedule.

Another key part of the successful project was the use of innovative technology. Handheld scanners were utilized to better measure concrete repair areas on the arch ribs, piers and spandrel columns. These scanners were used by the project team after concrete had been removed, providing a more accurate quantity of the amount of concrete needed to go back into the repair area.

To provide 50 years of additional service life for the original arch ribs, a cathodic protection system was installed. The sacrificial anode for the system was a thermally sprayed metal composed of Aluminum-Zinc-Indium wire. This anode or metallizing was applied to the top of the arch ribs.

Test stations were installed in each of the arch spans to confirm performance of the system. In addition to the passive cathodic protection system, all concrete surface repairs utilized zinc rich primer paint on exposed steel, and were anchored and reinforced with galvanized reinforcing steel.

Safety Performance and Safety Program

Construction management techniques and methods to ensure safety were paramount to completing the project on schedule and without incident. The contractor implemented a safety program to encourage and motivate a safe work environment, and the foreman discussed the day's activities along with the safety hazards and proper personal protective equipment necessary for the day.

The safety program for this project included careful considerations for the use of the tower cranes. As noted, the foresight that went into construction staging was crucial for maintaining a safe project site.

Community Relations

Stakeholder engagement was critical to achieving a successful bridge rehabilitation. This started with extensive agency coordination throughout the design and construction. SEH and City staff coordinated with the following stakeholders:

- Minneapolis Park Board
- University of Minnesota
- BNSF Railway
- Minnesota State Historic Preservation Office
- Three utility companies

Project engagement meetings were held with nearby neighborhoods and the public to convey the construction scope and potential detours. All design was reviewed and coordinated with MnDOT's State Aid Bridge office.

Strong community relations were especially important given the historic nature of this bridge and the important role it plays carrying traffic over the Mississippi River.
There were also issues of particular interest to Minneapolis residents based on current policy initiatives, such as the improvements to pedestrian and bicycle crossings.

ASPECTS OF SUCCESSFUL COMMUNITY RELATIONS INCLUDED THE FOLLOWING TECHNIQUES:

- **Project website** - SEH developed and maintained a project website over the course of design and construction. This kept stakeholders informed with project descriptions, schedule updates, and the opportunity to sign up for email updates.
- **Public meetings** – SEH worked with the City to share up-to-date project information and collect stakeholder feedback. SEH led virtual construction update meetings, informing the public of the construction progress and schedule.
- **Neighborhood and special focus group meetings** – This allowed the team to tailor the information delivered and location to the needs of certain stakeholders.

Additionally, with the tools already in place to offer flexibility, SEH and the City seamlessly adapted to safety guidelines for COVID-19 to maintain community relations and public outreach.

Environmental Considerations and Sustainable Design Techniques

Sustainability played a prominent role in the 10th Avenue SE Bridge Rehabilitation. Preserving and rehabilitating the historic bridge by keeping much of it intact saved and re-used an exceptional amount of material.

Another key consideration was Minneapolis's commitment to reducing climate impacts. Before rehabilitation, the bridge had four traffic lanes. As part of this rehabilitation, the roadway was reduced to two lanes. This allowed for a two-way bike path on the downstream side and sidewalks on both the downstream and upstream sides.

Fewer traffic lanes and safe multimodal travel for those bicycling, walking and rolling will significantly reduce the City's carbon footprint and encourage active lifestyles in the City.

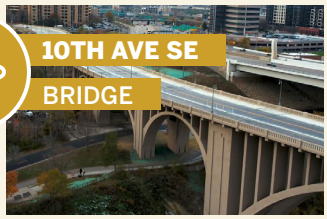
Unusual Accomplishments Given Adverse Conditions

The adverse conditions created by the climate in Minnesota contributed to the need for this project in the first place. The team also accounted for these conditions with design solutions that will hold up for years to come.

As noted, the bridge deterioration was from a combination of freeze-thaw damage and corrosion-based damage. On the bridge, the majority of the work was on the seven concrete arches. Old concrete was removed, reinforcement was placed, and new concrete was added to the structure.

These steps were key to the project's success; the arches are critical because they support the superstructure of the deck. Additionally, the concrete spandrel columns and caps were also rehabbed. The deck itself was completely removed during the project and replaced with a new deck, and the approach span received new concrete overlays. The rehabilitation will add 50 years of useful life to the bridge.

Another unique accomplishment of this project was the relocation of a large water main that was suspended underneath the bridge structure. This relocation was completed in conjunction with the bridge rehabilitation work. More than 70 years old, the 54 in. water main suffered from many similar deteriorating conditions as the bridge.



Additional information on this project's accomplishments and its importance to the City of Minneapolis is available by following the link to this video.

Instead of rehabilitating the water main pipe on the bridge structure, it was removed and a new pipe was constructed under the Mississippi River. The replacement water main was installed underneath the river by excavating two large, deep shafts on both sides of the river: 130 ft. deep on the south side and 70 ft. on the north side. A specialized tunneling machine was used to excavate and install the new water main pipe under the river, a process called micro-tunneling.

Burying the pipe helps to ensure protection from elements such as road salt and will extend the life of the pipe by 100 years or more. SEH provided permitting and construction inspection services for this separate but simultaneous project. The use of the specialized tunneling machine allowed the City to implement this improvement to aging infrastructure at the same time as the bridge work.

Future Value to Public Works Profession and Perception by the Public

This project provides future value by serving as a model for maintaining the budget on projects at a time of great uncertainty in this area. The City and SEH worked closely on the design, specifications and planning to ensure an accurate cost estimate. However, with expansive bridge rehabilitations, coming up with a precise cost estimate for construction bidding could have been difficult.

With little margin for error and the project being funded through State of Minnesota bonds and local bridge funding, the close collaboration, experienced and careful planning resulted in bids less than 1% from the original engineer's estimate. This supported the City's ability to meet its initial budget projections.

The rehabilitated bridge also supports positive perceptions of engineering by the public by protecting and strengthening a historical structure. The original concrete arch bridge was constructed in 1929 and was a significant achievement for Kristoffer Olsen Oustad, the City's municipal bridge engineer and one of the most influential bridge engineers of the late 19th and early 20th centuries.

The 10th Avenue Bridge held significant meaning as a landmark. By implementing a project that shows careful consideration for this history, the City provided an example of how to preserve and celebrate a City landmark while still providing crucial infrastructure upgrades.

Additional Considerations

Before this project, the last substantial improvements to the 10th Avenue Bridge had been implemented in the 1970s. The structure was listed in the National Register of Historic Places in 1989. After years of deterioration, planning began to conduct a rehabilitation of the bridge. After several years of lobbying, state bonding money was obtained. Rehabilitation plans were completed in 2019 with construction starting in 2020.

Overall, the City and the SEH and ONE team worked closely to carry out these plans and achieve the City's key objectives. Now completed, this project restored historic infrastructure in a way that will serve multimodal travelers for decades to come.