

8th Street Roadway & Greenway Improvements – Sioux Falls, SD
Submitted by: Infrastructure Design Group, Inc.

The 8th Street Arch Bridge was constructed and opened to traffic in 1912. Beyond typical maintenance, the only significant rehabilitation took place in 1977; it consisted of replacing the bridge infill, new surfacing, and replacing the decorative railing and installing new roadway lighting. As of 2016, there were no original design plans on file, and the bridge had a sufficiency rating of only 46.3. With no load rating and at over 100 years old, the bridge was identified by the City of Sioux Falls Capital Improvements Plan for replacement at a cost of \$15 million.

Prior to committing to replacement, the city wanted to verify whether rehabilitation would be a feasible alternative. The team performed an in-depth inspection of the structure to quantify areas of deterioration, recreate existing plans for load rating analysis, analyze existing concrete characteristics through coring and petrographic analysis, conduct historical research, and provide a summary of findings with recommendations. Alternative reviews included a life-cycle analysis comparing the build of a new structure and two rehabilitation alternatives for a minimum 30-year service life and design life estimated at over 75 years. The chosen path called for hydro-demolition and hand-chipping for removals along with gunite or shotcrete for final patching, with a cost estimate of \$3.2 million - nearly \$9 million less than a new build and nearly \$1 million less than fiber-based rehabilitation.

The next challenge was private and public utility coordination. Gas, electric, water and multiple different communication lines were crossing the bridge. One of the more significant utilities present was a series of 14 conduits sandwiched between the top of the arches and the pavement surface. All were operated by CenturyLink with many of them concrete encased, full of fiber and copper lines, and feeding much of eastern Sioux Falls and beyond. CenturyLink hired Terra Technologies LLC to coordinate viable options of supporting the lines while allowing access for rehabilitation crews. After more than a year of coordination between Infrastructure DG, the City of Sioux Falls, CenturyLink and Terra, an appropriate support system was selected. All other utilities were able to be relocated or removed within the construction limits while bridge work was accomplished.

Final project elements included greenway improvements on both sides of the river, an interpretive wall display along the west trail under the bridge, hydro-demolition and traditional concrete removal, surfacing and bridge fill removal, waterproofing of the arches, hand-stamping of shotcrete repairs, resurfacing of the spandrel walls, pier nosing reconstruction, a new bridge drainage system, cast in place coping beam, precast balustrade railings, historic street lighting, balustrade railing lighting, up-lighting of all arches, river greenway walls, pre-insulated fused PVC water main with a heat tracing system, utility installation, and final concrete surfacing.