

January 2, 2018

The 500-Year Bridge

“Do you want it to last 100 years? Or 500 years?” This was the question posed to WHKS structural engineers by stone mason Ted Wilson at their first meeting to discuss the dry laid stone arch bridge to be built in Dunning’s Spring Park in Decorah, Iowa.

An aging wooden foot bridge that crossed a spring fed stream in the park was scheduled for demolition. The idea of replacing it with a stone bridge had been the brain child of Randy Fulton, then Parks Superintendent, and stone mason Wilson for almost 15 years. As the two developed their idea, Wilson made sketches, Fulton promoted the idea and local business owners, the Storlie family, came forward with a donation to the City that would largely fund the project.

A brand new, dry laid stone arch bridge is an anachronism in 21st century Decorah. Using construction techniques that date from Roman times and were last commonly used in the 1800's, the bridge is made exclusively of carefully shaped blocks of stone that, when fitted together, form a load-bearing arch that supports the weight of the bridge itself and anything that crosses over it. It contains no modern steel or concrete, no mortar to hold the stones together, no reinforcing of any sort, and no synthetic materials. Not only have the skills to build such a bridge been almost lost, the modern engineering formulae to determine its load-bearing capacity have never been developed and there isn't a building code in the country that addresses stone arch bridges.

Engineers work with steel and concrete, and design bridges for today. There simply isn't much call for load calculations on an ancient bridge. But the bridge was to be built in a city park and cities need empirical data to back up their risk exposure. Hence the meeting between WHKS's 21st century engineers and old-world stone mason, Ted Wilson.

Wilson, who was born and trained in England, mastered his craft restoring 800-year-old medieval cathedrals. He'd always wanted to build an arch bridge and the Dunning's Spring Park site was his opportunity. He'd done his research and been preparing for this project his entire career. He studied old bridges in Scotland and analyzed one of the last ones built in this country early in the last century. He prepared sketches of the main arch and detailed drawings of how the stones would fit together. For their part, the engineers scratched their heads, went back to first principles and determined how to perform an arch analysis of the design.

Years before, the city had stockpiled a large quantity of high-quality dolomite stone from the foundations of a demolished school building - a perfect material for the bridge. Wilson prepared a detailed drawing for each of the most critical stone pieces - 26 tall arch stones and 24 short arch stones - which were then sent to a mill for cutting. The remainder would be carefully shaped on site by hand.

After 15 years of hoping and several months of detailed planning, the bridge was underway. From the placing of the first spring stone to setting the keystone in place was just 8 days.

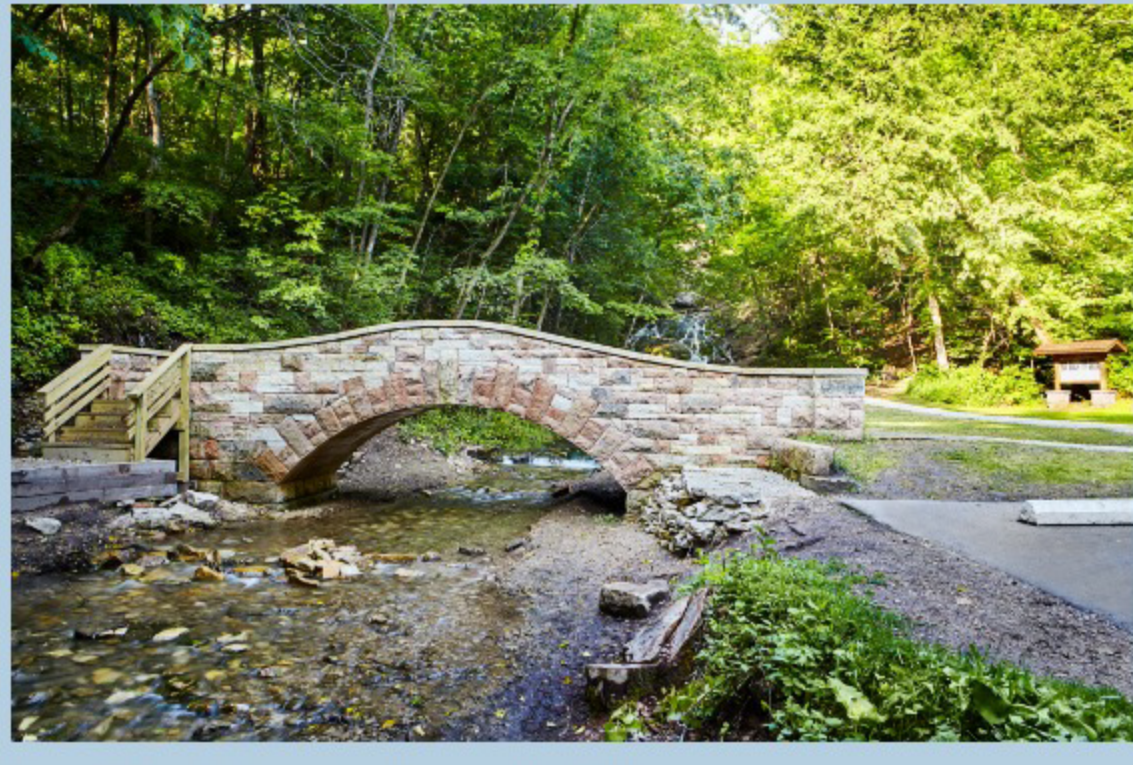


Setting the Keystone

While Ted Wilson designed the bridge and led the project, he didn't work alone. Sean Smyth, a stone mason from Montana, joined the team and he and Wilson provided the bulk of the labor and all the expertise. The project wouldn't have happened without Andy Nimrod, the City's Park Superintendent, who specializes in bringing people together and fostering community goodwill. Randy Fulton, the now-retired Parks Superintendent volunteered his labor daily through the entire project and rightly earned the nickname, "Randy Rubble." Kevin Quandahl built the footings. Luke Cote, a Parks and Recreation staff member, provided occasional muscle while Benoit Lefebvre and Matt Fernandes, two Canadians learning the stone mason trade, volunteered in order to learn from Sean and Ted.

The life expectancy of a modern, steel-and-concrete highway bridge, is about 70 years. Even before the average bridge reaches mid-life, significant environmental damage has typically occurred requiring repair. Steel rusts, concrete spalls, and synthetic caulking deteriorates. The dolomitic limestone - the **ONLY** construction material in the new bridge, is about 450 million years old and still going strong.

Do you want your bridge to last 100 years? Or 500 years?



Finished Stone Arch Bridge in Dunning's Spring Park

