



# Artistic Flyover

BY OSCAR OLIDEN, P.E., AND GARY GARDNER

**ISAAC MIDDLE SCHOOL** in central Phoenix is located on McDowell Road, a major east-west artery that runs parallel to and about ½ mile north of the I-10 freeway. Every morning and afternoon, several hundred of the school's 1,000 year-round students cross the heavily traveled highway, which carries an estimated 30,000 cars per day.

After two student deaths, the city in 2005 conducted a feasibility study and identified the need for a pedestrian bridge to provide safe passage across the busy highway. The study coincided with efforts of the West Side Phoenix Revitalization Area (WPRA) to increase city services and infrastructure by partnering with residents. The project was also to incorporate public art associated with the beginnings of the neighborhood.

The city awarded the project to the team of Jacobs Engineering Group, Inc., Phoenix, and Bison Construction, Carson City, Nev. Jacobs, in conjunction with the city's Office of Arts and Culture, selected public artist Rosemary Lonewolf to participate in the development of the design and ultimate construction of the project.

The Jacobs Engineering team initiated a comprehensive public involvement and educational program. Several bi-lingual neighborhood public meetings took place to educate, inform, and develop understanding of the project and to gain its final approval. The team also provided educational inspiration to the Isaac Middle School students by conducting a series of engineering and art challenges, demonstrating how ideas can become reality.

## Fast-tracking Design

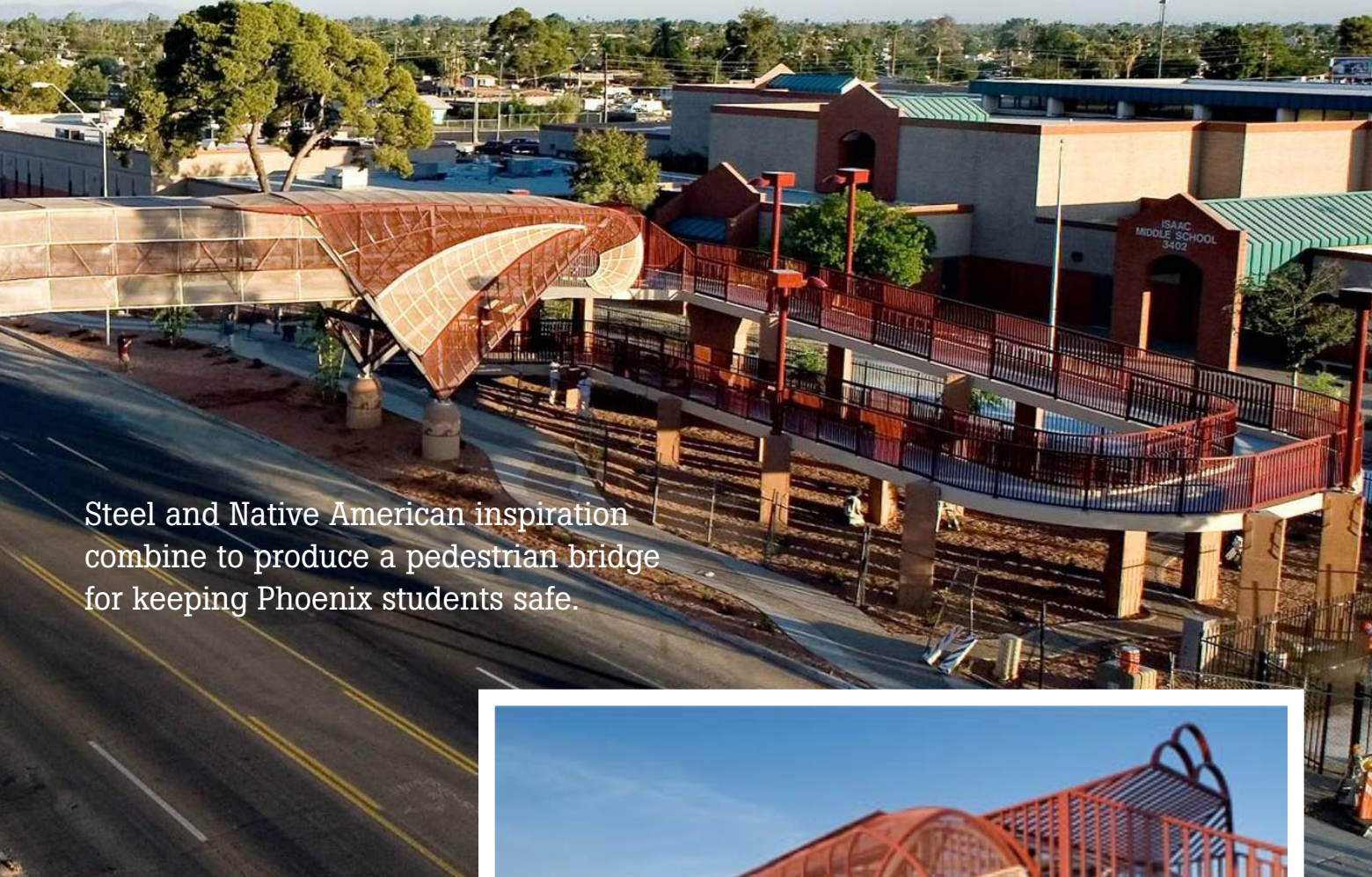
In less than six months the project team met the requirements for federal funding in association with the Arizona Department of Transportation (ADOT Local Government Section). This quick funding resulted directly from cooperation with the city, the Isaac community, ADOT, and congressman Ed Pastor. With funding in place, the fast-track process to design and build the project began.

To speed design, a partnership of ADOT, the city, and the project team minimized review times. A compressed review process allowed final design to begin well ahead of the typical waits for environmental clearances.

The team completed the initial project assessment in one month, including a public meeting to bring the project to the public for the first time. It completed the categorical exclusion within two months of project initiation. The 30% concept drawings were complete two months after receiving a notice-to-proceed from the city. The public and the city enthusiastically received the 70% design plans. Final design plans were completed and bid in 6½ months.

## Designing For Constructability

During the design process, Jacobs invited all statewide certified steel bridge fabricators to review emerging design concepts and to offer comments regarding constructability. Their comments helped the artist to work with an eye toward engineering and helped Jacobs to arrive at a more accurate engineer's estimate and bring in an accurate bid.



Steel and Native American inspiration combine to produce a pedestrian bridge for keeping Phoenix students safe.

The Isaac Middle School Bridge in the center of Phoenix provides safe passage for hundreds of students going to school each day, while also paying tribute to the area's Native American heritage.

Jacobs designed the main span over McDowell Road as a fully enclosed structure to enhance student safety. The artistic treatment incorporated into the truss resulted from close collaboration between Jacobs and Lonewolf.

The final design called for a bridge about 90 ft long and 9 ft wide, along with 450 ft of total developed ramp length (225 ft at each end). The bridge span offers 8 ft of clearway width for pedestrians and bicycles along with 8.5 ft of headroom. It provides a clearance of 17.5 ft for vehicles on McDowell Road.

**Incorporating Artistic Treatments**

Introducing public art into a transportation project like a pedestrian bridge presents a variety of challenges. Incorporating artistic vision and defining the medium and materials were among the first issues addressed. The unique design of the Isaac

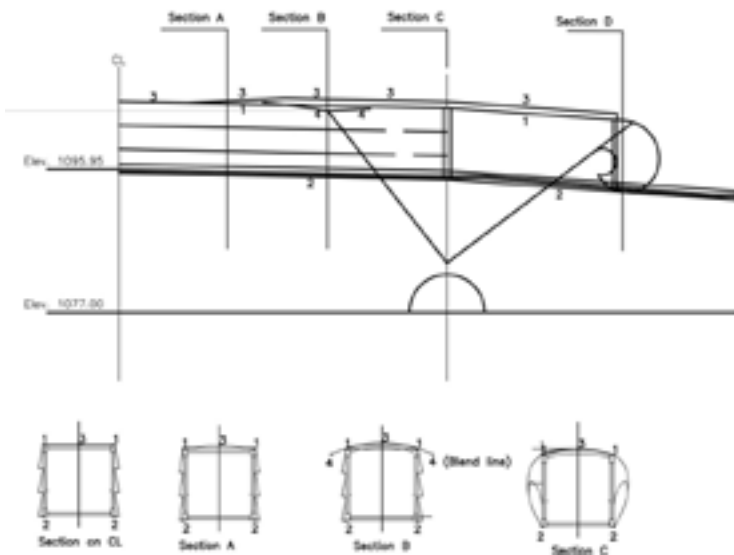


Inspired by images on early Native American pottery, artist Rosemary Lonewolf collaborated with the fabricator and engineer to incorporate shapes and colors reminiscent of macaws in flight.

photos this page by Craig Smith

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Oscar Olden

One of Lonewolf's early clay models and its translation into structural sketches.



Stinger Welding Inc.

Pedestrian Bridge resulted from a close collaboration between engineer and artist.

Lonewolf, a Native American Pueblo Tewa Indian, drew her inspiration for the bridge's bird-like artistic treatments from the geometric images of parrots painted on prehistoric Native American pottery. Her vision started with a clay model of a parrot called the scarlet macaw. In the final design, steel wings of the macaw flying in opposite directions spread out over the canopy of the bridge from either entrance and on both sides.

Brightly-colored relief pictures on the bridge columns tell the story of ancient traders toting corn and other goods from one culture to another. In addition to the relief images on the columns, the bridge features feather designs for railings and smaller support piers, an abstracted motif of birds sand-blasted into the walkway, and red LED lighting to accent the bridge at night.

Design and construction issues relating to the bridge's footprint had to balance keeping existing landscape features and attaining available right of ways. The city's various owner departments streamlined the process by donating various rights of way. For example, a strip of land was transferred from the Isaac Middle School to McDowell Road. The final ramp layout avoided conflict with several existing trees to maintain local aesthetics.

**Above:** Ultrasonic testing of full-penetration welds ensures they contain no inclusions or porosity and verifies that the welds are, in fact, full-penetration.

**Below:** Each piece of wing consists of several expanded metal sections, which required that workers be careful when welding it to the structural members to avoid damage from excessive heat.



Stinger Welding Inc.

### Building the Bridge

Stinger Welding, an AISC-certified major bridge fabricator, built and painted the entire 75-ton bridge, along with the stairways and ramps, in its Coolidge, Ariz., shop. The company then transported the bridge truss to the project site and installed it on its four support pillars and welded the ramps and stairways into place.

Structural members for the 90-ft X-pattern truss and curved roof are ASTM A500 Grade B HSS that were hot-formed to conform to the design. The company's certified welders attached the truss members with open root, full penetration D1.1 welds followed by ultrasonic testing. Using gas-shielded flux-core arc welding (FCAW-g) exclusively ensured the strength and long-term integrity of all of the welds.

Expanded metal, rolled flat, encloses the entire bridge and makes up much of the art treatment and design patterns.

Using cold-formed expanded metal to create the stylized macaws on each end and side of the bridge required a great deal of cutting and piecing, as well as care in welding.

Stinger built the truss and the four major stylized parrot art treatments separately, providing for attachment later via welding. Ramps and stairways also consist of welded rectangular HSS sections. Many verticals for the ramp and stairway railings are cut into a feather shape.

The design of the ramps and stairways purposely provided an open structure underneath for good security and visibility. The bridge floor consists of stay-in-place galvanized forms for the concrete decking added to the bridge after its installation.

### Final Touches

Because aesthetics of the bridge were a significant concern, Lonewolf played a large role in selecting the three expanded metal types and railing designs, as well as colors for the paint and LED lighting. To make the bridge's decorative lighting more effective in highlighting the artistic treatments, Stinger attached small reflectors of sheet metal with a high-gloss finish. The reflectors direct light from the LEDs to the bridge surfaces, avoiding nighttime glare for motorists.

After the bridge truss had been rolled out into the yard and the end treatments had been attached, painters applied a great deal of masking to attain the variety of colors required. Coatings consisting of an organic zinc primer followed by two color coats and a clear anti-graffiti top coat were applied electrostatically for uniformity with minimum waste. Most of the painting occurred at night when cooler temperatures prevailed.

### Installing the Bridge

Physical clearances and transportation limitations of the entire bridge span required that its mounting "feet" (attachments to the four pillars) be cut off, and reattached in the field. Ramps and stairways arrived in the form of panels and also were welded into place in the field.

Two key customization items—custom-designed light poles and customized feather shapes for the metal railings—contributed to the bridge's final cost of \$3.6 million exceeding the budget estimate of \$3.2 million. Although the original project schedule provided three years for design and construction, Jacobs and its partners completed the bridge in two years. The bridge opened for pedestrians in August of 2008.

MSC

#### Owner

City of Phoenix Street Transportation Department

#### Consulting Engineer and Project Manager

Jacobs Engineering Group, Inc., Phoenix

#### Steel Detailing, Fabrication and Erection

Stinger Welding Inc., Coolidge, Ariz. (AISC and NSBA Member)

#### General Contractor

Bison Contracting Company, Carson City, Nev.

#### Public Artist

Rosemary Lonewolf, Santa Clara Pueblo, N.M.

#### Structural Software

GTSTRUDL, Tekla Structures

#### Bender/Roller

Albina Pipe Bending Company, Inc. (AISC Member)



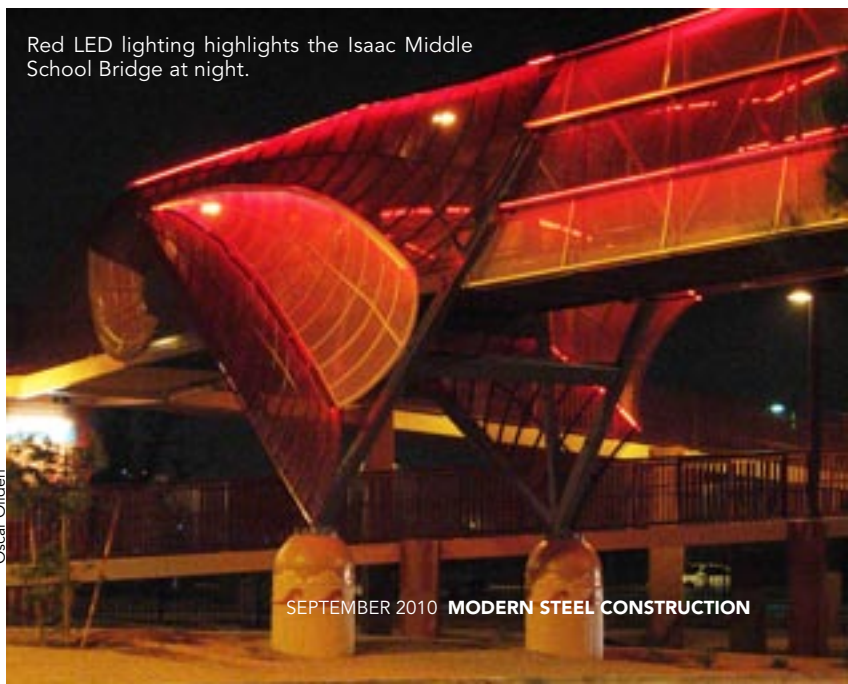
Stinger Welding Inc.

Painting often took place at night after temperatures had dropped. Prior to sandblasting and painting, Stinger rolled the bridge truss out of the shop, attached the stylized macaw head treatments at the ends, and masked as needed.



Stinger Welding Inc.

In addition to fabricating and painting the bridge, Stinger installed the structure onto its four support pillars, two each on the north and south sides of McDowell Road.



Oscar Olliden

Red LED lighting highlights the Isaac Middle School Bridge at night.