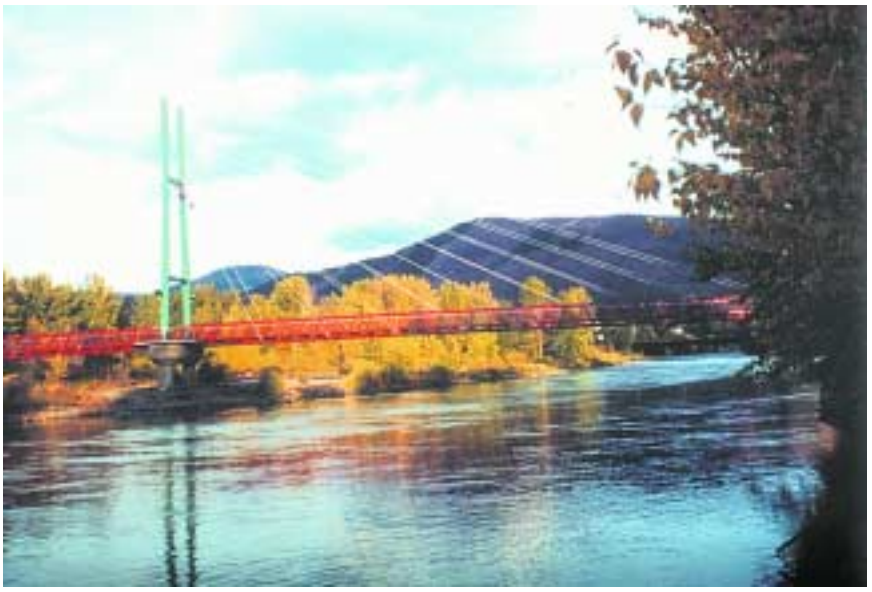
California Street Bridge

Missoula, Montana



Missoula is known as Montana's bicycling town. The city of Missoula has long been a supporter of non-motorized transportation, and has been proactively developing a system of trails, bike-lanes and sidewalks. A bicycle/pedestrian bridge across the Clark Fork River has been a need in this area of town since an aging structure was torn down at the California Street location in the mid-1980s. Additionally, the river has been a substantial obstruction to travel about town for wheelchair users. In 1996 the city of Missoula hired our firm to perform a study of constructing a new bridge. That study evolved into the design of the California Street Bridge project.

The project consisted of the construction of a new bicycle/pedestrian bridge and included the following key elements:

- Developing and evaluating alternatives;
- Preparing an environmental assess ment; and
- Preparing construction documents.

The bridge provides a connection between two extensive city trail systems. That system includes a trail system that parallels the river and connects to an extensive city-wide network of non-motorized facilities. Even though this is the site of a previous bridge crossing, the location was re-evaluated to verify that California Street was still the optimal location for the bridge. The preferred site and type of structure was determined through an extensive consultant led public involvement process involving the entire community. Once the structure type and location had been determined then detailed plans were developed to construct the project. The study and environmental assessment began in 1996. Construction of the bridge started in the fall of 1998. It was dedicated and opened to the public in October 1999.

Applications of Technology

While cable-stayed structures are not a new construction method, this choice was selected for this site because it provided both a cost-effective method to span the river at this location and an aesthetically pleasing structure. The use of cable-stay in combination with a steel truss permitted the resulting structure to be relatively thin for the 400' span crossing. This also proved to be less costly than other options investigated in the conceptual stages of the project. It was estimated that the structure cost 30% less than a more conventional bridge design.

The construction staging and assembly areas available for use were limited. Use of the truss bridge design permitted assembly of major elements either on the ground or off site. The could later be assembled over the river. The design was accomplished so that the superstructure elements of the truss, floorbeams and deck could be constructed incrementally. The truss portion was designed to be self-supporting, to facilitate erection and to permit the connection of the cable-stayed portion after bridge erection and before casting of the concrete deck surface.

Technical Value

The use of the truss in combination with the cable-stayed method of support demonstrates the ability to erect a bridge over a very large river without use of unusually large equipment or disruption to a sensitive river setting. The incremental construction method was also important in that it facilitated the construction and minimalized the disruption to the surrounding land users. The elements of a composite concrete deck, steel trusses and the cable-stays act integrally to provide the efficient use of materials within the structure.

Social and Economic Considerations

Missoula is known as Montana's bicycling town because of its extensive use of non-motorized forms of transportation. Missoula is home to the University of Montana which also generates significant interest in pedestrian and bicycle use within the community. This crossing provides a critical route for residents traveling between residential areas of Missoula to the downtown area. This bridge also serves as a key link in the non-motorized network that serves the University and other areas of town.

The bridge is also located near a large apartment complex used by people who experience mobility impairments. The trail system and bridge design permit easy access for wheel chair bound users to cross the river. Prior to construction of the bridge these users were restricted to using buses or some other vehicle to cross the river because of the lack of other wheel chair compatible crossings.

The bridge was sponsored by the city's Redevelopment Agency to increase the city's pedestrian trail system and is viewed as a vital link to revitalizing the riverfront area in Missoula. The bridge is a critical link between trail systems that extend widely on each side of the river, as well as up and down its shores.

The selection of the location and bridge type were both key elements of the design process. The city's objective was to involve as much of the community as possible in the process so that acceptance and use of the bridge would be maximized. Our team made extensive use of computer based visualization methods to provide the public with technically accurate views of how different types of bridge structures would appear at various locations. Several innovated public coordination efforts were conducted where citizen input was solicited to develop the concepts for the structure. The citizens actually provided input for the type and location they preferred. The final selection was made and computer generated renderings completed prior to construction. The actual structure duplicates the conceptual plans developed in the early stages, from the detail of color to major elements.

Complexity

The design of the foundations, especially the center pylon foundation, required careful design and planning to take advantage of an island in the river. Each support is founded on drilled shaft concrete foundations. Earlier attempts on other projects to use this type of foundation along the Clark Fork River in Missoula had resulted in significant cost overruns when large boulders were encountered in construction, this time special care was taken to properly locate and design them to minimize possible construction problems.

The erection sequencing had to be developed in detail to balance the construction loads on the truss and cable-stayed elements. A casting pattern was developed to cast the concrete deck of the bridge without displacing the truss. Tensioning of the cables to provide the correct profile for the bridge deck also required careful planning and execution.

The site had limited area to use for staging the construction. The design was developed to permit segmental erection of the structural elements. This permitted the partial assembly of large pieces prior to erecting them over the river. The truss was erected in four pieces and bolted together over the river and the cable-stays fastened afterwards.

Meeting the Owner's Expectations

The Owner had limited funds with which to erect this structure. Yet they wanted an attractive structure that would enhance this area and attract people to the trail system. They also faced significant public concern over the aesthetics of the new bridge. All of these hurdles were over come as a result of the consultant's approach to the public involvement and design processes. The resulting structure is about 30% less costly than other available options. It has resulted in a spectacular looking structure that supports a pedestrian live load of 85 lbs. psf.

Project Team

Owner
City of Missoula

Designer
Carter & Burgess, Inc.

Steel Fabricator
Egger Steel Company

Steel Detailer
JDB Detailing

Steel Erector
Iroquois Industrial, Inc.

General Contractor
Bodell Construction Co.