Precast concrete was used effectively to restore the deteriorated elements of this historic bridge.

Renovation of Albert Memorial Bridge

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Regina's Albert Memorial Bridge was built in 1930 as a depression years make-work project. Built across Wascana Creek, the 850 ft (259 m) structure actually spans only about 40 ft (12 m) of water. In fact, it may hold a record for being the longest bridge spanning such a narrow stream.

By the early 1980s, the concrete balustrades of this designated heritage structure had deteriorated to the point where structural and architectural restoration were necessary (see Fig. 1). The high class structure incorporates some colorful and articulate terra cotta balusters and plaques which were manufactured by the Northwestern Terra Cotta Company of Chicago.

While there was significant heritage value attached to the terra cotta works, there was no heritage value given to the dilapidated concrete balustrade. The concrete top rail and base were initially cast continuously from one end of the structure to the other. Consequently, severe shrinkage cracks developed during the first winter that the bridge was open. Over the years, water and deicing salts had entered these cracks, leading to corrosion of the steel reinforcement and the embedded steel electrical conduit. Large pieces of concrete eventually spalled off.

Precast Concrete Considerations

During the design development phase, precast concrete was selected to replace

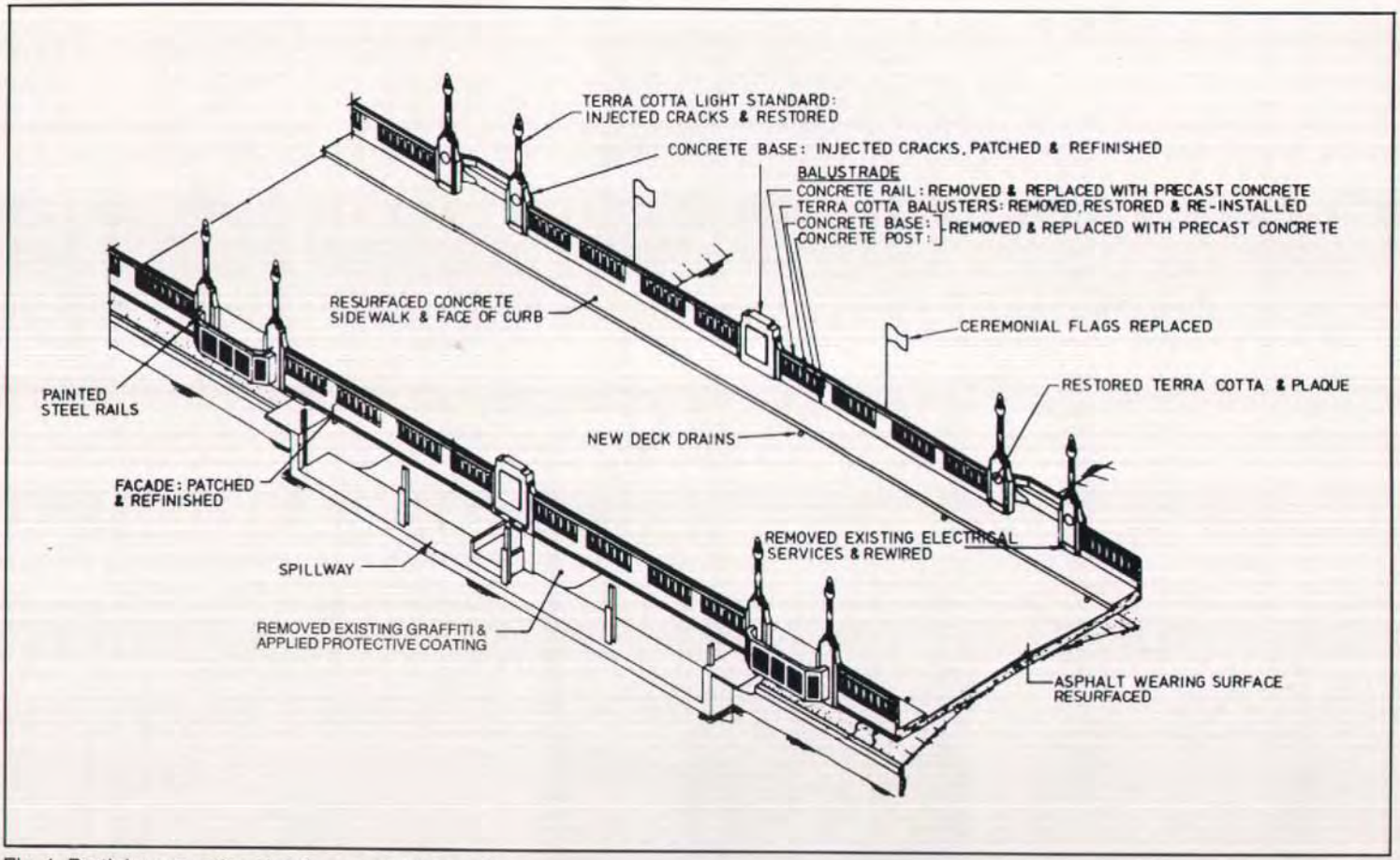


Fig. 1. Partial perspective showing restoration work.

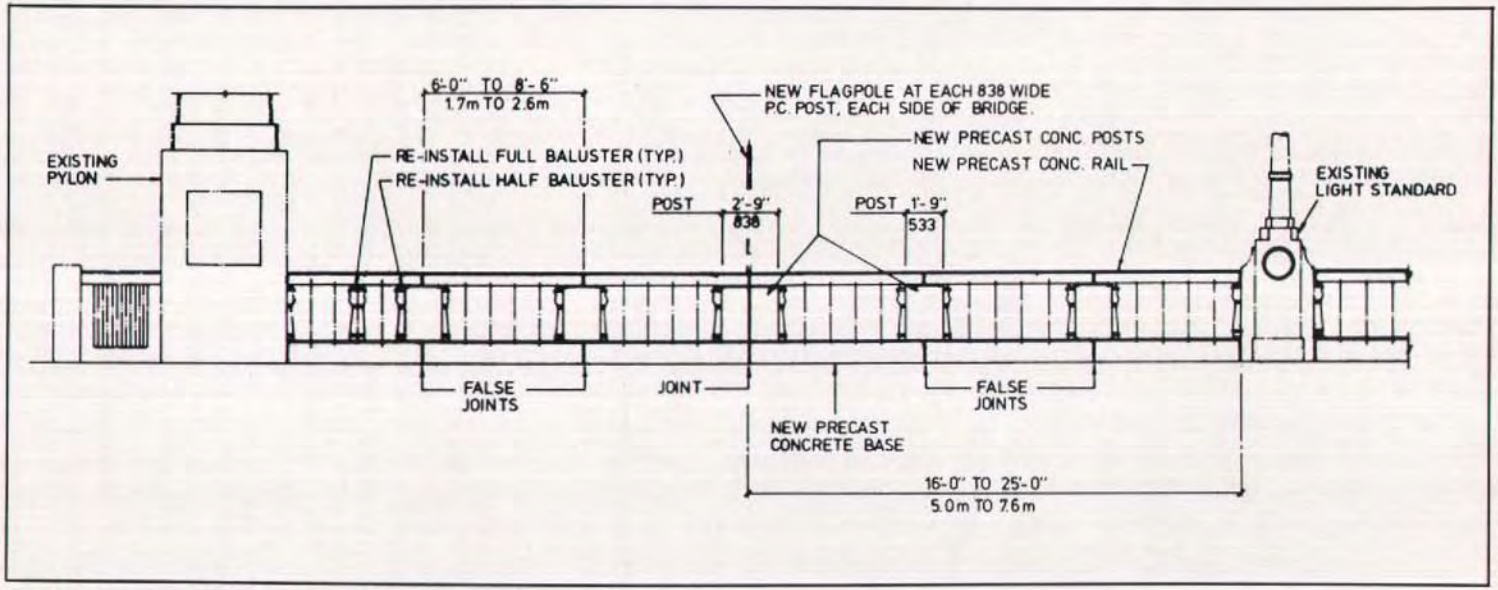
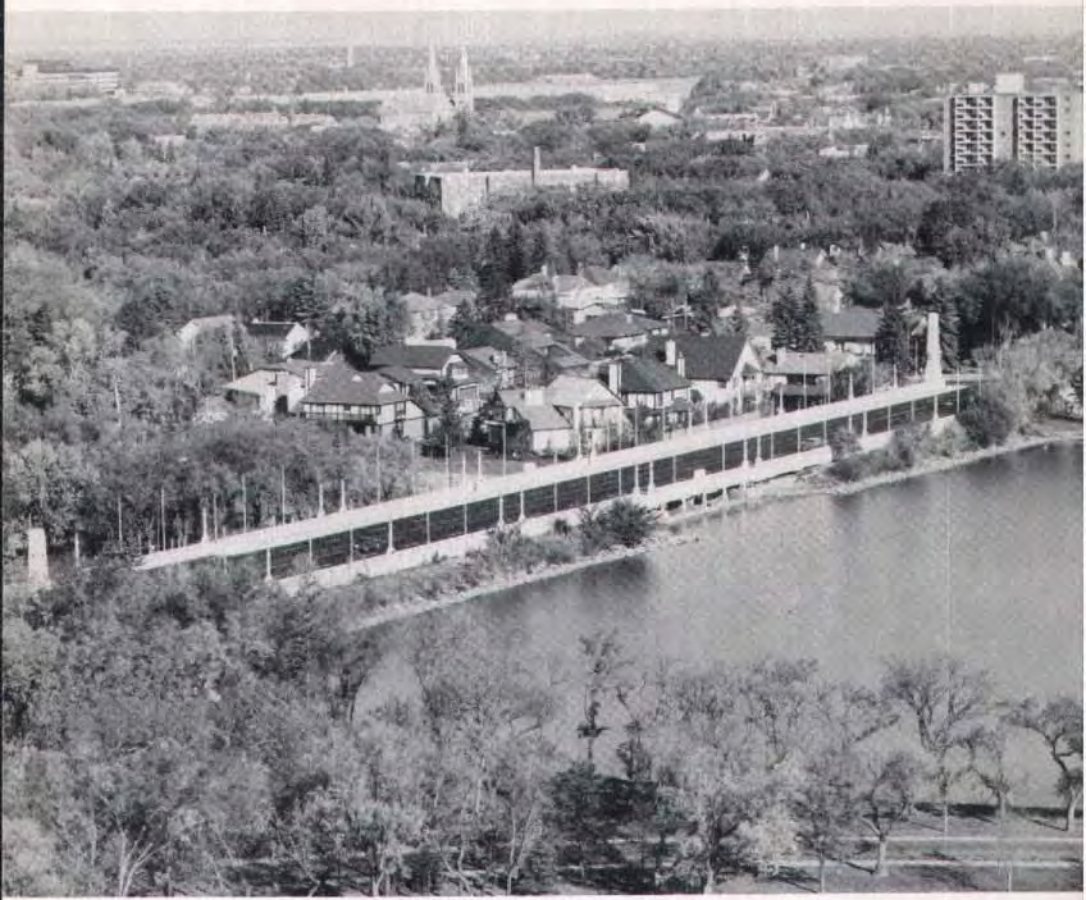


Fig. 2. Partial elevation of new balustrade.



General view: Albert Memorial Bridge.

the deteriorated balustrade for a number of reasons:

- The jointed precast system would accommodate the thermal movements.
- Off-site fabrication would minimize on-site construction activity, thereby reducing the length of disruption to passing motorists and pedestrians.
- Better quality control.
- The precast top rail system could be easily dismantled to accommodate future repairs to damaged terra cotta balusters.
- The precast system would accommodate the reinstallation of the balusters with minimal risk of damage to the precious terra cotta pieces.
- Reasonable cost.

The precast units had to be installed between existing light standards which could not be removed without seriously damaging the terra cotta plaques and lamps (see Fig. 2). Detailed field measurements were taken prior to preparation of the shop drawings. Precise bearing elevations were determined and shims placed prior to erecting the base units.

A cementitious coating was field applied to both the new precast concrete and the existing concrete to ensure a uniform appearance. All joints, including the tops of the terra cotta balusters (see Fig. 3), were sealed with a polyurethane sealant to accommodate thermal movements.

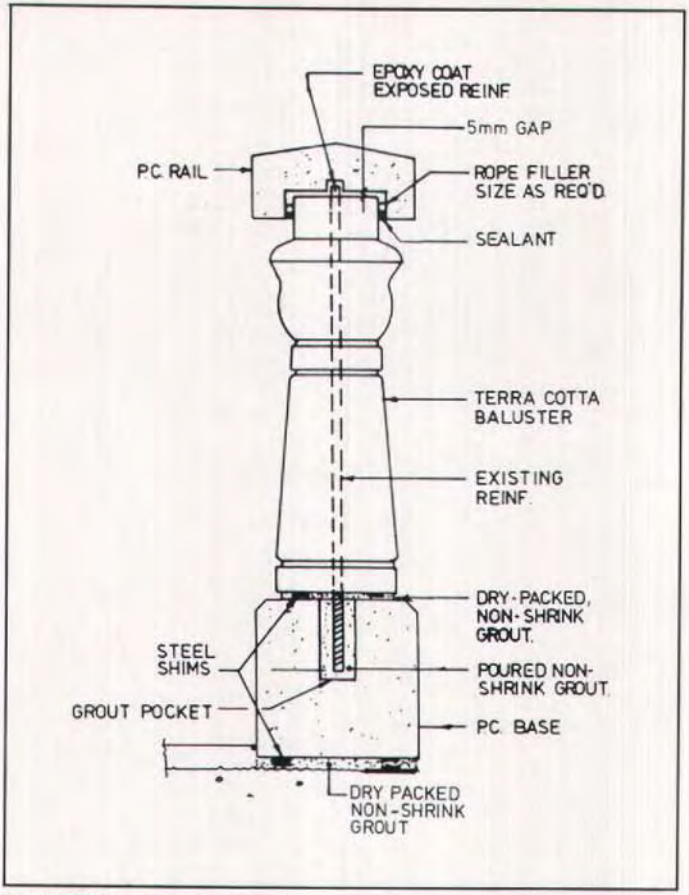
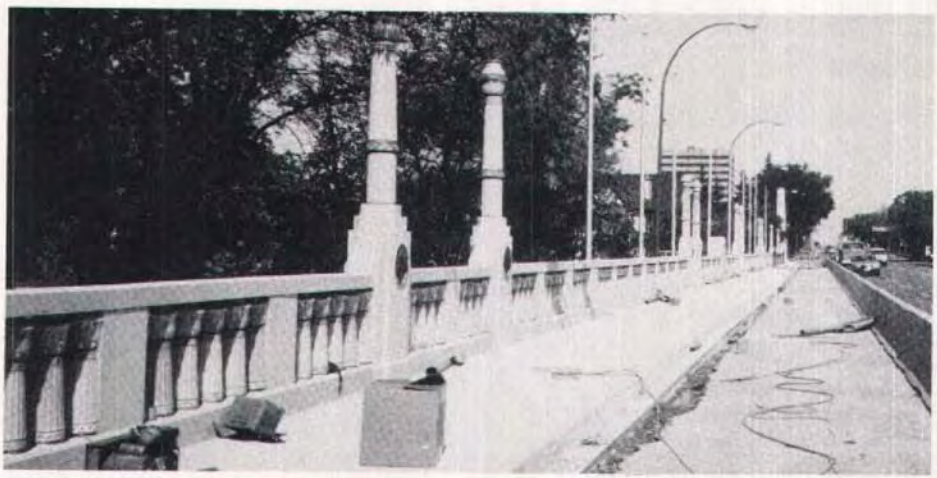


Fig. 3. Baluster replacement.



Completed precast balustrade ready for cementitious finish.

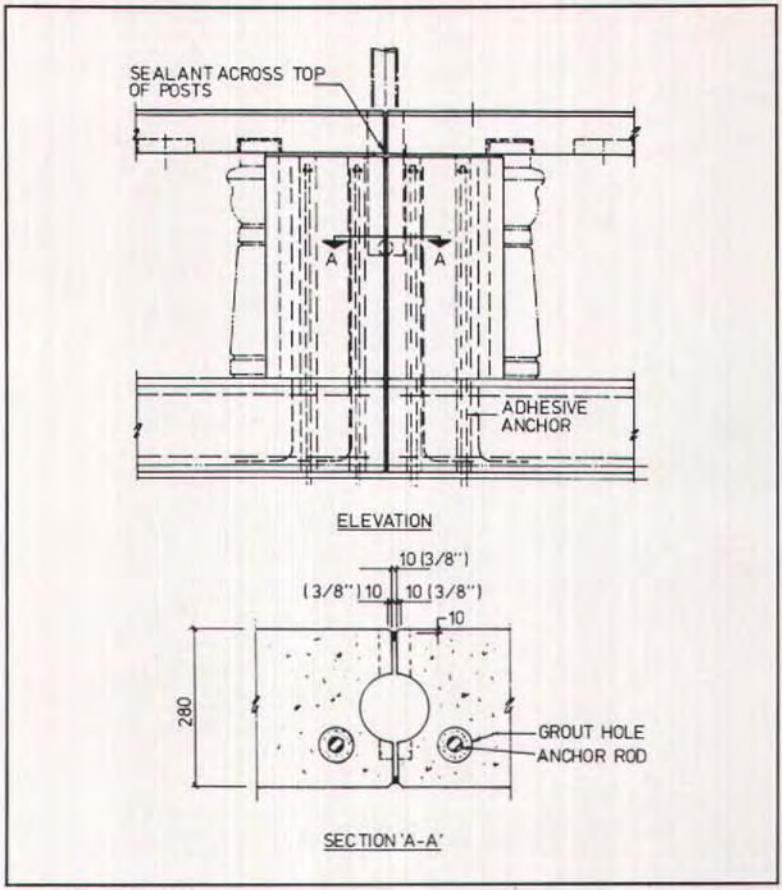


Fig. 4. Precast post.

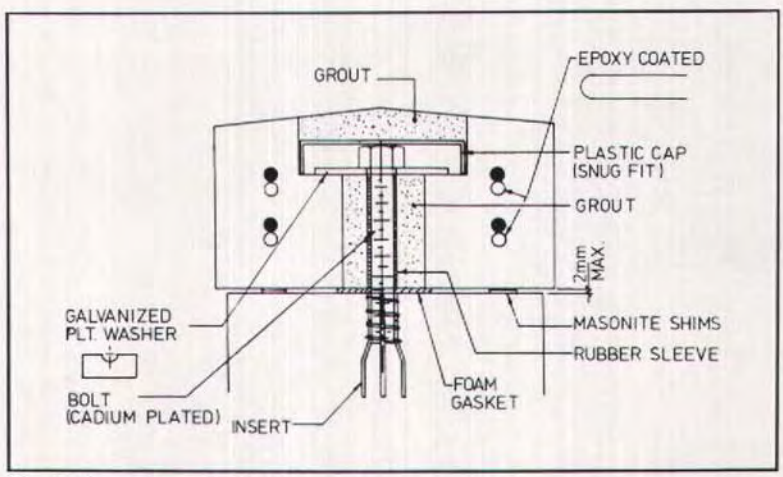


Fig. 5. Top rail connection.

Table 1. Precast concrete components.

Precast element		Dimensions	
Type of element	Number	U.S. units	Metric units
Base unit	70	12 in. thick x 12 in. deep x 16 to 25 ft long c/w 11 in. deep x 33 in. wide x 31 in. high posts	0.325 x 0.320 x 5.0 to 7.6 m c/w 0.280 x 0.840 x 0.792 m posts
Top rail	180	12 in. wide x 6 in. deep x 6 to 8.5 ft long	0.300 x 0.150 x 1.7 to 2.6 m

Installation of precast top rail unit.

Design Considerations

The precast concrete balustrade was designed for the combination of rail loadings specified in Canadian Standards Association S6-M78 even though the railing does not meet the configuration requirements. To reduce the potential for corrosion, epoxy coated steel reinforcement was utilized throughout the balustrade. Adhesive type anchors with an epoxy resin were used to anchor the base and the posts to the existing structure (see Fig. 4).

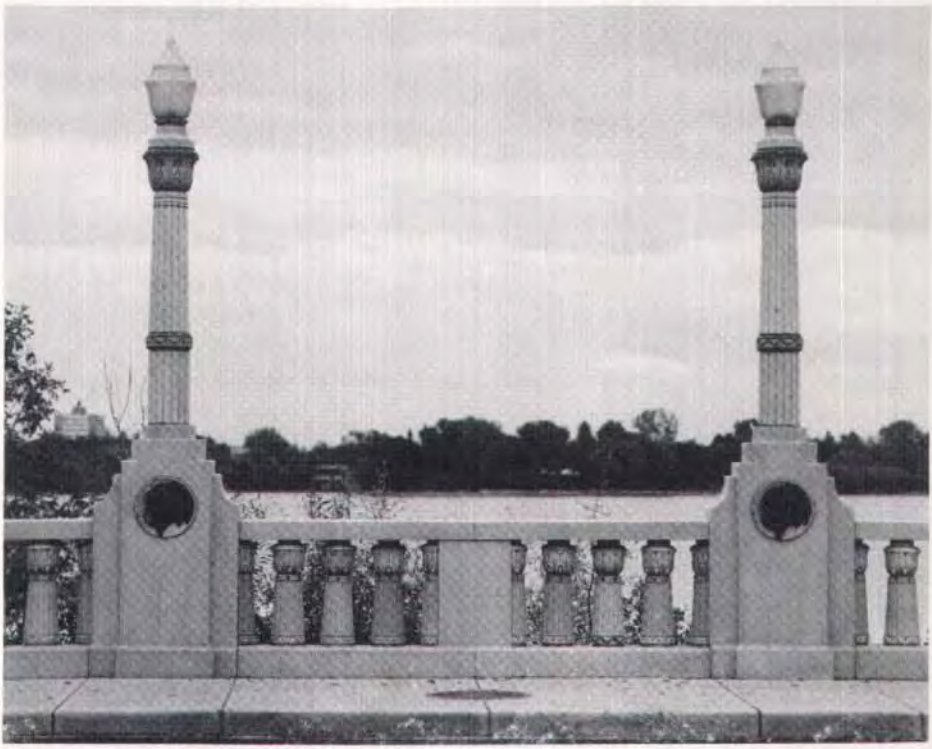
The top rail was bolted to the posts (see Fig. 5). Thermal movements in the rails were accommodated by providing a rubber gasket around the bolt.

Cost

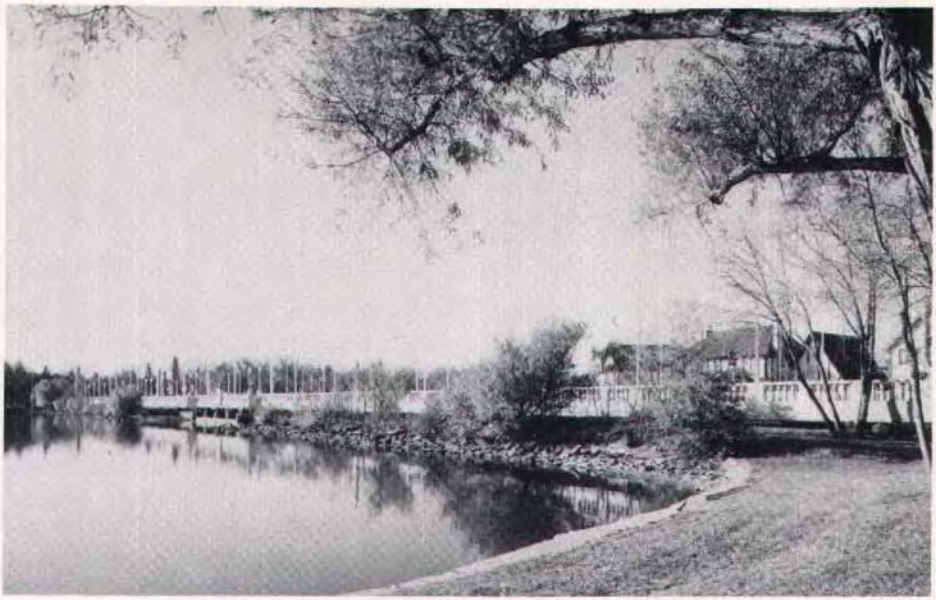
The total cost of the restoration project, including replacement of the sidewalks and asphalt wearing surface, new deck drains, rewiring and restoration of the terra cotta and other concrete, amounted to 1.36 million Canadian dollars. The precast concrete fabrication and erection work cost about $225,000 compared to an estimated cost of $180,000 for cast-in-place concrete.

Concluding Remarks

The use of precast concrete to restore the balustrade on the 60-year-old Albert Memorial Bridge has resulted in an aesthetically pleasing, durable structure. Future vehicular damage to the balustrade can be repaired easily simply by removing the top rail to facilitate replacement of damaged balusters. The jointed system easily accommodates the thermal movements.



Completed balustrade.



East elevation from Wascana Lake.

Close-up view of terra cotta balusters.

Credits

Owner: City of Regina.

Prime Consultant and Design Engineer: Reid Crowther and Partners Limited, Regina, Saskatchewan.

Restoration Consultant: Paul Stumes, P. Eng., Ottawa, Ontario.

Consulting Architect: Wiens Architects Ltd., Regina, Saskatchewan.

General Contractor: CANA Management Ltd., Saskatoon, Saskatchewan.

Precast Concrete Manufacturer and Erector: Con-Force Structures Limited, Regina, Saskatchewan.

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