

# **THE GUNNINGSVILLE BRIDGE PROJECT**

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## **Abstract**

The New Brunswick Department of Transportation has constructed a \$28.5 Million replacement bridge across the Petitcodiac River, linking the Greater Moncton Area. The bridge and associated approaches will serve as a vital transportation corridor that will contribute to economic growth and greater prosperity for the Communities, and will encourage residential, commercial and social development. The project incorporates unique features and extensive aesthetic enhancements for vehicular, pedestrian and cyclist traffic.

The four lane (23m deck width), eight span, 425 metre structure has observation platforms, endposts, light pilasters, pillars, decorative lighting and a four metre bridge sidewalk for combined pedestrian and cyclist traffic. The sidewalk connects an extensive riverfront recreational trail system.

Self-compacting concrete, acid stain and integral colour provide decorative architectural detail. The abutment breastwalls, wingwalls and endposts, and the barrierwalls have recessed ashlar stone patterned panels. Flat recessed panels are also incorporated in the endposts, light pilasters, pillars and barrierwalls. Two scenic arch shaped observation platforms are imparted with 3-dimensional flatwork surfaces. The integrally coloured concrete has a stamped block pattern for the arch surrounded by an ashlar stone pattern. Colour release powders provide contrast. Textured black powder coated aluminum pedestrian and traffic rails, light standards and overhead sign structures provide an ageless quality. The traffic and pedestrian railings were custom designed, detailed and fabricated.

The construction of the new bridge has improved traffic flow and will help ensure the future prosperity of the community. The project has provided a special place along the riverfront for the population of Moncton and Riverview to enjoy for generations to come.

## **1. Introduction**

The New Brunswick Department of Transportation has constructed a \$28.5 Million replacement bridge across the Petitcodiac River (Figure 1), linking the City of Moncton, the Town of Riverview and the City of Dieppe, or the Greater Moncton Area (GMA). The bridge and associated approaches will serve as a vital transportation corridor contributing to economic growth and greater prosperity for the GMA. The project incorporates unique features and extensive aesthetic enhancements for vehicular, pedestrian and cyclist traffic that was requested and partially funded by the municipalities.

The construction of the new bridge by the Department and new connections and bypasses by the communities will create a cross-river transportation loop. Traffic congestion will be alleviated and better access to arterial routes throughout the area will be available. Efficiency and safety will increase, and fuel consumption and vehicle delays will decrease.

Unique architectural details have been provided to aesthetically enhance the structure. They include observation platforms, pilasters for light standards and architectural contrast, decorative pillars and endposts. Enhancements have been made by providing acid stained random block ashlar stone patterned recessed panels; flat recessed panels; stamped, coloured concrete flatwork; decorative lighting; custom designed pedestrian and traffic railings; and a four metre bridge sidewalk for combined pedestrian and cyclist traffic. The sidewalk connects the extensive riverfront recreational trail systems of each community.

The architectural motif of the bridge is not only traditional and elegant, but also incorporates some contemporary features. The structure profile has a very gradual arch with simple clean lines. The superstructure girders are a continuous, consistent colour of light brown that provides a sturdy looking base to the concrete deck. To achieve the continuous colour, exterior concrete girders received a colour coating to match the weathering steel of the plate girders. All railings, light standards and overhead sign structures have a traditional black, textured powder coating that provides an ageless quality and does not take away from the simple bridge form.

The bridge pays tribute to the past by keeping the name “Gunningsville Bridge,” and by naming the pedestrian walkway “Veteran’s Walk.” The name Gunningsville Bridge provides a vital link to the community’s heritage and founding family, and the walkway honours Veterans and will serve as a reminder of the sacrifices made for the freedom of all Canadians.

## **2. Bridge Geometry**

The 425 metre, eight span structure, as shown in Figure 2, has a superstructure that utilizes both prestressed concrete and steel plate girders. Precast prestressed concrete girders are used for the first two spans on the North (37.15 and 37.85m) and for the first span on the South (30.0m). Steel plate girders are used for the interior five spans (55.0 - 70.0 - 70.0 - 70.0 - 55.0m).

The four vehicular lane bridge has a total deck cross-sectional width of 23 metres. The typical deck section is shown in Figure 3 with four 3.7m traffic lanes, two 1.5m shoulders and a 4m pedestrian sidewalk. At the locations of the observation platforms, there is an additional 3.3m in width (Figure 4).

## **3. Vital Transportation Link**

In conjunction with the construction of the new bridge, the City of Moncton and the Town of Riverview are constructing new bypasses and connections to the Bridge (Figure 5). Once these are completed, a cross-river loop will be created, and, as a result will serve as a vital urban transportation corridor. The loop will be created by Moncton extending Vaughan Harvey Boulevard to the new bridge on the north, and by Riverview constructing a bypass around its downtown business district.

The City of Moncton is extending two existing urban roads, Vaughan Harvey Boulevard and Assomption Boulevard, to connect to the north Bridge approach. These connections will

alleviate downtown congestion as traffic will bypass Main Street, and will provide better access to several arterial routes throughout the City. The east-west bypass in Riverview will provide an alternative route for traffic to travel from the east end of town (Gunningsville) to the west end (Findlay Boulevard) and avoid the busy downtown business district area of the town.

Motorists, cyclists and pedestrians will have more choices and opportunities for movement within the GMA. The opening of the new Bridge has greatly improved traffic flow and has increased capacity. This has directly made movement between and within the municipalities more efficient and safer.

## **4. Economic Growth**

The new bridge will contribute to the development and enhancement of sustainable urban transportation by increasing efficiency, as a result of a reduction in congestion and energy use, increasing traffic safety and reducing environmental impacts. Economic growth will be promoted through a savings in fuel consumption, and by a reduction in vehicle hour delays (passenger vehicles and trucks).

Urban development will increase with the improvement of the transportation network. Traffic flow will improve, capacity will increase and commute durations will become shorter. This will be a catalyst for residential, commercial and social development, and as a result, will directly increase the requirement for new goods and services. Enhanced sustainable communities will develop and reduce the need for residents to travel outside of their community to obtain goods and services.

Within the communities, the increased efficiency of the overall transportation network will reduce congestion and bottlenecks (reduced vehicle hour delays) on local streets, and as such, will permit better access to and from local service and business districts.

## **5. Aesthetic Enhancements**

The municipalities of Moncton and Riverview had a desire to acquire aesthetic enhancements on the new Gunningsville Bridge. Once a commitment was obtained to partially fund the enhancements, the Department proceeded with incorporating them. The enhancements include observation platforms, endposts, pilasters, pillars, stained stone panels, stamped concrete, decorative lighting, railings and a four-metre sidewalk.

### **5.1 Stone Patterned Panels and Acid Staining**

It was desired to provide a coloured, textured natural stone finish on the concrete components that would instill a strong sense of permanence to the bridge. To accomplish this, a random block ashlar stone pattern was imprinted into the concrete at recessed panel locations on the abutments, endposts and the barrierwalls. Figure 6 shows the stone pattern on the North Abutment

breastwall, wingwall, endpost and barrierwall. The stone pattern has the appearance of being hand-placed, it reflects workmanship, and provides character to the bridge.

To achieve an architectural concrete finish with sharp edges and smooth, void-free surface details, it was acknowledged that a regular concrete mix design would not be adequate. For its placement characteristics and high quality surface finish, self-consolidating concrete was utilized. To provide a natural and realistic appearance, the stones were acid stained to emulate the colours of the local geological formations. Three different shades were used (beige, rust and charcoal) with varying strength ratios and frequency. Following the staining process, the finish was preserved and protected by applying two coats of acrylic sealer.

## **5.2 Endposts**

Each entrance to the bridge is announced by the abutment endposts as shown in Figure 7 and 16. They are impressive in both size and architectural detail. On their high end, a cluster of four light fixtures are grouped together on a single fluted pole that is 7.3m high, and the pole is topped with a decorative finial. Flowing down a sloped horizontal face to the low end is a decorative 430mm concrete ball and collared base. The end faces of the endposts have flat recessed panels, and the centre vertical face panels have the recessed random block acid stained stone pattern. It measures 3100mm in length, 600mm in depth and is 2000mm in height at the high end.

## **5.3 Barriers, Pilasters and Pillars**

The barriers, pilasters, pillars, sign structure bases and endposts all compliment each other in architectural detail and appearance. They are detailed with a relatively thick base and cap, and have recessed panels that are either flat or stone patterned (Figure 8). To provide a balance between aesthetics, driver sight and traffic safety a barrier was provided with an overall height of 1200mm. A 270mm high aluminum traffic rail tops the 930mm high, main concrete traffic barrier. The downstream side barrier, in addition to redirecting errant vehicles on the bridge, also serves to protect the sidewalk from vehicular traffic. Along this sidewalk barrier, light pilasters are provided at 35.0 metre intervals to mount a combined pedestrian and roadway light standard. Equally spaced between these pilasters, three half-pilasters are placed to provide conformity and barrier enhancement. In addition, the pilasters provide shadow lines and protection to the textured wall face. The textured rock panels generally run 8.75m in length with a height of 0.6m. On the exterior side of the sidewalk, a 250mm high curb has been provided to mount the pedestrian rail.

The concrete overhead sign structure support bases and the observation platform pillars have the same architecture details as the pilasters and the endposts. The support base in Figure 9 has two end pillars that are tied together with an intermediate recessed section. The base extends slightly higher than the barrier to help visually define it. As with the endposts, decorative balls and collared bases sit atop the pillars that extend slightly higher than the adjoining pedestrian railing. Figure 10 shows the pillars that are located at the corners of the boxed out viewing platforms that frame and announce the lookouts visually.

## **5.4 Sidewalk and Observation Platforms**

The four metre recreational sidewalk (Figure 11) on the Bridge connects extensive riverfront trail systems in both Moncton and Riverview. Traffic traverses across a 75mm thick fibre reinforced topping slab that contains a shrinkage-reducing admixture.

The Petitcodiac River at this location is host to a natural phenomenon, the “Tidal Bore”. To provide scenic outlooks of the river and the riverfront, two traditionally arch shaped observation platforms (Figure 12) with a boxed projection have been provided on the bridge along the sidewalk. As previously stated, pillars have been placed at the corners of the platforms. The observation platforms are located at Pier 3 and 6. They are 17.75m in length and 3.3m in width. The outlooks are additionally enhanced with an integrally coloured, stamped concrete finish applied to the lookout portion of the sidewalk. A curving half circular band of red brick arches from the outside curve back to the barrier wall. This provides a visual clue of the platforms for quite a distance. The inside of the curved band is filled with a contrasting beige flag stone pattern. By not extending this stamped pattern to the barrierwall, a visual separation is maintained between the sidewalk travel zone and the platform itself.

## **5.5 Railings and Light Standards**

All of the railings, light standards and overhead sign structures are black so as to not take away from the simple bridge form, as shown in Figure 13. Black is a traditional, ageless colour that is also neutral to the differing colour schemes employed in the Moncton and Riverview downtown streetscapes. The aluminum railings and light standards have a textured powder coating.

Custom designed, detailed and fabricated traffic and pedestrian railings were provided for the Bridge. The pedestrian railing (Figure 14) is detailed with straight clean lines and decorative scrollwork. The panels are mainly detailed with square and rectangular tubing, and the post caps have decorative sphere finials. To maintain a clean and pleasant sightline, all connections are recessed on the underside of panel members. Both straight and curved sections (Span 8) are provided in varying lengths. At the expansion joints, special details were incorporated into the panels to accommodate the bridge movement. The complementing traffic rail, as can be seen in Figure 8 and 11, placed on the concrete barrier was provided to enhance the overall appearance of the barrier and to meet requirements for cyclists. A curved half circular arch forms the top profile of the rail that is tapered in width from top to bottom. As with the pedestrian rail, underside recessed connection details were provided to keep the sight lines clean and to prevent possible clothing snags.

The entire project includes the provision of 60 light standards. Along and adjacent to the bridge there are 27 roadway/pedestrian light standards that have both a roadway and pedestrian luminaire as shown in Figure 15. Each of the four endposts (Figure 16) have a four luminaire cluster mounted to a single pole topped with a decorative finial. On the bridge approaches there are 14 roadway light standards. At the adjacent Riverview intersection, the poles are additionally mounted with complimenting horizontal traffic signal lights. The adjoining recreation trail is

illuminated by 15 light standards that have a pedestrian luminaire mounted to a pole topped with a decorative finial (Figure 17).

At the location of each observation platform, floodlights mounted to the underside of the superstructure illuminate the river. Where the recreational trail passes under the bridge, lights have also been attached to the superstructure.

The lighting serves to enhance visibility as well as to showcase the elements of the bridge. Luminaires chosen are a traditional Renaissance style that is reminiscent of the 19<sup>th</sup> century. They compliment and enhance their surroundings by day, and light up the night with style. The metal halide light fixtures embellish the quality of the textured stone panels, and with their cut off style reduce light pollution. The shepherd's hook suspended luminaire mounting with decorative scrolls and a finial matches the pedestrian railing. Fluted poles and decorative base covers also enhance appearance. Additionally, the poles have single plant support arms with a scroll, and are mounted with a duplex receptacle.

## **5.6 Approaches and Trails**

The approaches to the bridge establish an attractive welcoming landscape for the communities of Moncton and Riverview. The aesthetics of the gateway to the bridge set the tone for the entire bridge. As such, much attention has been given to the approaches and the connecting recreational riverfront trail system. All utility lines have been relocated underground, and lighting was replaced to match the decorative light standards on the bridge. Grassed boulevards and islands provide a pleasing separation between the ramps and the sidewalks.

As part of the trail system, connections to the bridge have been made in the means of stairs, ramps and tunnels. The stairs have a decorative black steel railing with scrollwork, spheres and tubing to match that provided on the bridge. The ramp to the tunnel has an ashford stone patterned concrete block retaining wall that is benched and infilled with greenery.

## **6. Quality Management System**

Quality Management initiatives were considered to be critical to the ultimate success of the materials and methods incorporated in the bridge aesthetics, and were therefore initiated years in advance of the bridge construction tender.

The Department had barrier wall test panels constructed that incorporated the random block ashlar stone form liners, firstly with our conventional Low Alkali Silica Fume High Performance Concrete Mix, and subsequently with self-consolidating concrete for its high quality surface finish. Concrete colouring was attempted with the use of integral colour powder admixtures and stains. It was determined that the acid staining technique appeared to have the most potential of achieving the look of natural stone. Satisfaction was attained that the detailed design was constructible with local talent.

The Contract went to tender and included an invitation to bidders for a “Bidder’s Conference” to discuss the Architectural Concrete item. The Department’s expectation to receive a quality product was delivered and information was shared with respect to our testing experience.

The contract contained a “Quality Control Plan” in the particular specifications to address quality assurance of the architectural concrete. The Contractor was required to submit for approval an architectural concrete acid stain finish procedure; his proposed method for placing, finishing and curing the flatwork sections of the sidewalk topping slab; test methods and frequency of testing. The Contractor was also required to cast suitable reference panels and slabs on-site, prior to construction on the bridge itself, to be used as a reference tool for quality acceptance for the work on the structure.

## **7. Concluding Remarks**

With this project, it was acknowledged that community involvement was very important. Throughout the design and aesthetic enhancement development process, the municipalities were conferred with. Both Moncton and Riverview provided feedback and opinions on the proposed enhancements. Additionally, it was a collaborative effort amongst the Department’s design team in preparing the tender documents. The bridge design was produced by NBDOT structures design staff, complemented by several local consulting firms. Eastern Designers Ltd. was hired as the lead structural designer; SGE Acres was hired as the municipal and approach designer; Daniel K. Glenn Ltd. was hired as the landscape architect; and Ralph Smith Engineering Ltd. was hired as the electrical designer.

One of the goals in the development of infrastructure with significant service life expectancy, is to create bridges that are aesthetically enhanced to blend into the local landscape. The accomplishment of this goal in the design and construction of the new Gunningsville Bridge has served to provide a valuable recreational and business link between the two municipalities, as well as create a source of community pride.

The aesthetically pleasing architectural design and its successful integration with the surrounding landscape will provide timeless visual appeal for its users and future generations to enjoy for the remainder of the 21<sup>st</sup> Century.





Figure 1: New Gunningsville Bridge

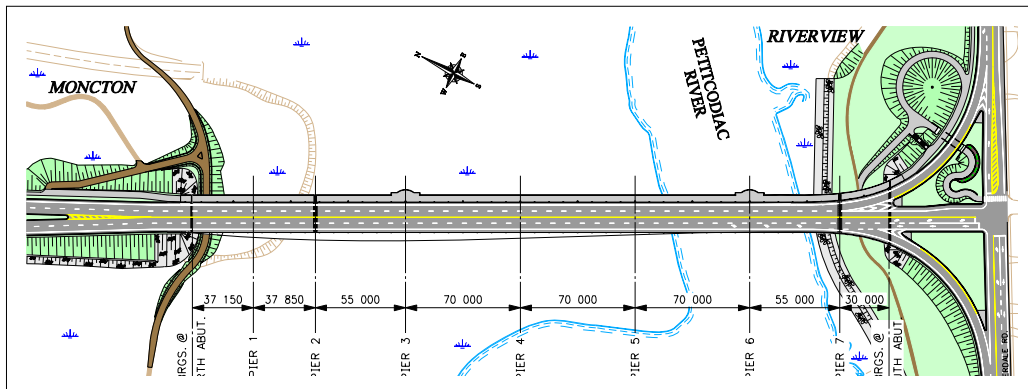


Figure 2: Plan View

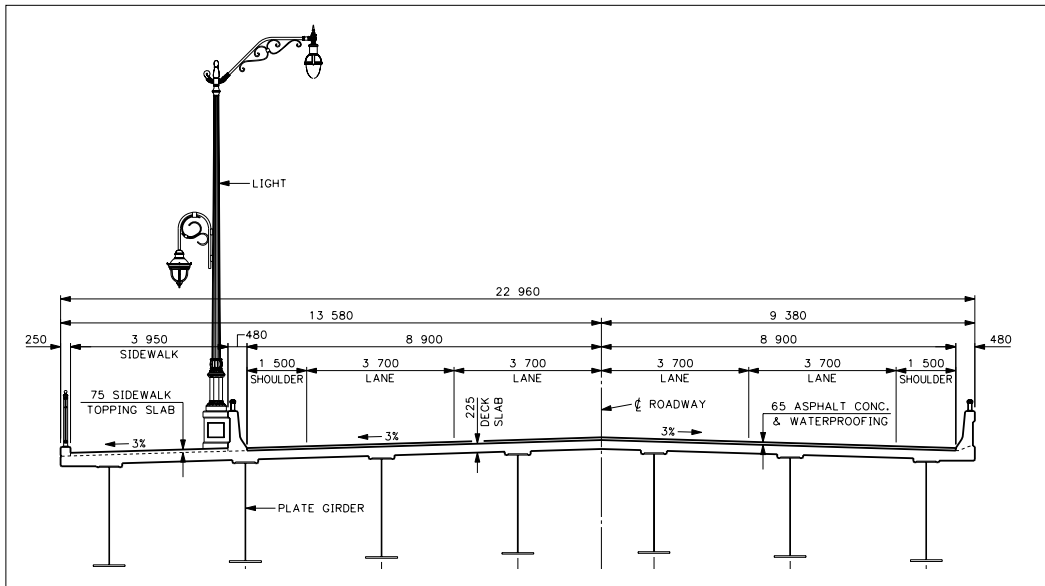


Figure 3: Typical Deck-Section

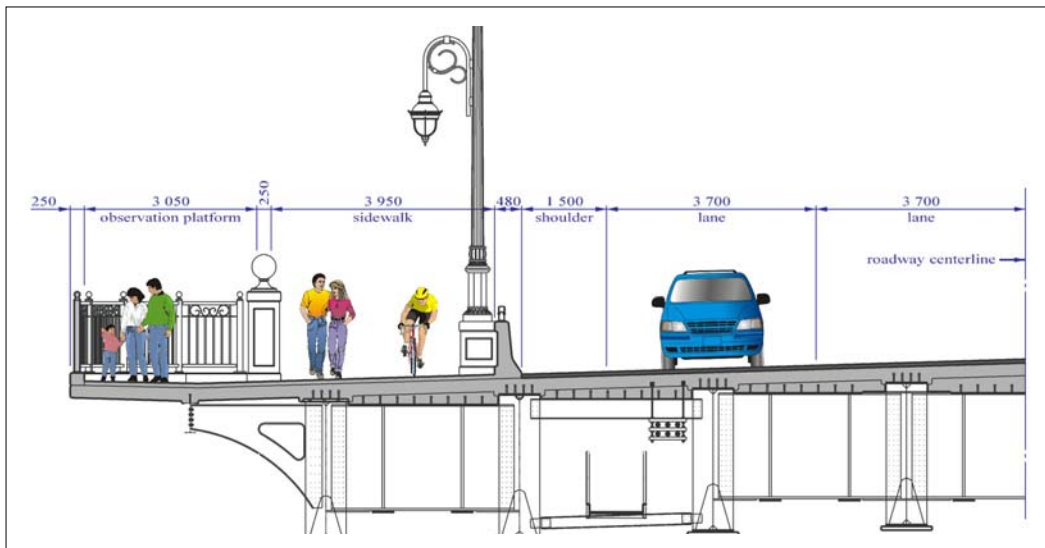


Figure 4: Deck Cross-Section at Observation Platform



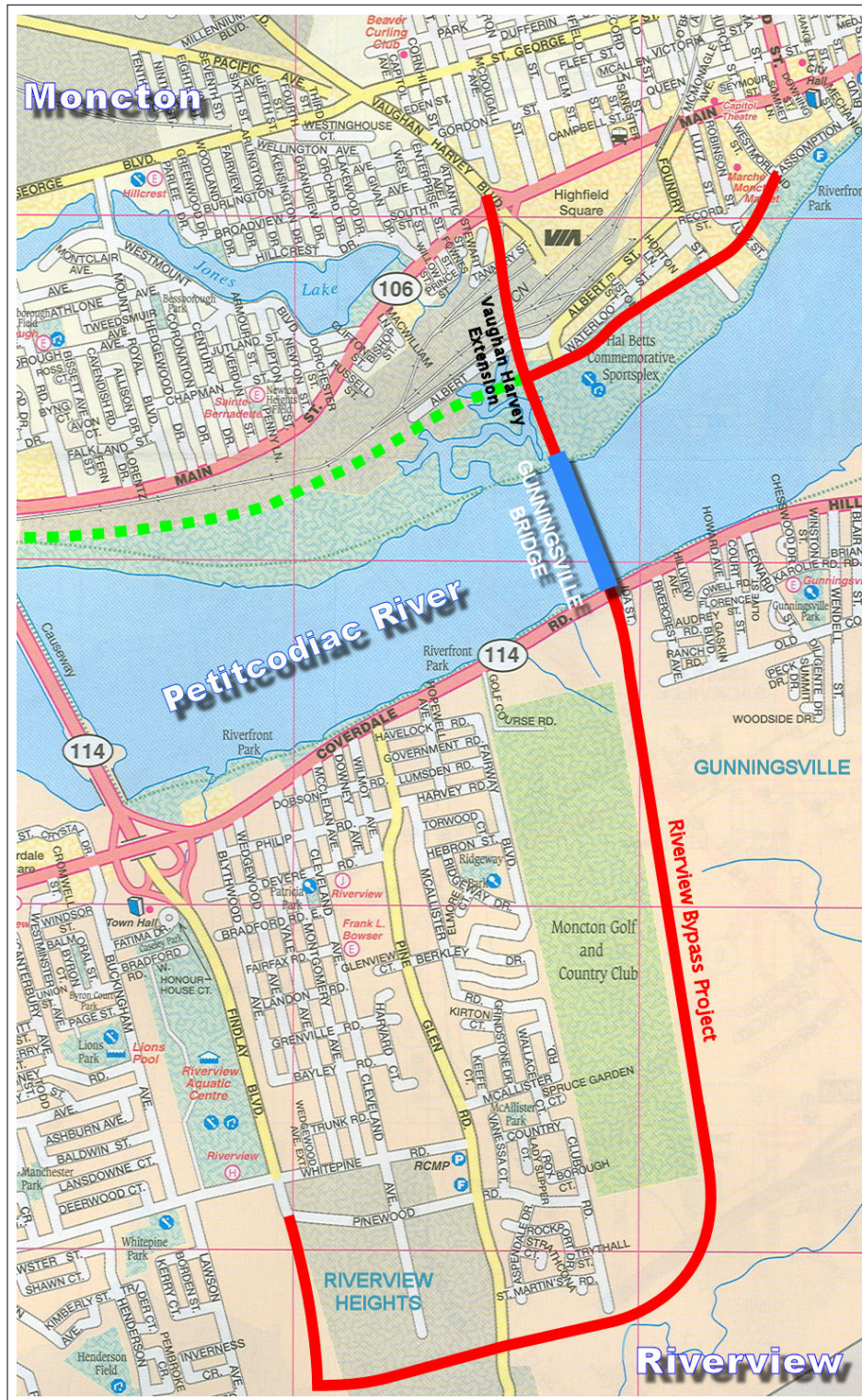


Figure 5: Bridge Connections





Figure 6: Ashlar Stone Pattern



Figure 7: Endpost



Figure 8: Exterior View of Traffic Barrier



Figure 9: Sign Structure Support Base



Figure 10: Observation Platform Pillars



Figure 11: Sidewalk



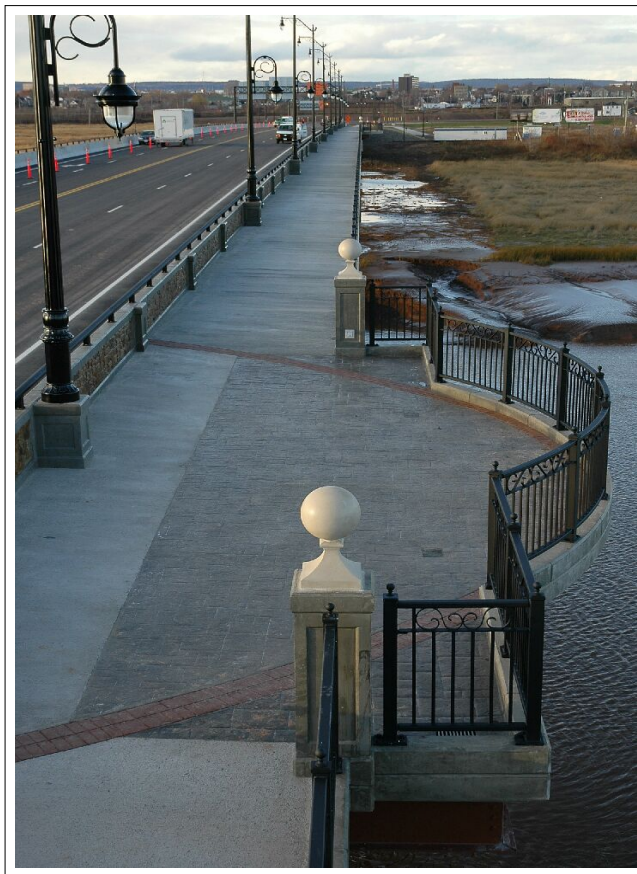


Figure 12: Observation Platform



Figure 13: Railings and Light Standards



Figure 14: Pedestrian Railing



Figure 15: Roadway / Pedestrian Light





Figure 16 : Endpost Light



Figure 17: Trail Light