Winnipeg Richardson International Airport

Elevated Roadway – Departures Level Bridge

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Paper prepared for presentation
at the Structures Session

of the 2015 Conference of the
Transportation Association of Canada
Charlottetown, Prince Edward Island

ABSTRACT

The Winnipeg Richardson International Airport is Manitoba's gateway to the world, and on October 30, 2011 the Winnipeg Airports Authority (WAA) officially welcomed travelers through Canada's newest and greenest airport.

The approximately $585 Million Airport Site Redevelopment program was completed under three major projects, the Terminal Building and Parkade, the Groundside Site Development (GSD) and the Airside Site Development. A fully integrated and versatile groundside system was required to connect the airport to its customers. As part of an attractive, modern and efficient facility, the new roadway system includes the Elevated Roadway / Departures Level Bridge, which provides direct curbside access to the Departures Level on the second floor of the Terminal Building, and direct curbside access to the Arrivals Level on the main level of the Terminal Building.

Challenges of the GSD and Departures Level Bridge included the roadway system, geometry, structural design, and architectural requirements. A minimum 5.0 m vertical clearance was required between the Arrivals Level inner curb and structure soffit while respecting the terminal frontage interface relationships. This resulted in a 1.0 m maximum available structural depth, which is a very thin cross section for a structure of this size.

The unique cast-in-place bridge structure has main beams running along the edge between columns, and laterally post-tensioned transverse beams to provide a shallow structure depth between the main beams. The structure utilized the post-tensioned concrete beams, galvanized reinforcing, and a high performance concrete overlay to increase durability and reduce maintenance. The structure was very heavily reinforced to minimize dimensions, and three-dimensional modelling was utilized to ensure that the reinforcing, post-tensioning, and various connection anchors could in fact be placed in the field.

The Elevated Roadway was a complicated structure to design due the site constraints and architectural requirements. The sheer size of the bridge added significantly to its complexity – at a total length of 506m, this is the second longest bridge in Manitoba, and with a width of 20m it is significantly wider than typical highway bridges. The requirements for post-tensioning in the bridge added further to the complexity, and the tight radii of the Up and Down Ramps created sharply curved structures requiring special considerations in design due to the significant torsion on the structures, and the multi-directional expansion and contraction of these curved structures.

The new Terminal Building is designed to be a very open structure, with minimally obstructed site lines throughout. This open concept allows for a highly functional facility where visitors can actually see where they are going next. The Elevated Roadway and Departures Level Bridge design compliments this concept. The resulting design has a high vertical clearance, allows natural daylight in during the day, is well lit at night, and does not have the appearance of a bridge or freeway.

Introduction

Winnipeg continues to grow as a transportation hub and travel destination visited by travelers from around the world. As a result, its airport also needs to provide services and facilities appropriate to this changing environment. The Winnipeg Richardson International Airport is Manitoba's gateway to the world, it is the first place travelers see when they arrive by air, and it is Manitoba's first opportunity to create a favourable impression. As part of the complete Airport Site Redevelopment, on October 30, 2011 the Winnipeg Airports Authority (WAA) officially welcomed travelers through Canada's newest and greenest airport.

The approximately $585 Million Airport Site Redevelopment program was completed under three major projects, the Terminal Building and Parkade, the Groundside Site Development (GSD) and the Airside Site Development. As part of the plan to provide a truly world-class facility, a fully integrated and versatile groundside system was required to connect the airport to its customers. In accordance with this vision, the new roadway system provides convenient and efficient connections between the new Air Terminal Building, new parkade, and reconfigured surface parking serving both the public and employees. As part of an attractive, modern and efficient facility, the new roadway system includes the Elevated Roadway / Departures Level Bridge, which provides direct curbside access to the Departures Level on the second floor of the Terminal Building, and direct curbside access to the Arrivals Level on the main level of the Terminal Building.

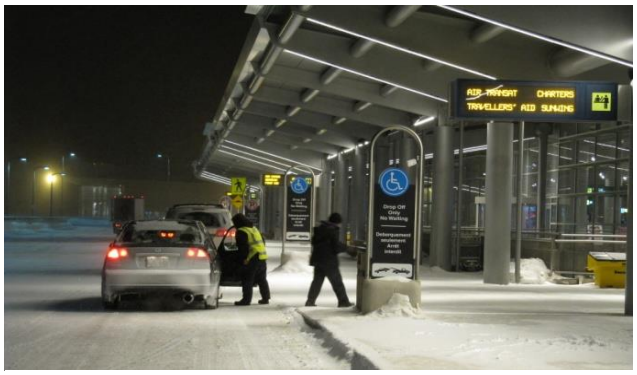

Photo 1: Elevated Roadway - New Upper Departures Level

Photo 2: Beneath Elevated Roadway - New Lower Arrivals Level

The team for the Departures Level Bridge was led by AECOM (formerly Earth Tech). AECOM provided the traffic, roadway geometry, geotechnical, and municipal design for the GSD, and the structural engineering for the Departures Level Bridge. The Prime Architect team for the entire Airport Site Redevelopment consisted of Stantec Architecture Ltd. and Pelli Clarke Pelli Architects (formerly Cesar Pelli). The structural design of the up and down ramps to the Departures Level Bridge and the bridge lighting design for the entire Elevated Roadway was provided by MMM Group Ltd. in Toronto, as a subconsultant to AECOM. The landscape architecture for the Elevated Roadway was provided by Scatliff + Miller + Murray, also as a subconsultant to AECOM.

WAA's vision for the Winnipeg Richardson International Airport is to lead transportation innovation and growth. The redevelopment of any major airport is inherently unique due to the site specific layout, volume of air traffic, roadway traffic requirements, existing infrastructure and projected development and growth. The Elevated Roadway / Departures Level Bridge is a key component and complements the new and innovative airport facility.

Traffic Planning and Roadway System Design

The terminal development project provides modern facilities to serve up to 4.0 million passengers by 2020. This recognizes growth in the domestic and US/transborder traffic as well as an increase in direct international flights to other destinations. Terminal organization included: domestic operations at the west

end; and transborder/international flights at the east end, which was important to ensure that wayfinding and passenger convenience was optimized in the roadway development.

Simulation of all groundside and terminal traffic was undertaken by a specialist subconsultant, Daniel, Mann, Johnson, Mandenhall (DMJM, now AECOM) during the Preliminary Design phase. The outputs from the simulation were used to confirm traffic volumes and lane requirements on all road segments in the terminal area. Level of service determinations were then undertaken for link capacity and weaving capacity. The simulation correlated vehicular and passenger demands based on flight schedules and confirmed roadway lane requirements and levels of service. The connectivity of roads, the Terminal Building, surface parking, and the parkade was fully defined for pedestrian circulation, ramp systems, wayfinding, parkade entry/exits, rental cars, and the roadway signage concepts.

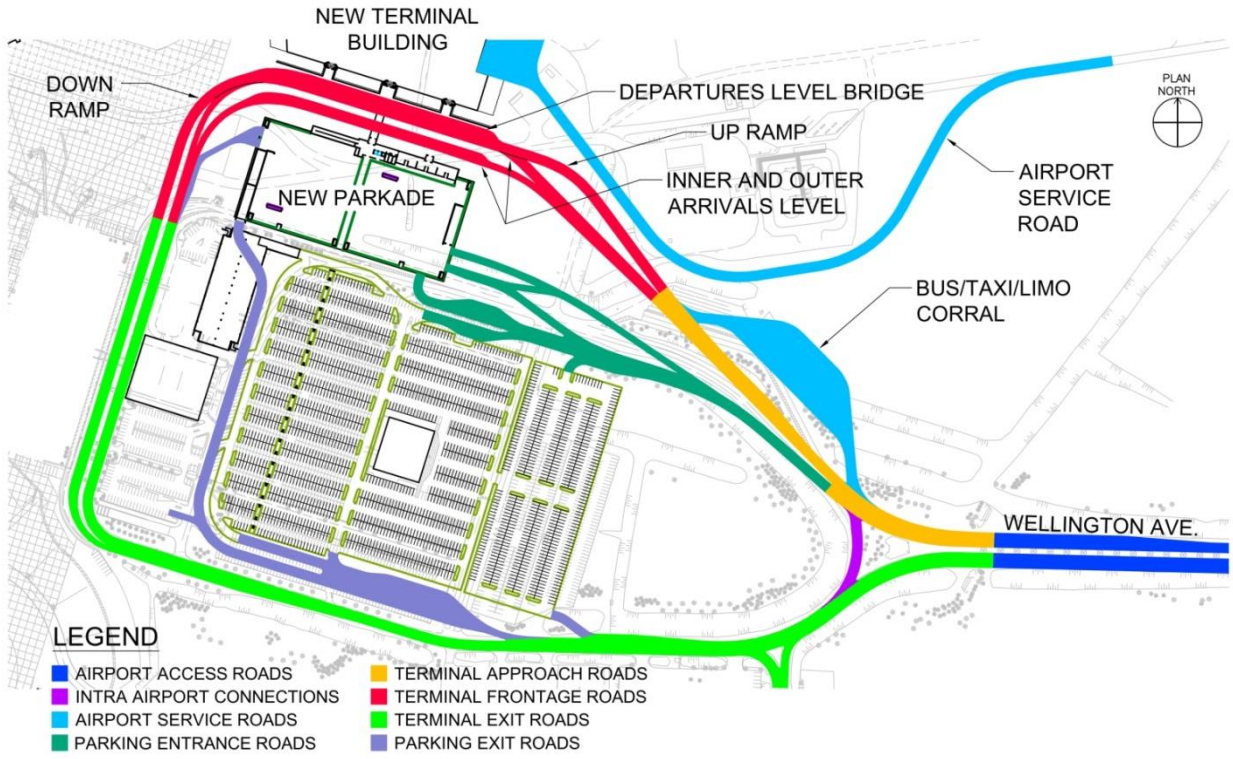

Figure 1: Roadway System Layout and Elevated Roadway

A key element of the roadway system was the length of available curb at the terminal to accommodate arriving and departing passengers. Curb management, particularly during busy periods, is important to ensure that dwell times are controlled. Monitoring of operations and re-allocation of vehicles between curbs is also an effective way of making use of available curb length.

Fundamentally, it was essential to provide adequate curb length to accommodate the expected demands. Analysis undertaken during the Program Definition phase indicated minimum curb length requirements of 85 m for Arrivals and 175 m for Departure Levels. The pre-design layout provided 350 m on the Arrivals Level (two curbs) and 220 m on the Departures Level. The curb length was reviewed upon completion of the simulation modeling. Mode split information was also utilized to determine appropriate terminal curbside allocation by vehicle type (private cars, taxis/limousines, rental cars, transit vehicles, and hotel shuttles).

Photo 3: Roadway Signage for Vehicle Wayfinding

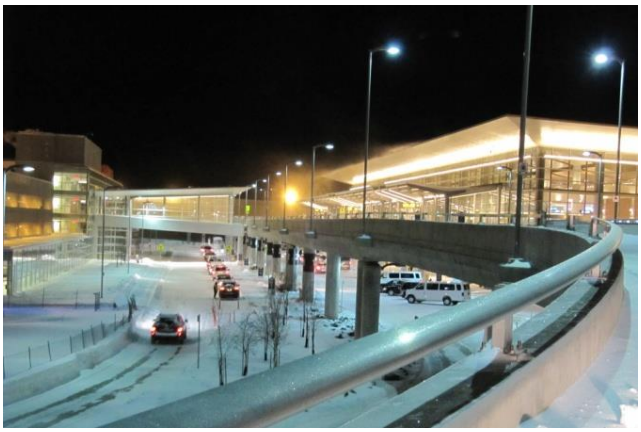

Photo 4: Outer Arrivals Level Curb and Up Ramp to Departures Level Curb

The roadway system was developed to provide the following:

- Accommodation for various combinations of origins and destinations, including re-circulation movements.
- Adequate capacity to meet projected demands at acceptable Level of Service with minimal congestion and delays, considering access roads, intersections, weave areas, parking ramps, and curb fronts.
- Reserve capacity for operation during collisions, breakdowns, adverse weather, and other emergencies.
- Efficient interfaces with the surrounding City streets and accessibility for emergency vehicles.
- Provisions for future expansion in balance with the overall airport ultimate capacity.
- Roadway geometrics and other features that foster an efficient progression of speed reductions approaching the terminal, and speed increases leaving the terminal, that minimize trip times.
- Directness of routing and ease of wayfinding, supported by signing with a simple sequence of decisions and adequate sight line distances to enable reading, comprehension, decision making, and lane changes.
- Compatibility with on-going airport operations during construction through proper phasing.
- Effective mitigation of potential pedestrian / vehicular conflicts.
- Identification and mitigation of potential environmental impacts.
- Accommodations for various types of commercial vehicles and their unique characteristics.
- Compatibility with utility requirements and relocations.
- Constructability and cost considerations.
- Provisions for effective snow and ice removal.

Photo 5: Inner and Outer Arrivals Level Curbs with Open Views to Terminal Building

Photo 6: At Grade Pedestrian Access into Terminal below Bridge

The terminal frontage roads consist of a combination of at-grade roads and elevated structures. The Arrivals Level includes 3-lane and 2-lane at-grade roadways, which are adjacent and parallel to the inner and outer curbs respectively. On this level, private vehicles, taxis, limousines, shuttles, and buses are directed to the appropriate inner or outer curb. The Departure Level Road is on an elevated structure with 3 lanes. On this level the 3 lane configuration provides adequate capacity for drop off with provision for double-parking in Lane 2, if necessary. (See Figure 2.) Pedestrian access to and from the parkade to both Departures and Arrivals Levels occupy a portion of the frontage road area with at grade crossings on the Arrivals Level and pedestrian bridges connecting the terminal and parkade to the Departures Level Bridge. Key constraints that influenced the relationships between the terminal, parkade, frontage roads, and pedestrian bridges interface were:

- Vertical clearances to pedestrian and vehicular bridges.
- Terminal elevations at Arrivals and Departures Levels.
- A horizontal offset between the Departures Level Bridge and Terminal Building to allow natural light to penetrate the Arrivals and Departures Levels both inside and outside of the Terminal Building.
- Parkade elevations at floors connecting to Arrivals and Departures Levels.
- Grades on roadways, sidewalks, and pedestrian bridges.
- Connection of pedestrian bridges to the terminal and parkade.
- Pedestrian/vehicular inter-visibility at the Arrivals Level.

These constraints had a direct impact on the design of the Elevated Roadway Structure discussed in the following section.

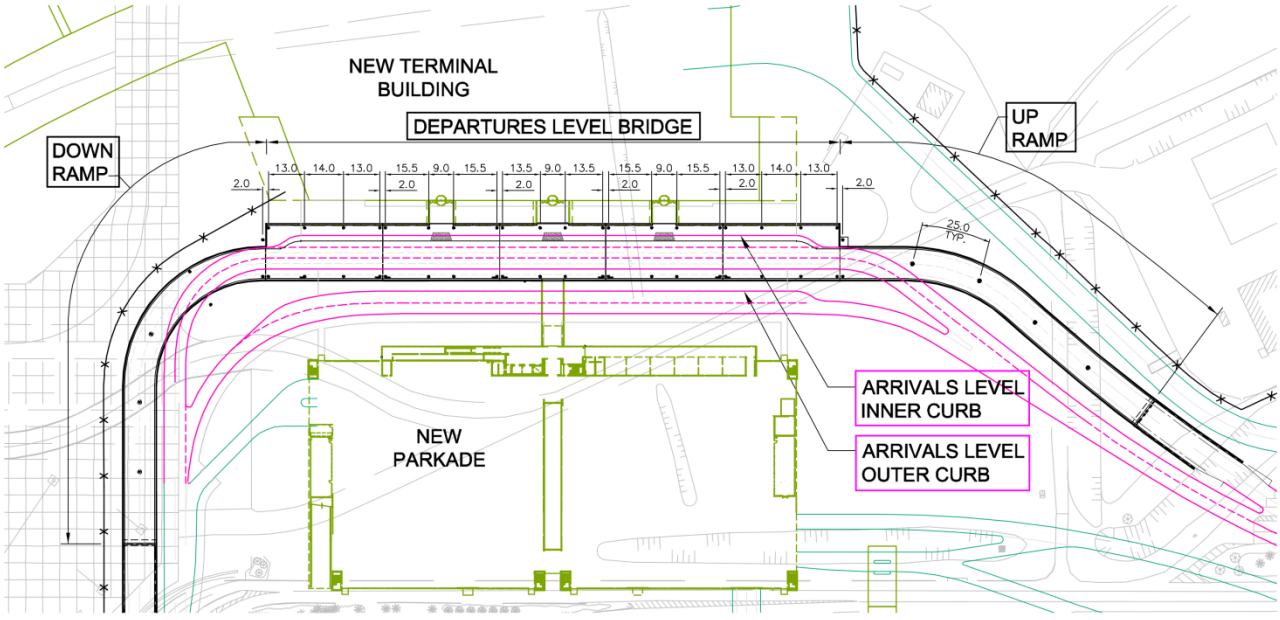

Figure 2: Elevated Roadway – Departures Level Bridge and Ramps

Elevated Roadway Structure – Departures Level Bridge and Up / Down Ramps

The elevated frontage road structures include vehicular bridges serving to access the terminal curbside and consist of the Departures Level Up-Ramp, the Departures Level Bridge, and the Departures Level Down-Ramp. (See Figure 2.) The geometry of the bridges was governed by the road alignment and

cross-section. The flat section of the Departures Level Bridge is comprised of a series of bridges. Typical spans are between 13.0 m to 15.5 m to provide an attractive layout, avoid a "forest of columns" and achieve a balance between an efficient structural system, reasonable structural depth, and aesthetics.

Bridge aesthetics were important to overall site development because of the visibility of the elevated roadways, accordingly every opportunity was used to provide attractive structures. The bridge aesthetics was developed in conjunction with the Prime Architect team. Pedestrian bridges (designed by others) provide a convenient link between the terminal and parkade at four locations, tying into both sides of the Departures Level Bridge.

The structural concept for the elevated frontage road was prepared while considering all the physical site constraints including: column configuration; staging areas; construction access limitations; emergency access; roadways; operating and maintenance requirements; tie-in requirements to the Terminal Building; aesthetic limitations; vertical and horizontal clearance envelopes above and below the structure; and drainage.

The general arrangement of bridges and ramps were further developed with due regard for utilities; electrical (lighting); foundation requirements; the landscape concept; and the terminal/parkade interfaces (canopies, railings, light fixtures, and column and soffit/beam shapes). Column locations were also placed with due consideration for sidewalk locations and vehicle/pedestrian inter-visibility.

Photo 7: Column Size and Spacing Accommodated Open Structure

Photo 8: Column Spacing Adjusted to Suit Function of Arrivals Level

Post-Tensioned Superstructure

Structural concepts were reviewed and feasible alternatives selected based on multi-disciplinary considerations: architectural, structural, and transportation/roadway. During the early stages of the preliminary design multi-disciplinary workshops were held with the Prime Architect team and Groundside design team to coordinate requirements, confirm layout and concepts, and obtain concurrence on the preferred general arrangement and aesthetics of the elevated frontage roads.

Column layout alternatives were reviewed in conjunction with the geometric design of the Arrivals Level. It was required to maintain a 2.0 m clearance from the face of curb to the face of any columns for pedestrian/vehicle intervisibility. The Departures Level elevation within the terminal, parkade elevations, slope requirements for the pedestrian bridges, curb heights, and roadway/boulevard grades were the determining factors for the top of roadway elevation. The need to maintain a minimum 5.0 m vertical clearance between the Arrivals Level inner curb and structure soffit while respecting the terminal frontage interface relationships, resulted in a 1.0 m maximum permissible structural depth. This presented the structural engineers with a very thin cross section for a structure of this size.

Column locations were established based on structural requirements, aesthetic considerations, Arrivals roadway alignment, Arrivals levels entrances/exits, pedestrian cross walks, roadway alignment consideration and permissible structural depth. The final column layout provided the maximum possible column spacing and large open areas below the structure.

Photo 9: Column Spacing to Provide Large Open Areas on Arrivals Level

Several options were investigated for the superstructure including precast prestressed concrete girders, a composite concrete slab on steel girders, a post-tensioned solid concrete slab, and cast-in-place concrete beams. The required structure depth could not be met with the prestressed concrete girders without compromising the optimum column layout. Moreover, this would have strongly resembled an overpass or freeway structure in appearance. A steel girder superstructure would meet the span requirements; however, the appearance and long term maintenance of coatings were undesirable. In addition, the curved up and down ramps would have required expensive steel box girders to meet the torsional requirements for the horizontally curved geometry.

A post-tensioned concrete slab was a viable option to meet the structural depth and aesthetic requirements; however, the Prime Architect had a strong desire for a “coffered” layout from an aesthetic perspective. The selected structure for the Departures Level Bridge included the cast-in-place “coffered” or transverse beam/ribbed structure, with post-tensioning to reduce the beam sizes. The transverse beams were supported by main beams running along the edge of the structure between the columns. The main edge beams were located over the sidewalks and medians, and as a result their depth was not restricted by the roadway clearance requirements. In addition to supporting the rib beams, the longitudinal beam on the terminal side also supported and anchored a series of steel columns, supporting the roof canopy along the Departures Level curb. While being price competitive in the local market, cast-in-place concrete also allowed for a variety of architectural features and shapes. The post-tensioning also keeps concrete members in compression under service conditions and increases their long-term durability by minimizing the possibility of cracking. The use of high performance low permeability concrete also further reduced the effects of chloride attack.

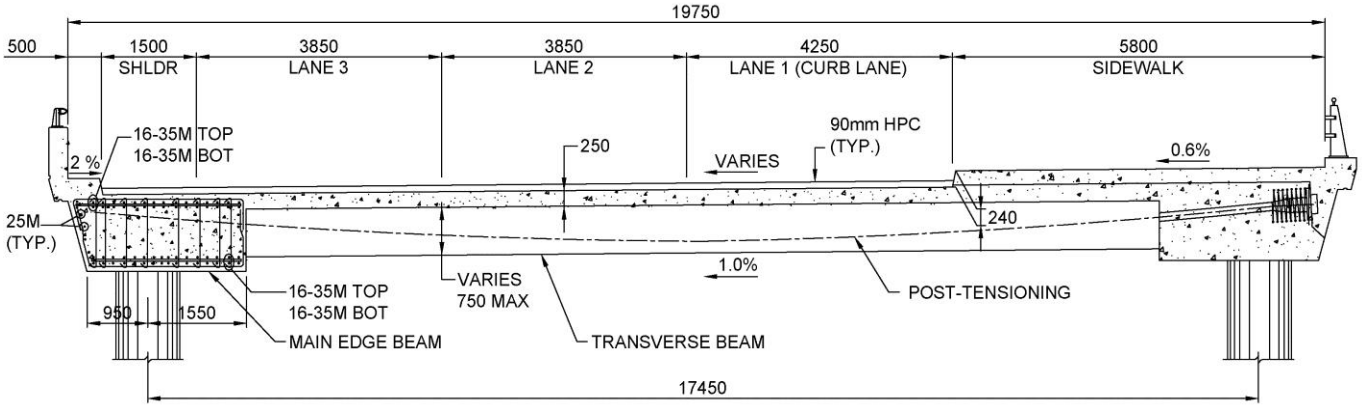

Figure 3: Elevated Roadway Section at Fixed Columns

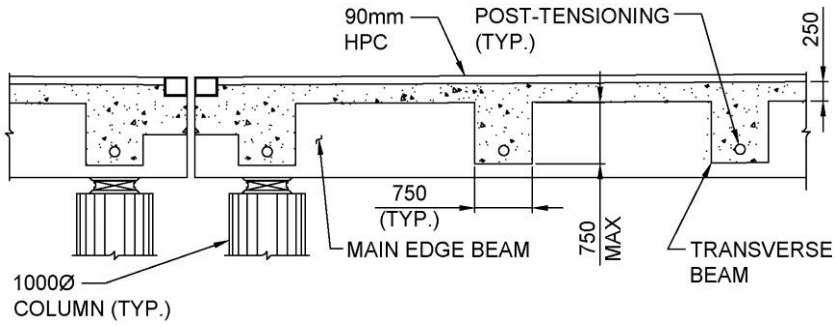

Figure 4: Elevated Roadway Section at Transverse Beams

Photos 10 to 12: Post-Tensioned Transverse Beams and Thickened Edge Beam to Meet Vertical Clearance Requirements, Improve Bridge Aesthetics, and Provide Open Column Spacing

For the curved ramp structures (Departures Up-Ramp and Down-Ramp), the selected alternative was a post-tensioned cast-in-place concrete slab superstructure supported on a concrete abutment and circular pier columns, located to accommodate the merging Departures and Arrivals Level roadways. The tightly curved slab structures were post-tensioned longitudinally and transversely which facilitated longer clear spans. When used in combination with post-tensioned straddle beams, they allowed for supporting column locations that accommodated the configuration of the Arrivals Level Roadway underneath.

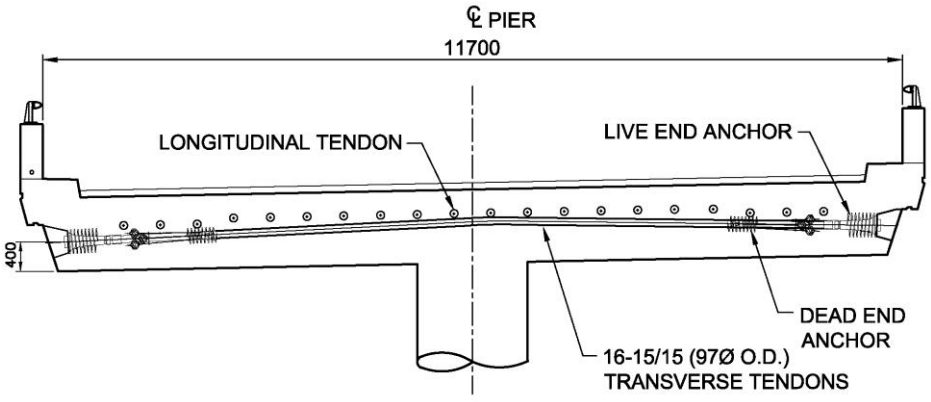

Figure 5: Up-Ramp Section at Single Column

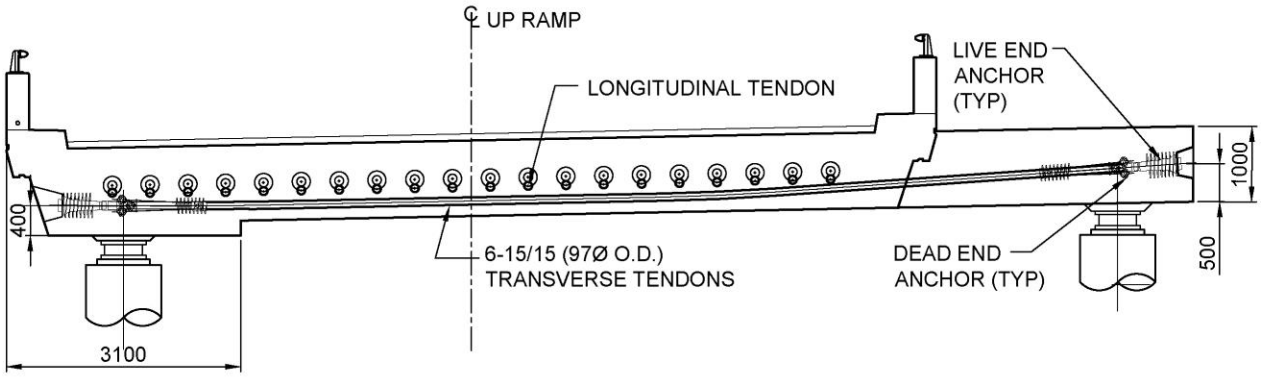

Figure 6: Up-Ramp Section at Straddle Beam with Two Columns

Various column shapes were reviewed. Circular columns were selected to minimize the appearance of their size and provide the most efficient cross section. Heavily loaded columns were reinforced with two rings of vertical reinforcing steel to further minimize their diameter. All columns were supported by concrete pile caps on either steel H-piles or precast concrete piles depending on the suitability of the underlying soils and bedrock at various locations.

Photo 13: Galvanized Column Reinforcing

Photo 14: Curved Post-Tensioned Down-Ramp

High performance concrete with silica fume was utilized for substructure and superstructure components including: columns; abutment retaining walls; approach slabs; beams; deck slabs and sidewalks, the deck overlay (topping); and parapet walls. The minimum specified 28 day strength was 50 MPa, with a specified rapid chloride permeability of 1000 Coulumbs or less at 28 days. Curing of unformed surfaces, including the approach slabs, bridge deck/sidewalks and concrete overlay, was a minimum of 7 days with burlap and water applied with soaker hoses. Fog misting was also required from the time of screeding until application of the burlap. Construction of a trial slab was also required prior to placement of any superstructure concrete.

Other Design Elements

The coffered bridge structure resulted in a very unique configuration due to the main beams running along the edge between columns and the post-tensioned transverse beams. This configuration was required in part due to the Arrivals Level Roadway running parallel underneath the Departures Level Roadway, as well as the requirement for a shallow structure depth. Elevated roadways do exist over parallel roadways, typically on major urban freeways, however the architectural component of the work is

usually not as critical as it was for this project. This resulted in an attractive blend of the Engineer's expertise with the Prime Architect's aesthetic requirements for the Elevated Roadway.

The structure utilized post-tensioned concrete beams, which are not common in Manitoba, and galvanized reinforcing in combination with the high performance concrete overlay to improve durability and reduce maintenance. The use of the concrete overlay not only enhanced deck durability, it also allowed for riding surface placement following initial short-term correction of the transverse rib beam camber. The structure was very heavily reinforced to minimize the structural dimensions, and three-dimensional modelling was utilized to ensure that the reinforcing, post-tensioning, and various connection anchors supporting the roof canopy could in fact be placed in the field.

Significant consideration was given to the traffic barriers along the edge of the Departures Level Bridge. Various traffic barrier configurations were researched, and traffic barriers were also investigated at many existing airports. The architect desired an open structure that minimized any blockage of light into the Terminal Building; however, the barriers had to be safe for vehicles and pedestrians. It was determined that the barrier on the outer edge of the bridge would be a reinforced concrete barrier with an aluminum railing on top. This provided adequate vehicle crash protection, met bridge code requirements, lowered the barrier height, and improved the aesthetics of the wall as much as possible.

Photo 15: Aluminum Railing on Concrete Traffic Barrier

The barrier on the inside edge of the bridge is at the back of the 5.8 m wide sidewalk. The design team had significant discussion on whether this barrier required the same impact resistance, as this condition is not addressed in the bridge codes. It was also noted that some modern airports only include plexi-glass barriers at this location. Based on the risk of an errant vehicle traveling across the sidewalk, it was decided to have a 150 mm concrete curb with a galvanized steel post and railing system to provide adequate vehicle crash protection. A stainless steel railing and mesh system was then mounted on the steel railing. This allowed light penetration into the Terminal Building and Arrivals Level below, as well as provided minimal maintenance. The metal mesh was similar to the adjacent parkade façade screening to tie these architectural elements together.

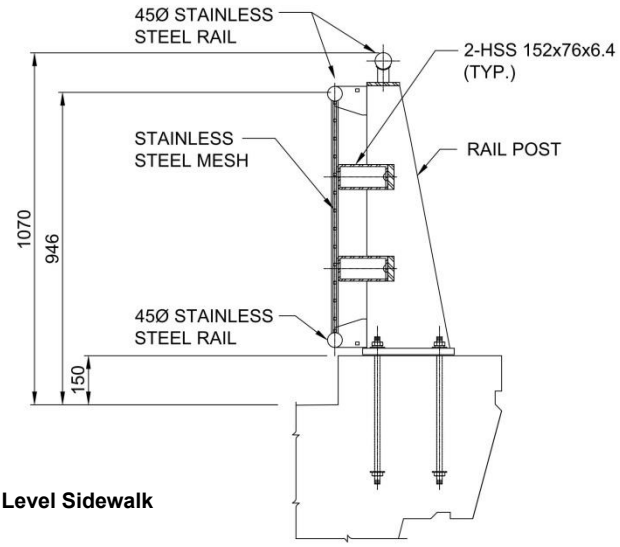

Photo 16 and Figure 7: Barrier / Railing Detail along Departures Level Sidewalk

This project required extensive input from the Prime Architect in order to achieve the objectives for the Elevated Roadway Departures Level Bridge. Coordination of the Structural Engineers and the Architect throughout the design process was critical to achieving this success.

Complexity of Design and Construction

The new terminal location for the Groundside Site Development was selected to be in close proximity to the existing terminal in order to make the best use of the site, and existing infrastructure such as the existing parkade, hotel and parking areas. However, the location selection was also required to minimize impacts to the existing airport operations during construction. This presented many challenges, as the new road system was designed to serve the new 52,000 m^2 terminal complex and 1600 car parkade, yet still provide efficient operations and wayfinding for vehicular and pedestrian traffic during the various stages of construction.

The enormous redevelopment program included three major projects, the Terminal Building and Parkade, the Groundside Site Development, and the Airside Site Development. These three projects were also carried out by various consulting engineering and architecture firms and teams. The large number of active participants in the design and construction added significant complexity to the project.

The geographic layout of the site further increased this complexity, as the Roadway system wound through all components of the Groundside Site, Terminal Building and Parkade. The Elevated Roadway was located between the new Parkade and Terminal, with the new terminal's being the interface between the Groundside and Airside components of the site. All three projects were interdependent, and there were many critical links among them including roadways, bridges, tunnels, utilities, and other infrastructure.

The Elevated Roadway was a complicated structure to design and construct due to all of the site constraints and architectural requirements. The sheer size of the bridge adds significantly to this complexity – at a total length of 506 m, this is the second longest bridge in Manitoba, and with a width of 20 m it is significantly wider than typical highway bridges. Adding significantly to the complexity were the requirements for post-tensioning in the Departures Level Bridge and Ramps. The tight radii of the ramp horizontal alignment created sharply curved structures requiring special considerations in design due to the significant torsion on the structures, and their significant multi-directional expansion and contraction.

Photo 17: Placing Cast-In-Place Concrete for Elevated Roadway – Departures Level Bridge

Social and Economic Benefits

The Airport Site Redevelopment Program was implemented in accordance with WAA's community-based strategic directions:

- Enhance customer service and value.
- Deliver and operate excellent facilities and services.
- Expand air service to and from Winnipeg.
- Be an effective community partner.
- Develop and realize employee potential.
- Develop new revenue streams.

There has been a significant enhancement in customer service and value for air travel through the new Terminal Building, Parkade, Groundside and Airside Facilities. This includes quick and efficient access for travelers using private, public or commercial transportation to and from the New Terminal Building via the Departures Level Bridge and Lower Arrivals Level. There is a measurable reduction in access time when compared to the single level arrivals/departures roadway of the Old Terminal Building. The configuration of the Departures Level Bridge combined with the open concept of the new Terminal Building allows travelers direct and clear access from the curbside to their check-in location.

Despite a global economic downturn air passenger travel through Winnipeg increased 5% from 2010 to 2012. More recently, the number of passengers boarding at Winnipeg Richardson International Airport set a record high in 2014, reaching 3.67 million, an increase of 5.3% over the prior year's results.

A variety of community benefits have been realized through the redevelopment program including: improved safety and reliability; cost efficiency; adaptability for future industry needs; and ongoing support of local economic development.

Environmental Benefits

As Canada's greenest airport, and the first to achieve LEED Silver Certification, the Airport Site Redevelopment is an environmentally sustainable project. LEED certification distinguishes building projects that have demonstrated a commitment to sustainability by meeting higher performance standards in environmental responsibility and energy efficiency. The Departures Level Bridge and associated roadway system includes a land drainage sewer system equipped with an oil/grit separator. The separator is capable of removing 80% of suspended solids and oil and grease from collected stormwater runoff.

With respect to transportation, employees, passengers and building tenants have access to two regularly scheduled local bus routes accessing the Terminal Building via the Arrivals Level.

Photo 18: Offset Between Terminal and Bridge Allows Daylight Harvesting

The Terminal Building takes full advantage of daylight harvesting. The design and horizontal offset of the Departures Level Bridge from the Terminal Building maximizes the amount of light which can enter both the Arrivals and Departures Levels of the Terminal Building, which is unique for most major airports in Canada.

Architectural and Functional Requirements

Winnipeg Airports Authority, operates, manages, maintains, and invests in the Winnipeg Richardson International Airport. The Groundside Site Development project recognized the overall program objectives related to enhanced customer services and value; delivery and operation of excellent facilities and services; expanded air services; development of new revenue streams; and effective community relations. The new road system was designed to serve the new terminal complex and parkade by providing convenient and efficient wayfinding for vehicular and pedestrian traffic. The roadway system and Departures Level Bridge provide a modern and direct approach to the terminal complex.

The Terminal Building is a very open structure, with minimally obstructed sight lines throughout. It has an emphasis on views outwards from the terminal, and views from one portion of the terminal to the next, i.e. from the Arrivals/Departures Level curbs through glass façades into the building. This open concept allows for ample natural light, an aesthetically pleasing structure, and most importantly a highly functional facility where visitors can actually see where they are going next. The Elevated Roadway and Departures Level Bridge design complements this concept. This resulted in the requirement for a high vertical clearance, a structure that would allow natural daylight in during the day, be well lit at night, and not have the appearance of a bridge or freeway. The adjacent photos provide a comparison to other major airports in Canada.

Photo 19: Calgary – Perpetual Night Appearance, Large Columns Obstructing Views, and Low Clearance

Photo 20: Edmonton – Dark and Highly Congested Appearance, Low Vertical Clearance

Photo 21: Ottawa – High Vertical Clearance and Open Concept but With Appearance of Freeway

Photo 22: Winnipeg – High Vertical Clearance, Open Views, Well Lit, Arrivals Curb is Extension of Terminal

Conclusion

The Elevated Roadway Departures Level Bridge and Ramps were completed ahead of the schedule required to meet the overall schedule for the Airport Site Redevelopment. Timely design inputs, internal and external, were critical to the overall success of the project. Coordination and cooperation between all parties was also a significant contributing factor. This was of particular importance due to the three main design contracts, large number of consultants, multiple construction contracts, and the significant impact of errors or delays on the overall Groundside Redevelopment Project.

The selected structures for the Departures Level Bridge and Ramps were economical given the tight vertical constraints and architectural requirements set for the project. The structure has performed very well through three years in service, including the following:

- The concrete deck overlay is in very good condition and does not show significant signs of wear.
- The effect of chlorides has been minimized as WAA does not apply road deicers to the structure. Chlorides are brought onto the structure from traffic entering via the City of Winnipeg's roadway system, however regular snow clearing and mechanical sweeping keep the deck and sidewalks safe and as clean and clear as possible.
- The structure was designed and constructed with durable high quality materials to increase the life span and require less maintenance. This included: galvanized reinforcing; high performance silica fume concrete; a durable deck overlay; and post-tensioned superstructures to minimize cracking, chloride ingress and subsequent deterioration.
- The structure has met the architectural and functional requirements required for the new airport facility. The open concept allows for ample natural light, an aesthetically pleasing structure, and most importantly a highly functional facility.
- There has been a significant enhancement in customer service and value for air travel through the new Terminal Building, Parkade, Groundside and Airside Facilities. This includes quick and efficient access for travelers using private, public or commercial transportation to and from the New Terminal Building via the Departures Level Bridge and Lower Arrivals Level.

As noted previously, WAA's vision for the Winnipeg Richardson International Airport is to lead transportation innovation and growth. The Elevated Roadway / Departures Level Bridge is a key component and complements Winnipeg's new and innovative airport facility. In 2014 the Elevated Roadway / Departures Level Bridge also received an Award of Excellence from the Association of Consulting Engineering Companies - Manitoba.

Photos 23 and 24: Terminal Building and Elevated Roadway Structures