

INVESTING IN ROAD CONSTRUCTION: USING A DESIGN-BUILD APPROACH TO BUILD CANADA'S ECONOMY IN SASKATCHEWAN

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Paper prepared for presentation
at the **INVESTING IN TRANSPORTATION: BUILDING CANADA'S ECONOMY** Session

of the 2017 Conference of the
Transportation Association of Canada
St. John's, NL

ABSTRACT

Despite the current economic downturn throughout Western Canada, the Province of Saskatchewan has been growing at an unprecedented rate, and the bedroom-community cities of Warman and Martensville, north of Saskatoon have mirrored that growth. As a result, Highway 11 and 12 corridors travelling adjacent to these cities have been the subject of several planning studies over the last 5-10 years. These studies have indicated a need for interchanges at both Warman on Highway 11 at Highway 305 and Martensville at Main Street/Township Road 384. Therefore, the Ministry of Highways and Infrastructure (MHI) in Saskatchewan has decided to proceed with plans to construct interchanges at both locations. The interchanges will address safety and economic development requirements for the Highway 11 and Highway 12 corridors north of Saskatoon. This project represents the first phase in addressing the larger transportation infrastructure needs in the Saskatoon region.

Funding from the Federal Government, along with a provincial contribution, enabled the project to become a reality as a design-build project. MHI and ISL Engineering and Land Services Ltd. (ISL), as the Owner's Engineer, have joined forces to prepare design-build documents for these interchanges with construction starting in 2017 and completion by 2019.

Although, the steps taken to undertake a design-build project are well documented by several jurisdictions, numerous different examples exist for the preparation of design-build documentation. Saskatchewan has undertaken this task by combining parts of the Ontario, British Columbia and Alberta models, which have resulted in a robust model that has used a Fairness Monitor to ensure transparency throughout the Qualification and Proposal Request processes, and an Independent Certifier, which combines the normal duties of this independent body with a Road Safety Auditor. A "bucket" system has been developed for contract deficiencies, whereby negative points are accumulated by the Design-Builder resulting in financial penalties when the bucket is full. This paper examines the amount of work involved in incorporating these unique requirements into clauses in the design-build agreement.

Introduction

Bedroom communities of Warman and Martensville, north of Saskatoon, are growing at very fast rate because of an unprecedented thrive in the Province of Saskatchewan in recent years. Studies of the Highways 11 and 12 corridors have indicated a need for interchanges at both Warman on Highway 11 and Martensville at Main Street/Township Road 384 to improve access to those cities. The MHI is proceeding with construction of these interchanges using a design-build delivery methodology. This paper discusses the development of the Request for Qualifications, the Request for Proposals and the Design-Build Agreement for a Saskatchewan market.

Project Context

Warman and Martensville are small suburban towns, but developing fast. Because of their close proximity to the City of Saskatoon, they are a perfect choice to reside for people working in Saskatoon – giving them a title of bedroom communities. Moreover, families that desire a small town atmosphere to raise their children, while working in a big city like Saskatoon select Warman, Martensville and other similar communities as their homes. Warman is approximately 5 kilometres (3.1 mi) north of the City of Saskatoon, and according to the 2016 census, is the fastest growing municipality in the country, growing 55% to a population of 11,020, between 2011 and 2016. Just 8 kilometres (5.0 mi) north of Saskatoon, Martensville is a similar sized community with a population of 9,645 per the 2016 census. The Rural Municipality of Corman Park No. 344 surrounds both cities.

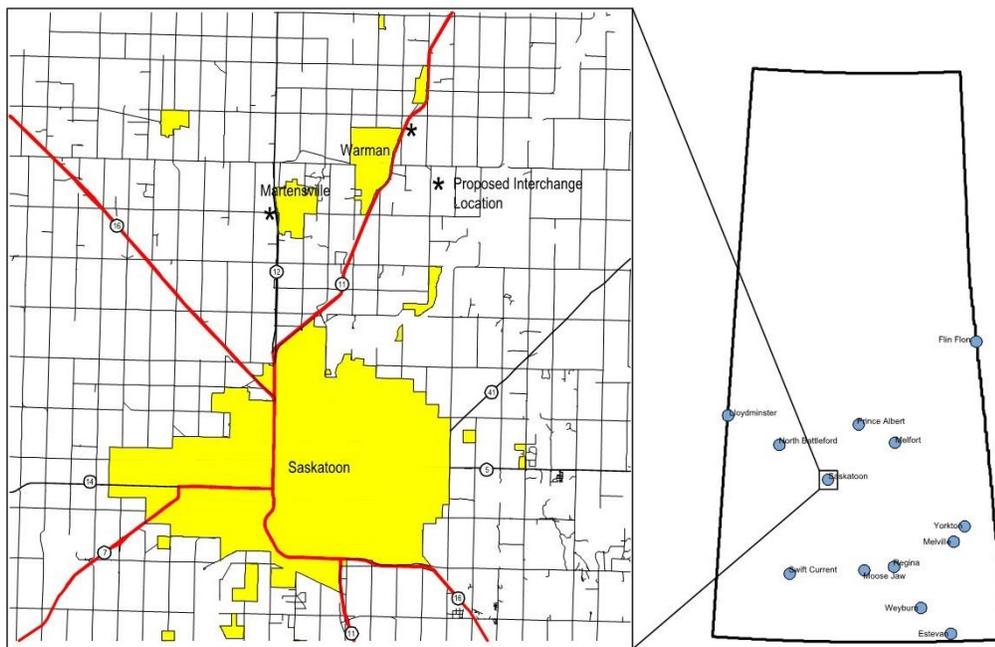


Figure 1: Project Location

Both corridors have been the subject of several planning studies in the last few years. AECOM completed a Phase I study in January 2012, which included the completion of a safety audit, historical collisions analysis and a review of existing traffic demands. This assessment of the existing corridor operations was utilized to propose mitigation measures addressing areas of immediate concern. The MHI, along with the R.M. of Corman Park, City of Martensville and the City of Warman jointly commissioned the MMM Group Ltd. to prepare a Phase II study, which provided the long-term network plan for the corridors. This study addressed issues related to the development pressures and growth within the municipalities as well as the R.M. and identified long-term access points to facilitate development. This study is being used to protect land for future infrastructure and mitigate safety issues along the corridors, including locations with high collision frequency and that are experiencing increased traffic volume growth. This study also identified potential interchange locations along Highways 11 and 12 and recommended services level interchanges for Highway No. 11/Warman and Highway No.

12/Martensville. In May 2013, the Ministry commissioned Associated Engineering (Sask) Ltd., (AE) to undertake a functional design of an interchange at Warman Central Street/Ferry Road and Highway 12 at Martensville Main Street /Township Road 384 as part of this assignment. The functional design defined the required footprint of the improvements resulting from the study. With the rapid growth of both the Cities of Warman and Martensville, the Ministry decided to proceed with plans to construct these interchanges as a single design-build project, with funding from the Federal Government to address the safety and economic development requirements of the corridors. The Ministry retained ISL to act as an Owner's Engineer to prepare documents for this delivery model for these interchanges with construction completion in 2018. ISL's mandate was to:

- develop a business case for submission to the New Building Canada Fund: National Infrastructure Component;
- develop a reference concept with input from the Ministry and local communities (Warman, Martensville, Osler and the RM of Corman Park);
- develop Request for Qualifications (RFQ), Request for Proposals (RFP) and Design-Build Agreement (DBA) documents based on the P3 Agreement documents developed for the Regina Bypass project;
- develop and implement procedures for the RFQ and RFP submission review, including a written manual for each;
- work with a Fairness Advisor throughout the RFQ and RFP process;
- develop and implement an RFP for an Independent Certifier;
- review the preliminary designs and costs to determine the Design-Builder for the project;
- develop audit processes and procedures for the design elements, management plans and construction; and
- implement those procedures during design development and construction.

The Business Case

A business case was developed for submission to the New Building Canada Fund: National Infrastructure Component for funding from the Federal Government. This business case outlined the following:

- a description of the project;
- project outcomes and benefits for Canadians, Saskatoon and the Martensville/Warman Corridors, including benefits to Canada's agricultural sector, improvements to efficiency and mobility of traffic moving, to and from the bedroom communities, and enhancement of Canada's potash, uranium and forestry sectors by removal of barriers to travel;
- a discussion of the economic advantages and public benefits as well as the strategic objectives that provide direction and focus for MHI activities, including supporting trade and investment, increasing transportation safety, enhancing quality of life and efficiently managing the transportation system;
- compliance of an Intelligent Transportation System (ITS) – A railway crossing very close to one of the accesses into the City of Warman was located in a blind spot just over a bridge, and consequently an ITS was developed that could warn drivers of a train on the crossing. Other ITS were considered, including CCTV cameras, Traffic Data Collection Systems and a Weigh-In-Motion (WIM) station;
- a risk workshop was held, acknowledging and identifying several risks to the project and their mitigation measures in the business case – the risks were quantified in terms of their likelihood to occur and the impact. The main risks identified included that land was not acquired in time for construction, the funding decision was delayed by the Federal Government, if the CN overpass needed to be modified and if the upgrading of the Carlton Trail Railway Crossing occurred; and
- a full cost-benefit analysis.

Notification that the Business Case and funding request were successful was received on June 21, 2016.

The Request for Qualifications

A Request for Qualifications (RFQ) document was developed over the summer and fall of 2015 and issued through SaskTenders (a Saskatchewan-based tendering website) on September 18, 2015, with a closing date of October 28, 2015. As this was to be a design-build project, we expected that proponent teams would consist of design firms, different contractors, environmental and other specialist firms. These were identified in the documents as “Key Firms”. The RFQ requested respondents to provide information about the individuals and firms involved and their approach to the project overall. This consisted of five different parts:

- Project Approach
- Key Firms and Processes
- Team Organization and Responsibilities
- Project Experience Including Design approach and Experience and Construction Approach and Experience
- Other Mandatory Data

Project Approach: When explaining the approach to developing the project, respondents were encouraged to provide examples of past approaches and experiences, which would help the proposed approach to this project. Specifically, RFQ asked the respondents to provide details on how the teams would be organized structurally and contractually, and managed to function as an integrated, seamless team, and how it would be coordinated with the other Key Firms. It asked about their approach to ensuring suitable and effective integration of design and construction Key Firms and functions; their approach to interacting and resolving disputes with the Sponsor; critical success factors for the project and skills of the respondent to ensure project success, including stakeholder relations, community involvement, experience in environmental processes and approvals and stakeholder communications strategies; and their approach to implementing an Integrated Management System (IMS) that combines safety, quality and environmental management plans.

Key Firms and Processes: RFQ asked the respondents to provide examples of past approaches and experiences, which have informed the proposed approach to this project. In addition, to provide a description of the overall team and structure, details about the proposed Key Firms, including corporate controlling interests as well as the experience of each Key Firm in carrying out major design-build infrastructure projects. Lastly, it requested an evidence of their ability to act as a single, integrated, seamless team, including evidence that some or all Key Firms have worked together.

Team Organization and Responsibilities: the RFQ asked the respondents to provide supporting information to enable the evaluators to perform a comprehensive evaluation of the Key Firm’s roles and responsibilities, including evidence of a well-organized team. It requested their approach to ensuring availability of an adequately trained workforce as well as their approach to risk allocation between the Key Firms and the approach to ensuring suitable and effective risk management. The teams’ approach to implementing the Integrated Management System (IMS) was also demanded, as it was important for the Design-Builder to have an effective organizational structure, clearly demonstrating the relationship and responsibilities between different Key Firms and measures that would be implemented to ensure continuity of personnel through the RFP and implementation phases of the project.

Project Experience (Overall, Design and Construction): The respondents were asked to provide three project examples showing each respondent’s capability, for all Key Firms, with detailed resumes indicating overall experience and any specific experience relevant to the nature and scope of the project. It also asked for the respondent’s approach to design, including examples of past approaches and experiences, which have informed the proposed approach to the project, the design team’s organization, and how it will function as an integrated, seamless team. Integration of the design team with the other Key Firms and the Sponsor was deemed very important by the Ministry, so the RFQ asked for details of the approach to all the elements of design and

construction relevant to the nature and scope of the Project. The RFQ also asked the respondents how the engineers-of-record/field review engineers would monitor the construction and ensure the construction was in accordance with the submitted design and project requirements and their approach to expediting the project schedule and their approach to identifying and rectifying non-conformances.

Several Standards Forms were also required as part of the mandatory requirements of the Qualifications Package, including:

- A Conflict of Interest Declaration
- A Confidential Information & Litigation Declaration
- Worker's Compensation Board Clearance or equivalent
- A Bonding and Warranty letter from an insurance company or insurance brokerage firm, licensed in Saskatchewan, outlining the respondent's ability to obtain various general, automobile and professional liability insurance

The RFQ Evaluation Process

The RFQ evaluation process involved senior personnel from both the Ministry and the Owner's Engineer. The Ministry and the Owner's Engineer established an Evaluation Committee to review all submitted Qualifications Packages. Consisting of senior staff from the Ministry and the Owner's Engineer, the committee reported to a Steering Committee comprised of Senior MHI Executive Directors, which in turn reported to the Deputy Minister. Advisors were available to the Evaluation Committee that included individuals from the Owner's Engineer for technical matters, Saskatchewan Justice for Legal matters and SaskBuilds – the Saskatchewan government alternate delivery board. An RFQ Evaluation Manual was developed and distributed to each committee member, which contained a scoring system to be followed to ensure all submissions were reviewed on an equal basis. Each evaluation committee member reviewed and scored independently each of the submission and held a meeting to make a final determination of three proponents to advance to the next stage, the Request for Proposals (RFP).

In order to ensure an equitable process, the Ministry retained a Fairness Advisor to oversee the entire evaluation process. A retired judge was selected as the Fairness Advisor whose mandate was to oversee the evaluation process and make sure that it was defensible and transparent. The Fairness Advisor was present at the opening of the submissions and during the Evaluation Committee meeting, not to offer any advice on the evaluation of the submissions, but to simply assess the fairness of the process. The Fairness Advisor was responsible to a Relationships Committee who oversaw the objectivity of the process. After the entire process was complete, the Fairness Advisor provided correspondence to the Deputy Minister affirming an equitable process.

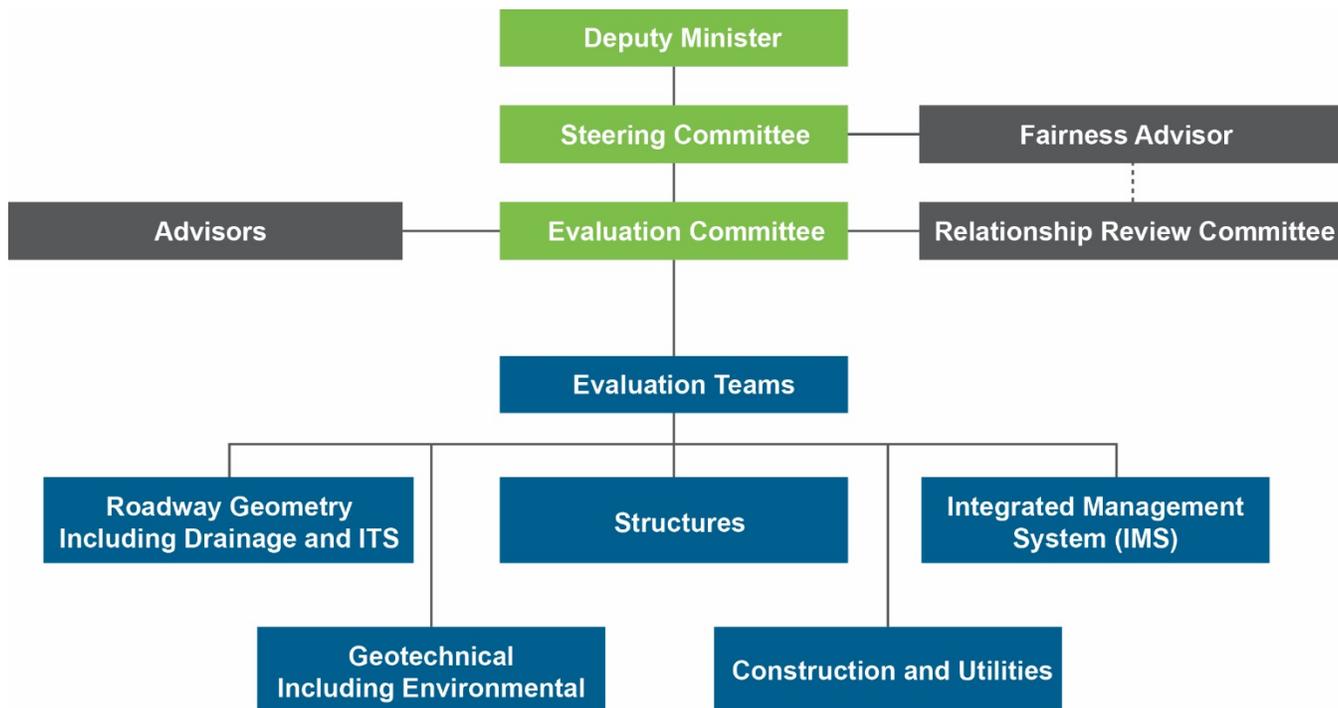


Figure 2: The Evaluation Committee and Evaluation Teams

The Request for Proposals (RFP)

From the above noted process, three proponent teams were selected to submit proposals for the design and construction of the project. These three respondents were deemed to have the best teams for the project by the entire Evaluation Committee and consequently moved on to the next phase. The teams were:

- Ames + Parsons Joint Venture
- Peter Kiewit Infrastructure Company
- PCL Construction Management

An RFP was distributed to the three proponents on January 5, 2016, with a closing date of June 21, 2016. The RFP set out the technical requirements for the two interchanges, and the proponents were to use the six months to prepare a competitive, technically compliant design that would allow them to estimate the costs of the interchanges. Ultimately, the lowest cost would win the opportunity to complete the design and construction of the two interchanges for the specified estimated lump-sum cost. An honorarium of \$200,000 was offered for the unsuccessful proponents in exchange for a release of their designs.

The Request for Proposals document consisted of:

- the RFP document, outlining all necessary parts of the proposal submission; and
- six Schedules including:
 - RFP Schedule 1 – The RFP Data Sheet, which had all the relevant information, such as project location, interim dates, honorarium details etc.;
 - RFP Schedule 2 – The Design Consultation process;
 - RFP Schedule 3 – Submission Requirements;
 - RFP Schedule 4 – An Administrative Checklist;

- RFP Schedule 5 – The Design Build Agreement; and
- RFP Schedule 6 – Key Firms and Key Individuals Form.

The draft of the Design-Build Agreement (DBA), in Schedule 5, contained a 95% final draft of all the parts of the agreement that could be negotiated and then would have to be executed, including terms and conditions of the design build and the following 13 schedules:

- DBA Schedule 1 – Definitions and Interpretation
- DBA Schedule 2 – Independent Certifier Agreement
- DBA Schedule 3 – Key Firms and Key Individuals
- DBA Schedule 4 – DBA Review Procedure
- DBA Schedule 5 – Works Report Requirements
- DBA Schedule 6 – DBA Design Builder Proposal Extracts
- DBA Schedule 7 – DBA Communications Protocol
- DBA Schedule 8 – DBA IMS Requirements
- DBA Schedule 9 – Technical Requirements consisting of General, Design and Construction Requirements;
- DBA Schedule 10 – DBA Payment Adjustments
- DBA Schedule 11 – Change Order Forms
- DBA Schedule 12 – Dispute Resolution Procedures
- DBA Schedule 13 – Insurance and Bonding Requirements

Secured Room for Review

It was necessary to ensure all interim and final submissions by the three proponents were reviewed in complete secrecy and that the submissions were kept within a closed group of individuals to prevent the ideas of one proponent from being leaked to another. A “Secured Room” was set up at ISL’s office in Saskatoon, and all submissions were opened and reviewed in that room. A digital lock was installed on the room and a log book of all access to and from the room was kept – no-one was allowed in or out of the room without authorization, and physical copies of the submissions were not allowed out of the room. Members of the Evaluation Committee and teams were required to sign a Confidentiality and Non-Disclosure Agreement before they were allowed entry to the room, and reviews of drawings, documents etc. were only allowed to occur within the room. A Fairness Advisor, who was available to witness the process at any time, oversaw the entire process. He also witnessed the opening of the envelopes for the Financial Submission.

An electronic digital data room was set up for each of the proponents to allow them full access to all documents that had been accumulated during the preparation of the reference design, including utility information, reference drawings, specifications, the reference concept, MHI standard drawings and so on.



Figure 3: The Secured Room

A total of two confidential technical meetings and one confidential legal meeting were scheduled over six months to assist each of the proponents with their submissions and ensuring technically compliant submissions. These meetings provided each proponent with an opportunity to confidentially present their designs to the evaluation committee at various stages of completion. These meetings usually happened immediately before each technical submission. Five technical submission evaluation teams were engaged in the process to assess each technical submission at several intervals during the process. These teams consisted of technical personnel from the Ministry and the Owner's Engineer and were separated into the following five disciplines:

- Roadway Geometry, Drainage and Intelligent Transportation Systems
- Bridge Structures and Retaining Walls

- Integrated Management System
- Geotechnical and Environmental
- Construction and Utilities

Each team came to the Secured Room to review submissions during the RFP phase. During this phase, several interim steps were outlined in Schedule 1 of the RFP as noted below:

Steps in the Procurement Process	Estimated Date
Data Room Accessible to Proponents	January 5, 2016
General Proponents Meeting	January 19, 2016
Confidential Meeting #1 (Technical #1)	February 23-25, 2016
Confidential Meeting #2 (Technical #2)	April 5-7, 2016
Confidential Meeting #3 (Legal #1)	April 26-28, 2016
Initial Technical Submission Deadline	April 19, 2016 at 2:00pm CST
Initial Technical Submission Evaluation Period	April 20, 2016 to May 17, 2016
Deadline for RFP Documents Comments	May 10, 2016 at 2:00pm CST
Issue Final DB Agreement	May 17, 2016
RFI Deadline (for technical issues)	May 17, 2016 at 2:00pm CST
Final Technical Submission Deadline	May 24, 2016 at 2:00pm CST
Final Evaluation Review	May 25, 2016 to June 14, 2016
Issue Letter Inviting Proponents to Submit Financial Submission	June 14, 2016
RFI Deadline (for RFP process issues)	June 15, 2016 at 2:00pm CST
Financial Submission Deadline	June 21, 2016 at 2:00pm CST
Announce Successful Proponent	June 28, 2016
Agreement Signing	July 13, 2016

Table 1: The Request for Proposals Schedule

Document Control

With the submissions being time-sensitive, a document control system was required that could not only keep track of all the incoming and outgoing documents, but also time-stamp, so there were no claims for a late submission or reply. A confidential SharePoint webpage was set up at the beginning of the project to keep track of submissions and responses. This worked in three ways:

- distributing notifications that submissions had been presented;
- time stamping and distributing the actual submissions to the various technical evaluation team members; and
- time stamping and distributing back to the Design-Builder the responses to those submittals.

Schedule 9 – The Technical Requirements and Reference Concept

A Reference Concept formed part of the Design Build Agreement and provided, at a preliminary design stage, what the Ministry desired in the design of the two interchanges. This included:

- approximate position of the two Interchanges;
- land allowances – a certain amount of land was acquired for both the interchange projects, any additional land was to be acquired by the Design-Builder;
- numbers and positions of lanes;
- accommodation of future work in the initial construction;
- sizes of bridge structures;
- the location of any known utilities; and
- other pertinent information at a preliminary engineering level.

Each interchange had certain mandatory requirements, which were described as follows:

Warman Interchange: Highway 11 is a four-lane divided provincial highway that is on the national highway system with a rural arterial designation that may be expanded to six lanes in the future. The through lanes on Highway 11 will be relocated to the east to facilitate interchange construction. No special consideration of over-dimensional load bypass-lanes are required at this facility. Highway 305 is a two-lane provincial highway with a rural collector designation that will be widened as part of the proposed Future Works. It is mandatory that the bridge structure be designed and constructed in such a manner that it can be widened to accommodate two lanes westbound and one lane eastbound as indicated on the concept drawing for Future Works for this structure. It is also mandatory that the overpass structure be designed to accommodate a northbound service road under the structure as part of the Future Works. The Reference Concept interchange for this location is a Diamond interchange modified to defer the northbound exit ramp. It shall include a mandatory loop ramp in the northeast quadrant designed to accommodate the construction of a future northbound C-D Road as well as a widened bridge structure. The Interchange shall also be designed to include a future loop ramp in the northwest quadrant. Construction of the earthworks for the final build abutment fills and the northbound to westbound loop ramp connection to the ultimate Highway 305 alignment is mandatory. Highway 305, which will overpass Highway 11, will be a two-lane roadway with shoulders across the structure. East of the northbound ramp terminal intersection, this roadway will be designated as a rural local road with a double sealed granular pavement. West of the interchange, Highway 305 will retain a rural collector designation with two lanes and shoulders. The existing railway crossing with the Carlton Trail Railway is currently uncontrolled. Flashing lights and bells are to be installed at this crossing. The Design-Builder shall coordinate this work with the appropriate authorities. At the interchange, all ramps will be single lane ramps. The existing Highway 11 roadway within the project area will be removed from the highway inventory and returned to local authorities. It will be re-designated as a two-lane local road with the existing northbound lanes reclaimed and landscaped. There will be

no direct access from this roadway to Highway 11. There will be an at-grade intersection with Highway 305. The north and south ends of this roadway will terminate in cul-de-sac turn-around designed with a 14-metre radius and designed to fit within the right-of-way of the existing roadway. Range Road 3045 will terminate on either side of the new Highway 11 alignment in a cul-de-sac turnaround. Range Road 3045 south will access Highway 11 at the Ferry Road intersection. Range Road 3045 north will access Highway 305 via the existing Highway 11 roadway. The extension of Highway 305 east of the interchange will be constructed to a local road standard merging with Range Road 3044 and terminating with a T-type intersection at Ferry Road. The existing intersection at Highway 11 and Central Street/Ferry Road shall remain open at all times during construction. All areas within the Road Right-Of-Way except for hard surfaces (roadway surfaces) shall be cultivated, shaped and top soiled, as required, and seeded. Seeding shall be as per Ministry's Specification 6025DB – Specification for Seeding. The Highway 11 and Central Street/Ferry Road intersection, however, will be modified as follows:

- Traffic eastbound on Central Street will be restricted to right-turning and left-turning movements only. Eastbound through traffic to Ferry Road will not be permitted.
- Southbound traffic on Highway 11 will be restricted to through (southbound) or right-turns (westbound) only. Left turns to Ferry road or U-turns will not be permitted.
- Northbound traffic on Highway 11 will be permitted to make all movements. The centre median and Ferry Road intersection will however be channelized.
- Westbound traffic on Ferry Road will be restricted to right-turns only. Neither the westbound movement across Highway 11 to Central Street nor the left turn movement to Highway 11 southbound will be permitted.

A summary of the mandatory requirements for the Warman Interchange included:

- a loop ramp in the northeast quadrant;
- construction of the earthworks for the abutment fills and the tie-in of the loop ramp into the widened bridge structure;
- provision for future bridge structure widening on both sides;
- provision for a future northbound C-D Road under the structure; and
- provision for future loop ramp in the northwest quadrant.

Similarly, the mandatory requirements of the Martensville interchange were described as follows:

Martensville Interchange: Highway 12 is a four-lane divided highway with a rural arterial designation that may be expanded to six lanes in the future. The Reference Concept Interchange for this location is a Diamond interchange modified to defer the southbound entrance ramp and to include a mandatory loop ramp in the northwest quadrant. The existing alignment of Highway 12 will be relocated west to accommodate the construction of the Interchange. No special considerations of over-dimensional load bypass-lanes are required at this facility. All roadways that are to be abandoned will be obliterated. All asphalt and granular materials shall be salvaged and shall become the property of the Design-Builder and removed from the site. Embankments shall be obliterated with all disturbed surfaces top soiled, seeded and otherwise landscaped without interference to or alteration of existing drainage patterns and watercourses. The northbound exit ramp will be a double lane ramp. All other ramps will be single lane ramps. There will be a mandatory two-lane auxiliary exit off the northbound exit ramp that will intersect with Centennial Drive South at 4th Street South at a signalized intersection. The existing northbound slip ramp will be removed. The westbound to southbound ramp will be a free-flow ramp merging with the eastbound to southbound movement immediately north of TWP Road 384. The Crossroad (Twp. Road 384/Main Street) will overpass Highway 12. West of the Project Limits, the Crossroad will remain a two lane rural local road with a gravel surface. The existing ditch on the south side of TWP Road 384 is to be

retained in order to avoid encroachment onto the adjacent residential property located on NW-20-38-05-W3. East of the interchange, the Crossroad widens to a four lane extension of Main Street with turn lanes intersecting with Centennial Drive at a signalized intersection.



Figure 4: Warman Interchange Reference Concept

The initial build of the overpass structure will accommodate two lanes with shoulders. It is mandatory that the bridge structure be designed and constructed in such a manner that it can be widened to accommodate two lanes westbound and one lane eastbound as indicated on the Reference Concept for Future Works for this structure. Construction of the earthworks for the future build abutment fills and the westbound to southbound loop ramp connection alignment is mandatory. Field access shall be provided at the NE-20-38-05-W3 and the SE 20-38-05-W3 off of Township Road 384 as well as to the SE-30-38-05-W3 (both sides of Highway 12). As well the two right-in / right-out service road accesses north of Poplar Drive will be closed. One new right-in/right-out will be constructed on the Highway 12 southbound lanes opposite of Poplar Avenue. All areas within the Road Right-Of-Way except for hard surfaces (roadway surfaces) shall be cultivated, shaped and top soiled, as required, and seeded. Seeding shall be per Ministry’s Specification 6025DB – Specification for Seeding. It shall be mandatory that existing dugouts within the Interchange right-of-way will be pumped dry and completely filled with material suitable for embankment construction.

A summary of the mandatory requirements for the Martensville interchange included:

- a loop ramp in the northwest quadrant;
- construction of the earthworks for the abutment fills and the tie-in of the loop ramp into the widened bridge structure;
- provision for future bridge structure widening on both sides; and
- backfilling of existing borrow pits within the interchange right-of-way.

The Design Build Agreement

The Design Build Agreement was the final document to be completed. This document was developed from a combination of similar agreements that MHI had developed for the Regina Bypass and another small design-build project, however these documents required a complete review and rewrite because of the different delivery methods. A P3 project (Private, Public Partnership) for a Design Build Finance Operate (DBFO) project

will concentrate on the longer term aspects of a project because the consortium involved will have to maintain the project for a set period of time after the project construction is complete. Therefore, the agreement is not so concerned with the short-term longevity of the project. However, in this case, the interchanges are to be handed over to the Ministry upon completion and apart from the usual warranty period of two years, any excessive maintenance required because of deficient design or construction techniques would be the responsibility of the Ministry. Therefore, the Design Build Agreement needed to look at the short-term requirements to ensure the design was robust. Some clauses in the DBA that addressed this were those surrounding the construction observation and reporting of deficiencies, the Independent Certifier and the payment adjustment clauses. The construction specifications also required some modification to make them more suitable for a Design Build project. The Ministry also set up a Works Committee of senior personnel from the Ministry, the Owner's Engineer and the Design-Builder who met on a monthly basis to discuss the project at a high level and express any concerns in a partnering setting. All these elements were combined into a made-in-Saskatchewan Design-Build Agreement.



Figure 5: Martensville Interchange Reference Concept

Design-Build Project Award

The project was awarded to Peter Kiewit Infrastructure Company on July 13, 2016. After the award, detailed design began in earnest, and Kiewit developed a schedule for the design to be completed by April 2017. This included weekly technical working group (TWG) meetings to discuss the overall design progress as well as several discipline specific meetings. Documents and submissions were controlled as described previously and Issued for Construction drawings were completed by April 2017.

Deficiency Reporting and Non-Conformance Tracking

A Non-Conformance Tracking System was set up within the Design-Build Agreement that allowed reporting of non-conformances by the Ministry and Owner's Engineer, and the Design-Builder. It is known that deficiencies occur with materials and methods during construction, and a methodology was devised whereby points would be accumulated for each deficiency during construction, without penalty, until a certain threshold was met, at which time cost penalties would be applied. Reoccurring problems will receive double points. This system gave the Design-Builder an incentive to report issues by not having points applied if the Design-Builder self-reported.

The Design-Builder was given a certain amount of time to correct the deficiencies, and if successful, the deficiencies would be removed from the record. If the deficiencies remained on the record and accumulated until the threshold was reached then penalties would be applied. Certain serious non-conformances result in Quality Failure Points being assigned.

During construction, time is of the essence with reporting of non-conformances and because of the system of points being given for non-conformance and their date sensitivity, a system needed to be in place that would not only keep track of the points but also track the timing of them. A Non-Conformance Tracking Process system has therefore been set up, similar to the one used on the Regina Bypass project, whereby the points given were entered into a database points for Non-Conformances to the Design-Build Agreement. Opus Stewart Weir developed and modified the original Non-Conformance Reporting Tracking System (NCRTS) for this project. The process is outlined in the graphic below and has two domains whereby either the province or the Design-Builder can report a Non-Conformance, and it is tracked until resolved.

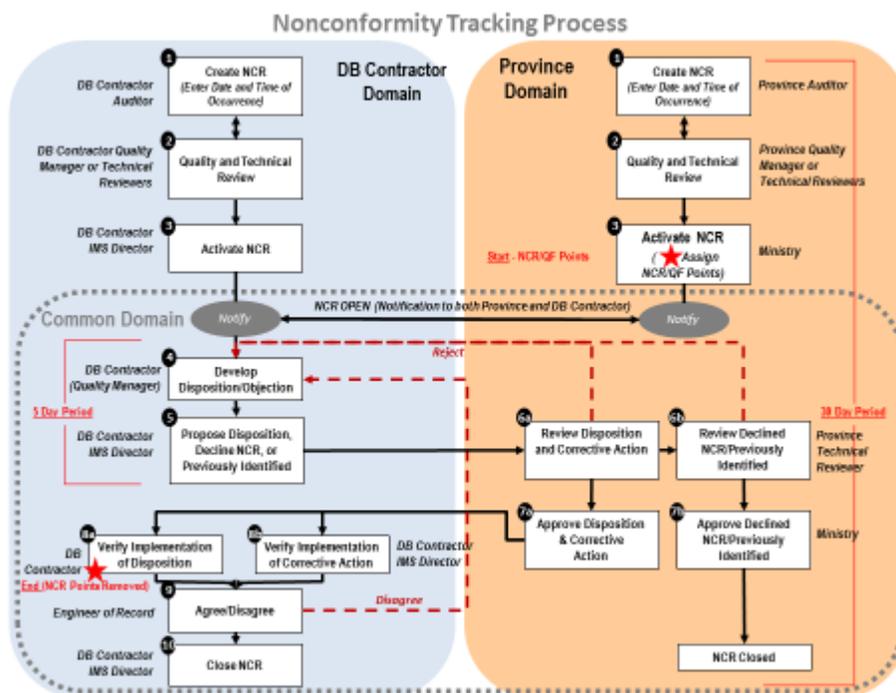


Figure 6: Non-Conformance Tracking Process (Graphic Credit: Opus Stewart Weir)

Audit During Construction

An audit team has been set up to conduct construction audits for this project. This team consists of technical expertise in roadway and bridge construction and administration from both the Ministry and ISL and will conduct audits throughout the construction of this project. The audit objectives are based on characteristics of processes, products, and the project itself, as well as contractual requirements, technical requirements and the need for supplier evaluation. The main audit objectives include:

- verifying conformance to contractual and technical requirements;
- determining the effectiveness of the Contractor’s management systems; and
- contributing to the improvement of the Contractor’s management systems.

The audit program scope consists of:

- IMS management plan effectiveness audits

- Bridge structure design audits
- Bridge structure construction activity audits
- Roadway design audits
- Roadway construction audits
- Traffic accommodation audits
- Utility construction audits
- Environmental audits
- Electrical and lighting design audits
- Electrical and lighting construction audits
- Drainage design audits
- Drainage construction audits
- IFC drawing audits

The audit criteria for establishing conformance are the Technical Requirements and the Contractor's management systems. Evidence will be acquired and assessed to the audit criteria. Non-conformances will be identified and documented in accordance with the Non Conformance Report Tracking System (NCRTS) processes and procedures. Audits will be conducted by audit team member(s) and relevant documentation, which may include drawings, technical requirements, written procedures, checklists, etc., are available for reference during the audit. Checklists were developed specifically for the project and will be used for reference by the auditor to confirm the audit investigation is comprehensive. The use of checklists and forms will not restrict the extent of audit activities. Audit activities may include the witnessing, monitoring and observing of construction work and activities, reviewing quality documentation, reviewing the Contractor's procedures, utilizing third parties to provide testing services on behalf of the auditor, conducting material fabrication audits, discussing work progress with the contractor's team members, reviewing and observing processes, documentation, and records related to the Integrated Management System (IMS). Two types of audits will be conducted:

Field Surveillance IMS Audits – These are performed daily and are scheduled or unscheduled field audits conducted on a random yet systematic basis. The objective of these surveillance audits is to monitor the Design-Builder's activities, including but not limited to workmanship, performance measures and general quality of materials. The auditor acting reasonably shall, during the performance of surveillance IMS Audits, record any observations and inform the Design-Builder of any deficiencies that require further evaluation. Any noted deficiencies shall be resolved to the satisfaction of the Minister through evidence of the Design-Builder's deficiency evaluation findings or the Non-Conformance process.

Internal IMS Audits – These are scheduled "system" audits, which are conducted at 6-month intervals to assess the performance of and compliance of the Contractor to the IMS. The auditor contacts the IMS Director and confirm the scope and schedule of the audit, and the schedule for associated audit meetings. At the audit-opening meeting with the Design-Builder, the auditor shall review the audit scope and objectives. The auditor will then conduct audit interviews, and document any observations on prepared checklists. At the end of the audit interviews, the auditor shall evaluate the observations and identify observed procedural or performance Non-Conformances that require Corrective Action. At the audit review meeting, completion of the audit, the auditor shall discuss the observations and inform the Design-Builder of any observed Non-Conformances and audit recommendations. The auditor may audit or inspect the Design-Builder's Quality Management Plan or procedures, quality records and results, and may perform reviews or undertake its own audit, inspection, sampling, or testing of any part of the Work at any time.

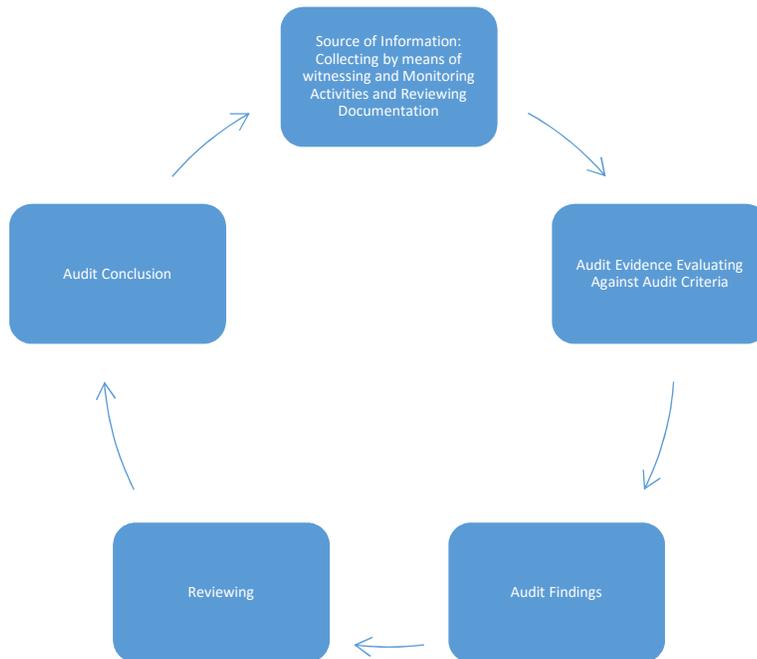


Figure 7: The Audit Process

Audit Findings and Documentation

Audit findings will be documented using the Audit Report function of the NCRS, and these forms will be completed in digital format on tablets in the field. The “Activity”, “Witness Point”, and “Audit Function” fields contain populated drop-down menus from which the auditor must make a selection. The ‘Audit Report’ will also record text which describes progress, measurements and observations made, photographs taken, non-compliances identified, and referenced documents. Multiple ‘Audit Report’ documents will be completed each day if the Contractor performs more than one activity, since one form per activity per day will be generated. At the conclusion of the weekly audit cycle, the previous week’s ‘Audit Report’ documents will be compiled and summarized in the ‘Weekly Audit and Non Conformance Report Summary’. This summary report will verify that the Audit Program is being followed, will track progress in construction, and will identify non-conformances. The ‘Weekly Audit Summary Report’ will not be performed using the NCRS. Other issues that are not identified as non-conformances but are construction issues nonetheless will be tracked on the Project Issues log. Audit evidence will be evaluated against the audit criteria in order to determine audit findings and compliance to the contract. Audit findings can indicate conformity or non-conformity. Nonconformities and their evidence will be recorded on the “Audit Report”, and audits will be reviewed on a weekly basis to determine any trends in findings, or discrepancies in the Contractor’s quality control program. Audit findings will be tracked on an “issues log”, and will be reviewed with the Contractor on a weekly basis during regularly scheduled quality meetings. Corrective actions and any remedial action will be discussed at this time. The items registered in the ‘issues log’ will be categorized as non-conforming (N), outstanding (O), on warranty (W). The ‘issues log’ is separate from the NCRS. Audits will record nonconformities by referencing these to the established audit criteria, which include Drawings and Technical Requirements. Where the Contractor fails to produce noncompliance documentation, the non-compliance will be documented using the NCRS, which will be initiated by the Ministry or Owner’s Engineer.

The Role of the Independent Certifier

An Independent Certifier was retained jointly by the Ministry and the Design-Builder to review invoices, conduct Road Safety Audits and develop an impartial monthly report to discuss the progress of the project. The role of the independent certifier is to:

- conduct Safety Audits at specified junctures throughout the project;
- review the progress of the project in relation to the Design-Builder’s approved schedule;
- review information as it relates to Relief Events;
- review information relating to Change Orders;
- prepare a monthly progress report;
- attend meetings as required;
- conduct inspections as required; and
- other independent certification duties as required.

Through the Design-Build agreement, in the case of disputes, the Independent Certifier is being paid jointly by the Ministry and the Design-Builder to provide an incentive to the Design-Builder to escalate issues to the Independent Certifier as little as possible. Terms and conditions exist within the Design-Build Agreement to specify how change orders are escalated and resolved by the Independent Certifier and when the Road Safety Audits are required.

Progress So Far

The Issued for Construction designs for the two interchanges were completed in April 2017, and construction has started on the roadway pre-grading and abutment piles. At the time of publication of this paper, the Design-Builder has started driving piles for the interchange bridge abutments.



Figure 7: Progress on Martensville Abutment Piles



Figure 8: Progress on Warman Abutment Piles

Conclusions

The entire process described above has taken almost two years to get to construction commencement. The Ministry now has robust Design-Build documents that can be used on future projects which were developed so that changes due to different project requirements can be easily modified in appendices, rather than changing entire sections of the agreement. There are two conclusions that were reached after this process was complete:

Degree of Freedom of Proponent in Design versus Owner Requirements – The Owner likely has a lot of experience with different materials and methods that they may want to see incorporated into the project. Often, they have had good experience with maintenance of a particular brand of some component of the construction. On the other hand, the Design-Build proponent needs to make sure the design is efficient and also to keep the costs down by specifying a product that is cheaper. The ability to realize huge cost savings in a Design-Build environment comes from the Owner’s surrender of their design requirements. Yet, that comes at a cost for many owners – the knowledge that something completely specified by a Design-Builder may not have the long-term operational requirements of a traditionally design-bid-build project. This creates a dilemma for the Owner – give up freedom for innovation by specifying inflexible design elements. A sophisticated Owner will know what elements of the design should be controlled with specifications and design. The decision to go with an alternate delivery method should be made with this in mind.

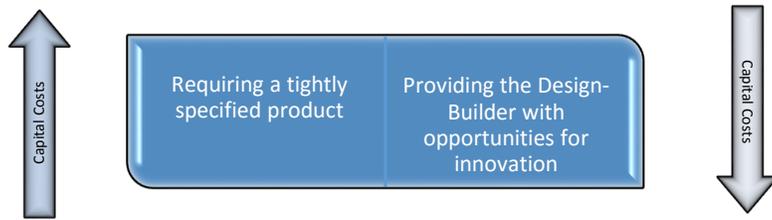


Figure 9: Degree of Freedom of Proponent in Design versus Owner Requirements

Complexity of Documents, Processes and Systems – An alternate project delivery method can be more complex to set up and maintain than a more traditional design-bid-build project. Oftentimes documents do not exist or are too generic for use in an actual project situation which will require that an Owner’s team (in this case the Ministry and their Owner’s Engineer) have to spend considerable time developing RFQ, RFP and DBA documents for use in an actual project situation. Because of the lack of experience in administering these types of projects, there will be a tendency to try to cover all eventualities in the design, the construction and the administration of the project which leads to very complex documents. In this case, a team of senior personnel from the Ministry, Saskatchewan Justice and the Owner’s Engineer spent many hours developing these documents.