Alberta

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Government of Alberta ■ Transportation

TECHNICAL STANDARDS BRANCH VOLUME 8, Issue 1, October 2009

Editor's Remarks

The October Newsletter contains articles on the Alberta Transportation In-House Engineering Initiative, Racked Seal Coats, The Athabasca River Bridge - Girder Launching, and Tech Talks.

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Highways for **LIFE**

LIFE *is an acronym for*
Longer-lasting highway infrastructure using
Innovations to accomplish the
Fast construction of
Efficient and safe highways and bridges.

Best Safety Lies in Fear

Hamlet Act 1, Scene 3 Shakespeare

IN THIS ISSUE

Racked-In Seal Coats

by
Jim Gavin
Surfacing and Aggregates

Seal coating, using either single sized (chips) or graded aggregate, has been used as a surface treatment on Alberta roadways for more than 40 years. There is a general consensus within Alberta Transportation and many rural road agencies that seal coating is a highly effective and inexpensive treatment for preserving pavements. However, this type of construction often generates complaints from the travelling public, especially on higher volume roadways. The main complaint involves vehicle damage due to "loose chips" that often occurs during construction.

Chip seal coats are constructed by first spraying a cationic emulsion (approximately 2 l/m^2) using an asphalt distributor and then covering with a layer of single sized aggregate. After rolling the chips, traffic is allowed to pass over the seal coat at a reduced speed of 50 kph. This aids with alignment and compaction of the chips into the emulsion however, loose chips can also be kicked up by speeding motorists onto other vehicles. This can lead to complaints being directed to the contractor, consultant and department staff.

The department continually looks at using different materials and/or placement techniques to help alleviate this problem. This includes: the use of polymer modified emulsions, fog coating the swept seal coat surface, using a pre-spray application of binder outside of the wheel paths and using a two-stage aggregate application process referred to as a racked-in seal coat.

The following briefly describes racked-in seal coats.

With the racked-in process the emulsion application remains the same. The first application of 12.5 mm chips is approximately 20% lower than the design application rate. Note that in a regular chip seal the target aggregate application is usually 5 to 15% higher than the design rate with the excess aggregate being swept after sufficient compaction and curing of the emulsion. The under application in the racked-in process allows room for a second application using the smaller chips (5 to 8 mm). These smaller chips are meant to wedge or rack themselves between the large chips. The intent is that any excess chips or chips not firmly bound with emulsion would be of the smaller size and therefore less damaging in a "flying chip" situation.

This process was first tried in July 2008 on a 12.8 km section of Hwy 39 west of Leduc. The project was successful and there were no complaints received in regards to loose chips and the general observation when driving over the newly placed surface was that any excess chips or loose chips were the smaller size.

For 2009, a second trial project was constructed on Hwy 2A south of Leduc. The same process was also recently used on Hwy 63 in the City of Fort McMurray to address a construction deficiency. The long term performance of a racked-in seal coat is expected to be the same as a regular chip seal, however; the Department will continue to monitor that aspect.

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Alberta Transportation
In-house Engineering Initiative
by
Jeffrey Xu
Design, Project Management and Training

Background

In 2008 Alberta Transportation implemented a strategy to "Retain Technical Expertise". The objective and goal of this initiative is for the department to maintain its status as a knowledgeable owner. Undertaking in-house engineering projects using internal engineering and technical staff supplemented with external consultants is one of three main components in this initiative. Others are formal training and placement of department staff in consulting engineer's offices and project management teams for work experience. Alberta Transportation has worked on in-house engineering projects since December, 2008.

Purpose

The purpose of this initiative is to 1) allow department staff to better understand how consulting engineers work while delivering planning, design and project management projects for Alberta Transportation and 2) allow department staff to learn particular engineering and technical skills so that they can be more effective in their current and future roles for AT.

Scope

This initiative is intended to "retain technical expertise" in all aspects of Transportation and Civil Engineering. All department engineering and technical staff can participate in this initiative. The work in question is generally described as "engineering and related". The types of work include Highway Planning, Highway Design, Geotechnical Engineering, Pavement Design, Environmental Engineering, Water Resource Engineering and Design, Bridge Planning, Structural Engineering and Design, Safety Analysis, and Traffic Engineering.

Project Set-up

Projects can be either initiated by TSB or Regions. The project director/lead of a small project only needs to fill in project outline form and organization chart. For large project (multi-discipline engineering work), the project director shall submit a formal proposal. All projects are subjected to the Director of Design, Project Management and Training's (DPMT) approval.

Project Report Requirements

In order to track all the in-house engineering projects, by the end of each month, project directors/leads send monthly reports to DPMT. DPMT summarizes them and prepares a final monthly report for the DEC. For reference purposes, all finished project final reports are sent to DPMT for records.

The department has begun work on 74 projects since December, 2008; a total of 24 projects have been completed by the end of June, 2009.

Currently, the largest design project is Bergthal Road Interchange Detailed Design. This project involves engineers and technologists from Highway Design, Water Resource Engineering and Design, Bridge Planning, Structural Engineering and Design, Highway Operations, Pavement Design, Environmental Engineering, Geotechnical Engineering, and Regional land agents. The preliminary engineering survey has started in September, 2009; geotechnical engineering survey will start in October, 2009.

Bergthal Road Interchange

Department employees can peruse related documents and monthly reports on the department **intranet** at

https://intranet.transportation.alberta.ca/TCE/TSB/RTE/Shared%20Documents/Forms/AllItems.aspx

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Athabasca River Bridge - Girder Launching

by
Rizwan Hussain
Bridge Engineering and Water Management

Background

The existing bridges over the Athabasca River in Fort McMurray are part of the 4-lane Highway 63. Traffic volumes are growing due to increasing industrial, commercial and residential developments. Alberta Transportation identified that this highway in the urban services area needed a new 5-lane north bound bridge over the Athabasca River to accommodate the growing needs of the region and that the existing bridges over the Athabasca River required major rehabilitation in the future to carry southbound traffic.

Bridge Description

The construction of the new 5-lane northbound bridge started in June 2008 and is scheduled for completion by June 2011. The total length is 472 metres with the longest span of 76 metres. The bridge has 10 girder lines of 3 metre deep welded steel girders. The new 5-lane bridge has out to out deck width of 33 metres resulting in a deck area of 15,500 square metres, making it the largest bridge deck in Alberta Transportation inventory.

Stantec/CH2M Hill was the designer and Flatiron Construction is the contractor on this 127 million dollar project. This bridge is designed to accommodate 6.4-metre wide; 2.25 million pounds (10,000 KN) overload vehicles which are approximately 12 times the weight of a normal design for truck.

Bridge Design

The design was a structural challenge that required innovative aesthetic, geotechnical, hydraulic and environmental solutions. In order to avoid disturbing fisheries spawning season, the in-stream construction window on this project was limited to mid July to mid September. With stringent requirements, the project team ruled out conventional erection methods for this bridge and the contractor decided to launch girders incrementally in an innovative way.

The Athabasca River Bridge design is typical for long span structures that cross rivers. What sets this bridge apart is not the structure itself but rather the launched-girder erection technique, which eliminates need for temporary erection towers in the river and piece-by piece “in place” erection of structural steel required by conventional methods.

The launching system was designed by Surespan Construction/Infinity Engineering. The steel girders were originally designed to be preassembled and launched from the abutment. The steel girders were fabricated in Quebec and British Columbia. Girder launching equipment was shipped from United Kingdom to Fort McMurray by sea/rail.

Girder Launching

The launch system included a pit to accommodate the construction, at grade, of a super-structure length of 64 metres prior to launching. A series of 10 temporary steel rails were equipped with vertical and horizontal rollers to support and guide girders during launching. A vertical bearing roller beneath the bottom flange of each girder supported the mass of each girder line. The guide rollers were positioned to roll against the edge of the bottom flange. A total of 10 vertical bearing rollers and 4 horizontal roller guides were placed at abutment and pier locations.

Vertical bearing rollers support each girder on its bottom flange, horizontal guide rollers provide alignment control.

The leading end of the steel girder unit was equipped with a tapered launching nose that consisted of tapered I-girders bolted to the leading end of permanent interior girders. The launching nose attached to the front of the first span was 24 metres long. The primary purpose of the nose was to touch down on top of the landing pier rollers and then recover or lift permanent girders upward into position as the girders continued to be launched forward longitudinally. By design, dead load deflection of the leading span was accommodated by the tapered form of the launching nose.

Large hydraulic jacks pushed structural steel into place on a system of guided roller bearings. The entire steel bridge deck system, including all diaphragms, lateral bracing and drain pipes, was launched at a pace of approximately 5-10 metres per hour.

Temporary launching nose will be bolted to leading end of permanent girders to accommodate dead load deflection.

The launched erection consisted of the following:
- Place girder segments in 10 girder lines on the intermediate supports, girder sled and Hillman roller at abutment location
- Secure girder segments horizontally and transversely by installing bracings
- Attach launching nose (leading edge) to girder train
- Jack the girder train (all 10 girder lines) forward longitudinally from north abutment
- Remove tail section and splice additional girder segments to the tail end of the girder train
- Reinstall tail section and jack girder train longitudinally
- Repeat sequence until superstructure is totally launched

Girder segments pre-assembled adjacent to abutment and pushed incrementally across bridge piers

End of the girders at launching pad connected with tie beam. Strand jacks mounted at end of each of launching rails and operate with 4-18mm diameter strand.

Launching in progress. Millions of pounds of structural steel pushed by customized equipment. During process, tapered launching nose touches down on top of landing pier rollers and lift permanent girders upward into position

View of launching in progress.

After launching, the bridge will be lowered onto permanent bearings and concrete deck will be cast.

Summary

Incremental launching is designed for environmentally sensitive areas and locations with restricted access. With the interim successful launching of over 3 spans, the project team pushed the limits of conventional construction techniques. This project shows that incremental launching can be successfully performed on long span steel I-girder bridges. Lessons learned will be beneficial in constructing future bridges.

Once construction is complete in 2011, residents of Fort McMurray will have an infrastructure that will be aesthetically pleasing, cost effective and constructed without compromising the environment.

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Tech Talks

by

Bill Kenny
Ron Stoski

On September 23 fifteen people partook in the first Tech Talk of the season at the Twin Atria. Bill Kenny started with an Update on the In-House Engineering Initiative. Jim Gavin followed by outlining Recent Developments with Chip Seals in Alberta. Both presenters got the opportunity to open to discussion the many questions raised by participants.

What is a Tech Talk?

It is a 15 to 20 minute presentation on a topic that may be of interest to you. The topics are current, somewhat technical, and presented informally with a question and discussion period. The presentations are designed to ensure that the subject matter is understandable by people working outside the specific technical area.

Attending a Tech Talk is an excellent way for you to learn about developments outside your normal work area as the Tech Talk provides you with a quick overview about topics that are currently important to other areas of Alberta Transportation. Attending also gives you a vehicle to meet people from various sections within the department.

The Tech Talk calendar for the next six months is shown in Figure 1. Details for each Tech Talk will be finalized and emailed about one week before the presentations.

If you would like to be a Tech Talk presenter and/or have suggestions for future topics or require additional information, please contact:

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Tech Talk Calendar

October 28, 2009
Regional Ring Road -Jim Der and Julian Macdonald

Winter Communications Plan - Sharla Griffiths

November 25, 2009
Primer on Environmental Approvals - Ron Middleton

AVLS, RWIS - Allan Lo and Beata Bielkiewicz

December 9, 2009
Alberta Traffic Safety Plan Initiatives
- Bill Kenny and Richard Chow

Update on Department Initiated TAC and C-TEP Projects - Bill Kenny and Richard Chow

January 27, 2010
Roadside and Median Barriers
Changes in Practice due to New Products
- Peter Mah

Transportation Planning Master Plan - Jim Der

February 24, 2010
Traffic Safety – Alfred Tauscher
Work Zone Traffic Accommodations

Potential Future Topics
Three Years of Dynamic Modulus Testing
-Chuck McMillan and Marta Juhasz

Location: Athabasca Room, Twin Atria Building
Time: 1430

Figure 1

If you would like to publish an article or to comment on the TSB Newsletter please contact:

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Previous editions of the TSB Newsletter are posted at:
http://www.transportation.alberta.ca/1881.htm