TSB Newsletter

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Editor's Remarks

This edition of the Technical Standards Branch (TSB) Newsletter contains articles on Alberta's Regional Traffic Management Centre (TMC) Demonstration Project, a Geotechnical Instrumentation Workshop, the 7th International Conference on Managing Pavement Assets (ICMPA), Strategies to Reduce Wildlife Vehicle Collisions on Rural Alberta Highways Workshop, Winter Friction Testing and Technology Transfer and Technical Training.

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Highwood Pass on Highway 40

IN THIS ISSUE

Alberta's Regional Traffic Management Centre (TMC) Demonstration Project

Allan Lo
Highway Operations

As the growth in Alberta's economy and population continues to escalate, the Province recognizes the need to manage ever-growing demands for safe and efficient flow of goods and people by using Intelligent Transportation Systems (ITS). In 2000, Alberta's transportation department developed an ITS Strategic Plan to guide the deployment of ITS projects for the next decade.[1] One of the first major undertakings commissioned after the Plan was an ITS blueprint development for the province's busiest highway corridor linking the cities of Edmonton and Calgary.[2] From this *Blueprint*, the Deerfoot Trail in the city of Calgary was identified as very distinct from other highway segments along the corridor as it was experiencing unprecedented traffic growth, leading to very high congestion and collision problems.

Deerfoot Trail was planned, built and maintained by the City of Calgary in the 1960s and extended in the 70s and 80s. While it serves as a vital transportation corridor for Calgary, it also acts as a key connector for the province's major North-South Highway and has both rural and urban setting characteristics. In May 2000, the Province took over the jurisdiction of the Trail through a transfer agreement. The Province constructed several interchanges along the Trail and built an extension to connect with Hwy 2 to the south; thus, forming an important part of the Canada-US-Mexico Trade Corridor (CANAMEX). While all the improvements helped to make the Trail a true freeway system, it also brought increased traffic. For the 53-km long (mainly six and eight-lane cross-sections) Deerfoot Trail, the 2007 traffic volume varied from 32,000 to 182,000 Average Annual Daily Traffic (AADT) and the total number of collisions averaged nearly 2,000 every year.

In June 2005, the City cut the ribbon on their million-dollar Traffic Management Centre (TMC) at their Manchester Centre near the downtown core.

Calgary TMC

The TMC is approx. 130 m^2 (1,400 sq. ft.) and is home to multiple systems used by the City for traffic and incident management and as a traveler information system. The City's 24/7 dispatching operation for roads maintenance is also based at the TMC. The TMC is staffed by seven full-time staff, two of which are devoted to traveler information tasks (Advanced Traveler Information System – ATIS). As of December 2007, the TMC operated 33 traffic cameras at strategic locations in the city. Of these, five are located along a seven-kilometre section of Deerfoot Trail to provide both visual and automatic incident detection capabilities. As part of the Alberta regional TMC demonstration project, the TMC also coordinates the display of messages on the 10 portable and 2 permanent Dynamic Message Signs (DMS) along the Deerfoot Trail.

A working committee consisting of staff from each organization and the private maintenance contractor (Carmacks Enterprise) was formed. The City representatives included TMC management and staff and the Advanced Traveler Information Systems Engineer. The Province was represented by the ITS Specialist and the district Operations Engineer while Carmacks was represented by the general manager and superintendent. Meetings held in the summer of 2007 defined the demonstration project scope and developed an action plan. Key people from this committee were assigned tasks to manage and coordinate; the many other city, provincial and maintenance contractor staff to bring this project to fruition.

Portable DMS

[1] Alberta Infrastructure, *ITS Strategic Plan*, September 2000, Edmonton.
[2] Delcan Corporation, *ATIS and ATMS Blueprint for Highway 2 between Edmonton and Calgary*, March 2004, Edmonton.

The six-month demonstration project ran from November 2007 to May 2008, and encompassed winter and summer periods. Based on all the components and services to be provided, the cost was agreed to be just over $220,000. The objectives for the project were:

- Reduction in incident duration, traffic delays and secondary collisions through early detection and verification of incidents, unusual traffic patterns, emergency situations and debris hazards on the Deerfoot Trail so Carmacks can provide immediate response where appropriate along with any other emergency management response (fire, police and medical).
- Reduction in travel delays due to weather-related events through monitoring road conditions during severe weather events (summer and in particular winter events) that will help (and possibly reduce the need in some cases) Carmacks with their maintenance patrolling efforts.
- Increase in maintenance effort efficiencies through better allocation of Carmacks patrols at higher-priority events and elimination of false reporting.
- More accurate and up-to-date traveler information through integration of traveler information services being performed by Carmacks and by the City of Calgary as well as elimination of duplicating efforts.
- Enhanced coordination of real-time message display for motorists through coordination of electronic signs under the Province's control and ones under the City TMC control.
- Reduction in overall traffic impacts on drivers and mitigation of driver frustration level through implementation of special traffic signal timing plans at specific interchanges to handle detours, coordinated display of messages, updated traveler information on media outlets and web site, and through more proactive response by Carmacks and other emergency agencies.

Portable DMS Specifications:

Portable DMS from various manufacturers were deployed on Deerfoot Trail for this project:

6 DAKTRONICS model VP-4000
2 DAKTRONICS model VP-1000 and
2 ADDCO model SOLAR-LED

All DMS used a Cypress CTM-132 modem for communications on TELUS 1xRTT wireless data network. In addition, the TMC staff coordinated with Alberta Transportation's Coordination and Information Centre (CIC) in Edmonton to display appropriate traffic messages on the two permanent overhead DMS near the Calf Robe Bridge.

Figure 1. Map of Traffic Cameras, DMS, Detour Routes and Affected Signals

Wireless Communications Specifications:

The wireless communication equipment used for traffic signal communication was ENCOM model 5200 operating in the 900 MHz band.

Detour Signal Optimization:

The detour route traffic signals were modeled using the SYNCHRO 7 software and a number of special timing plans were created for the various detour scenarios. These plans were entered as events into the MIST traffic control system for rapid execution of timing plans for the entire corridor. The special traffic signal timings designed to handle extra volume from any diversions on Deerfoot Trail were tested in the field by the TMC staff to ensure that they would work properly when activated.

Advanced Traveler Information System (ATIS):

As a cost effective method of gathering data from users of Deerfoot Trail during the pilot project, the City of Calgary on behalf of the Province designed and implemented a survey that was made available to the public for two weeks near the beginning and end of the project. The survey was conducted online as well as in a mail-out if requested. The questions were designed to provide an indication of how the different traveler information formats that were available via the City of Calgary's website, the en-route DMS, the Traffic Advisory Radio (TAR) and through the media such as television and radio, were perceived and used by the public to make travel decisions. It is anticipated that future surveys on a larger scale will be required to confirm any information gathered through these short surveys, and provide statistical significance to the numerical results.

Project Results

For the period November 15, 2007 to March 31, 2008, the TMC recorded and responded to a total of 137 incidents. The incident categories were as follows:

- Major incident 25
- Intermediate incident 53
- Minor incident 59

General definitions and examples of minor, intermediate and major incidents are:

Minor - Stalled vehicle moved to shoulder
Intermediate – Peak period right lane closed
Major- Two lanes closed during peak period, eg. collision. (Typical peak period 06:30-08:30 and 16:00-18:00)

Monthly detailed reports of these incidents were captured and recorded in a MICROSOFT ACCESS database. While it is difficult to quantify the impact of the project on the travel behaviour/decision of motorists, volume data recorded by the MIST system for the Barlow Trail N.E. detour route indicated an increase of approximately 30% (850+ vehicles/hr) when the DMS, ATIS and TAR advised motorists to use the Barlow Trail alternate route. Typically, the detour timings were activated about twice a month.

Depending on the nature of the incident, the TMC staff would either record a video clip of the incident in progress or get a snapshot of the incident scene for archival purposes. A log was kept for all DMS activations detailing the reason for the activation, the message displayed and when the message was turned off. Each incident had a severity level assigned to it. These ranged from severity A (minor incident) to severity E for the most serious, eg. Deerfoot Trail completely closed or its capacity greatly reduced. As indicated above and for ease of presentation, the five severity levels (A to E) were condensed into minor, intermediate and major incident categories.

Generally, poor weather increased the number of incidents recorded in any given month. There were also quiet periods when very few incidents were recorded. There were at least two incidents when Deerfoot Trail was closed completely to traffic for several hours. In one incident, a person trying to cross northbound lanes of Deerfoot Trail was hit by a vehicle resulting in closure of northbound lanes of Deerfoot Trail while the Police Service conducted their investigation. The DMS, ATIS/TAR and detour signals were all activated for this tragic event. In another incident, due to a rare atmospheric condition, some wood power poles situated close to Deerfoot Trail ignited and the Police Service closed Deerfoot Trail to all traffic for several hours while the power utility personnel dealt with the situation. Again, the motorists were advised via the DMS as to the reason of the closure and to seek alternate routes.

Carmacks was provided with access to the City's web streaming system and this proved to be very useful to them for verifying incidents reports, checking road and weather conditions which resulted in accurate knowledge of conditions in the field and increased operational efficiency. The TMC staff was able to help the maintenance contractor during severe road weather conditions with the selection and display of suitable messages to advise motorists of conditions downstream of their destination. This was necessary because during severe road weather conditions, maintenance contractor personnel were busy performing plowing and sanding, and generally did not have time to post important road advisory messages.

Table 1. Detour Routes and Corresponding Signal Control Work

#	Intersection #	Street	Avenue	Communications
NB & SB Deerfoot Trail alternate route from Country Hills Bvld. to McKnight Blvd. N.E.				
1	903	Barlow Trail	Country Hills Bvld	No
2	902	Deerfoot Trail	Country Hills Bvld EB Ramp	No
3	934	Deerfoot Trail	Country Hills Bvld WB Ramp	No
4	917	Freeport Drive	Country Hills Bvld	No
5	914	Barlow Trail	Freeport Blvd	No
6	916	Barlow Trail	100th Avenue	No
7	904	Barlow Trail	Airport Trail	No
8	1	Barlow Trail	Airport Road	No
9	56	12th St. NE/Aviation Bvld	McKnight Blvd	No
10	57	19th St. / McCall Way NE	McKnight Blvd	No
11	58	Barlow Trail	McKnight Blvd	Yes
NB & SB Deerfoot Trail alternate route from Memorial Drive to McKnight Bvld. N.E.				
1	274	Barlow Trail	Memorial Drive (S)	Yes
2	273	Barlow Trail	Memorial Drive (N)	Yes
3	272	Barlow Trail	3 Avenue	Yes
4	257	Barlow Trail	Centre Avenue	Yes
5	231	Barlow Trail	7 Avenue	Yes
6	168	Barlow Trail	23 Avenue	Yes
7	156	Barlow Trail	27 Avenue	Yes
8	141	Barlow Trail	32 Avenue	Yes
9	85	Barlow Trail	37 Avenue	Yes
10	786	Barlow Trail	39 Avenue	Yes
11	58	Barlow Trail	McKnight Blvd	Yes
12	56	12th St. NE/Aviation Bvld	McKnight Blvd	No
13	57	19th St. / McCall Way NE	McKnight Blvd	No
14	58	Barlow Trail	McKnight Blvd	Yes

For major incidents, the TMC and maintenance contractor personnel communicated and made decisions as to whether the detour signal timings needed to be activated along with the appropriate DMS messages and ATIS/TAR advisories.

Finally, as a surrogate measure of the success of the project, the number of phone-in complaints received by the maintenance contractor's call centre and Alberta Transportation's office regarding delays on Deerfoot Trail dropped significantly since this project started in mid-November 2007.

The dissemination of information via the 12 DMS, ATIS and TAR can be credited with a drop in the number of public complaints. Carmacks advised that the number of faxes sent to media outlets also went down dramatically (200 vs.900 in a typical month).

This was attributed to the more effective and efficient dissemination of Deerfoot Trail traveller information via the web and ATIS. The call centre personnel were trained to enter Deerfoot Trail related incidents on the City's ATIS system after regular business hours and weekends. The integration and coordination efforts achieved by the TMC and Carmacks personnel through this project were instrumental to the overall success of the demonstration project.

Conclusions and Lessons Learned

A project of this type requires solid teamwork between various participating agencies and a desire to see the project succeed. While most issues are of an operational or technical nature: institutional and legal issues must not be under-estimated. For example, obtaining the necessary approvals and preparing the legal contract for services. Based on feedback from Alberta Transportation, Carmacks Enterprises and the City staff, this project has not only been a success but has also achieved most of the goals identified in the initial Terms of Reference. We believe the template used in Calgary can be used in other jurisdictions in Canada for similar types of projects between municipal and provincial transportation agencies. Some of the lessons learned are:

- An operational procedure document must be developed early on and agreed to by all parties.

- Communications between the TMC and the maintenance contractor is critical for timely responses to incidents. Key personnel must be available via phone/cell phone for quick analysis and decision making. This type of operation cannot be done successfully via e-mail or voicemail due to tight time constraints.

- The upkeep of field equipment and wireless communication is vital for keeping motorists apprised of events/conditions on the highway. On a number of occasions, the DMS would not respond due to the batteries not charged enough via the on-board solar panels. The DMS had to be hauled back to the shop and charged by battery charger before returning to the field.

- The best tool for detection/verification of incidents was the five traffic cameras monitoring traffic flow on the highway. Again, these tools are only useful if they are available when needed, i.e. the cameras and associated wireless communication need to be maintained and replaced quickly if malfunctioning. This would require availability of spare parts, bucket truck and trained personnel.

- Coordination between TMC staff and ATIS staff was key in getting the word out on the web and the Traffic Advisory Radio for handling of major incidents.

- There was a flurry of media interest (print media, TV and radio) soon after the official press release on December 10, 2007.

- All components used in the demonstration project were fully utilized to their maximum capabilities. Cameras for detection/verification of incidents; DMS for motorists advisory; website and the Traffic Advisory Radio for the dissemination of traveller information; detour special traffic signal timings for moving the traffic away from the affected areas; wireless communications with the maintenance contractor personnel in the field, etc. were all effectively used throughout the project. If this Regional TMC is to continue, the various ITS components will have to be increased to cover the entire length of the corridor.

- The Regional TMC concept demonstrated that it is indeed feasible and desirable to manage and coordinate all ITS technologies from various jurisdictions/parties through a single centre staffed with the right technical capabilities.

- While the demonstration project is not complete, encouraging results have prompted the Province and the City to negotiate for the service to continue on a temporary basis and to discuss if such a Regional TMC arrangement is to become a permanent solution.

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Geotechnical Instrumentation Workshop

Fred Cheng and Rocky Wang
Geotechnical and Materials

The Geotechnical Society of Calgary held a Geotechnical Instrumentation Workshop on April 25, 2008. The workshop was attended by 125 people representing consultants, oil sand companies, Alberta Environment, and Alberta Transportation. The keynote presentation was on planning for an instrumentation program and was followed by three technical presentations and concurrent technical sessions.

The first technical presentation provided updates on instrumentation lightning protection and Micro-Electro-Mechanical Systems (MEMS) tilt sensors and data loggers. MEMS tilt sensors have moved from research applications to commercial availability. These devices are complete systems-on-a-chip and as a result of batch manufacturing are relatively low cost. They are expected to result in unprecedented levels of functionality, reliability, and sophistication. Compared to previous technologies, the new MEMS equipped devices provide users with better precision and higher durability.

A case study was presented by Corey Froese of the Alberta Geological Survey, on the Turtle Mountain (Frank Slide) Monitoring Project where satellite-based ground surface movement monitoring technology and a warning and emergency response system is in place to notify an emergency team should a portion of Turtle Mountain start to move beyond a threshold level. This type of monitoring and integration of emergency response teams may be a long-term goal of the Alberta Transportation geohazard monitoring program.

The afternoon session had two concurrent technical programs: technical talks and vendor demonstrations. Professor Bengt Fellenius presented on static loading tests on piles. The basic point was that static loading test provides a common frame of reference to others methods of pile capacity prediction, but also that even with static load tests the data interpretation and determination of pile capacity can be complex.

Instrument vendors were busy on site doing hands-on demonstrations and showing their new hardware and software. One particular technology of interest is the Measurand Autonomous 3D Shape and Vibration Sensing Shape Acceleration Array (SAA) monitoring system. The SAA is a rope-like array of sensors and microprocessors that fits into a small 27 mm ID casing and which was originally develop for motion capture for computer games and movie applications. Any deformation that moves the casing is accurately measured as a change in shape of the SAA. Vibrations can also be measured at multiple points. The same array can be used for horizontal or vertical measurements. SAA is re-useable and available with solar power and wireless communication so data can be remotely accessed over an internet connection. The software includes 3D display and real-time viewing of 2D and 3D shape. Products and details can be viewed at www.measurandgeotechnical.com.

GeoKon (www.geokon.com) demonstrated the reading and troubleshooting of Vibrating Wire (VW) sensors. Other vendor companies are Durham Geo Slope Indicator (www.durhamgeo.com), RST Instruments (www.rstinstruments.com) and Fox-Tek (www.fox-tek.com). Multiple functional data retrieval, real time, remote and fiber-optic monitoring technologies are other hot points.

The department has a history of using geotechnical instrumentation to monitor landslides, high fill construction (slope indicators and settlement plates), soil pore pressures (stand pipes, pneumatic and VW piezometers) and strain gauges (piles). Recently remote monitoring has gathered pace such as the retrieval of hydrologic data from weather and ultra-sound gauges (H743:16 Pembina River) and InSAR monitoring by corner reflectors at the Little Smoky River Landslide (H49:12). Recently, an automatic instrumentation trial site was contracted with AMEC, our Geohazard Risk Management Program (GRMP) consultant for Southern Region. AMEC and Measurand, a subcontractor, will install a remote real-time slope movement monitoring station at a landslide along Hwy 41 near Elkwater in Cypress Hills Provincial Park. There are significant advantages to remotely accessed, unattended instrumentation in our business to provide timely response to geohazards, and for provision of cost effective and high-quality monitoring results.

Attending this workshop keeps us at the fore-front of geotechnical monitoring instrument technology. This helps us make decisions as to new instruments best suited to provide reliable data and cost effective data for department projects. Workshop notes, vendor brochures and CDs are available from:

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7th International Conference on Managing Pavement Assets

John Crockett
Surfacing and Aggregates

The theme for the 7th International Conference on Management Pavement Assets (ICMPA) was "Preserving what we have… Investing in the future… Finding the balance". The theme reflected on pressures to develop infrastructure solutions that work today and that will be sustainable into the future.

The conference brought in 256 attendees from 24 countries to Calgary between June 24th and 28th. It covered preservation techniques, performance models, asset valuation and decision-making techniques. The conference co-chairs were Dr. Lynne Cowe Falls, Schulich School of Engineering, University of Calgary and Tim Hawnt, Assistant Deputy Minister, Alberta Transportation.

The first day started with a choice of workshops and the next three days covered 107 papers in a four concurrent session presentation format.

One session was dedicated to three formally invited speakers: Konrad Siu from the City of Edmonton to present on "Edmonton's Infrastructure Asset Management Experience" Tom Kazmierowski from the Ontario Ministry of Transportation to present "From Pavement Management to Asset Management-Ontario's Road to Sustainability". The third invited speaker was Roy Jurgens from Alberta Transportation. Roy gave a different perspective with his presentation "Alberta's Highway Capital Planning: Asset Management at the Cabinet Table".

As is customary with ICMPA a lecture was available to the general public. This years Distinguished Public Lecturer was Dr. Donaldson MacLeod whose lecture was on "Managing Infrastructure in the Face of Climate Change" covered the topic of future climate change, that is a current public issue, and how it will impact our infrastructure.

Wei He from TSB presented a paper co-authored by Wei He and Chuck McMillan on "Examining Paving Strategies for Provincial Highways Using a Pavement Management System in Alberta". The paper reviewed historic paving practices in Alberta using data from the province's Pavement Management System (PMS) known as Highway Pavement Management Applications. The presentation highlighted using the service life information in PMS to provide feedback to the pavement design process. It revealed that the Staged AC paving was the main form of highway pavement construction in the province and that structural AC overlays represented the majority of pavement rehabilitation projects. The impact of staged paving strategy was further studied in terms of life-cycle costs considering agency costs. In general, staged paving was proven to be a viable construction method with lower life cycle costs. In addition though, certain types of projects may be unsuited for staged paving due to the type or scale of the project, such as grade widening or adding passing/climbing lanes.

The study also provided service life statistics for rehabilitation treatments in the past 60 years, which can be used to assist pavement designers to perform life-cycle cost analysis and select economical treatments for maintaining our highway network.

Venkat Lakkavalli presented the paper "A Model for Real-Time Monitoring of Pavements". This paper was based on research conducted at the University of Calgary for Venkat's Master's degree. It was co-authored by Dr. Lynne Cowe Falls. The paper highlighted the need for a proactive method of dynamic pavement response measurement to manage roadway pavements effectively and to enable the concept of Smart Roads. The paper discusses the development of an instrumentation plan using the dynamic sensor instrumentation technique adopted in Accelerated Pavement Testing (APT) systems and the issues associated with real-time, long term monitoring of in-service pavements. The model is intended to aid engineers in determining the remaining service life of pavements which assist in decision making strategies of pavement management.

One of the workshops was by Brian Pidwerbesky (of Fulton Hogan Ltd., New Zealand) and David Hein (of ARA, Toronto, Canada) on the topic of Flexible and Rigid Pavement Rehabilitation and Preservation for warm and cold climate conditions. The workshop involved a wide range of treatments and techniques that are suitable for surface texture restoration. It considered factors such as economic, technical aspects, constructability, life cycle costs, sustainability and asset management.

The workshop concluded that emerging technologies combined with owner and contractor past experience will serve to improve the successful application and increase the performance of pavements. The key factors were the technical and social impacts of pavement maintenance and rehabilitation techniques.

A second workshop was 'Making Sense of Asset Management' by Tony Porter, Shawn Landers, and Travis Gilbertson from Opus International Limited highlighted how accounting rules come in to play when tracking assets, whether they are roads and bridges or buildings and sewers. As many nations, including Canada, introduce new requirements for governments to track and account for their assets, the role of asset managers will not only become more important, but will become a requirement that should help all agencies to start to speak the same language about their asset condition.

The Spyhill aggregate technical tour was sponsored by Lafarge on June 24, 2008. The Spyhill aggregate site is the provinces largest aggregate site and includes the department's source which is across the road from LaFarge. The aggregate crusher and wash plant is capable of producing one million tonnes of crushed aggregate in a year.

Lafarge has recently installed a new environmentally sustainable Astec Double Barrel Green Asphalt Concrete Plant, which is capable of incorporating up to 50 % Reclaimed Asphalt Pavement (RAP) into Asphalt Concrete mixes. It is also capable of manufacturing asphalt with Warm Mix Asphalt (WMA) technology.

The waste (reject materials) of the entire aggregate operation is minimal. Lafarge re-uses the reject materials to minimize the waste.

The ICMPA conference worked well as a platform for the international community to meet and present their views on many common issues in pavement and asset management. The next ICMPA is scheduled for the city of Santiago in Chile from November 15-19, 2011.

The conference website is at
http://www.icmpa2008.com

7th International Conference on Managing Pavement Assets
ICMPA
CALGARY, CANADA 2008

For additional information or a copy of the proceedings please contact:

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Implement the Platinum Rule:

"Treat others as they wish to be treated."

Leslie Charles

Strategies to Reduce Wildlife Vehicle Collisions on Rural Alberta Highways Workshop

Peter Mah
Highway and Roadside Planning

This workshop was held in Calgary in conjunction with the 7th International Conference on Managing Pavement Assets. The goal of the workshop was to present and discuss the most current methods used to manage rural highways efficiently and effectively in reducing transportation conflicts with wildlife populations.

Along with representatives from Alberta Transportation and Alberta Sustainable Resources Development, the workshop included presenters and attendees from across Canada, Red Deer College, University of Alberta, Alberta Association of Colleges & Technical Institutes, Western Transportation Institute - Montana State University, Parks Canada, Safety / Engineering Consultants and from the Netherlands Ministry of Transport – Public Works and Water Management. Various studies and projects were presented by wildlife biologists, managers, safety engineers and transportation engineers. All attendees participated in open discussion, sharing of information and generation of new ideas.

Based on collision data from 2002 to 2006, approximately 80% and 20% of the collisions were reported on Alberta Transportation's urban and rural roadways respectively. Of the rural collisions, about 50% were reported as animal related vehicle collisions. From 2002 to 2006, an average of 13,000 collisions per year was reported as animal vehicle related.

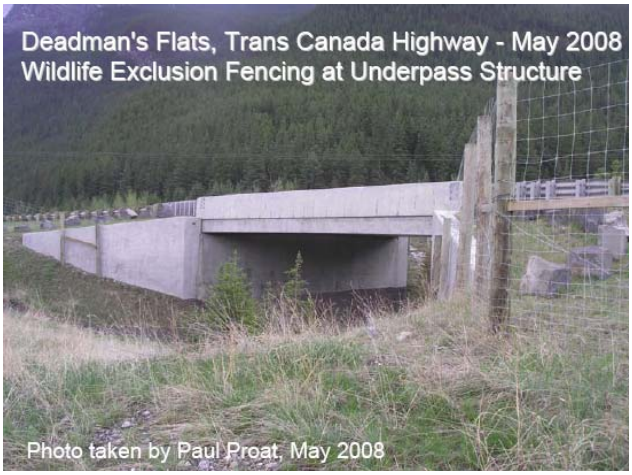
For more than 20 years Alberta Transportation has implemented either on a trial or permanent basis many different vehicle wildlife countermeasures along its highways. Wildlife countermeasures have included salt alternatives, predator repellents, signing, wildlife reflectors, right of way modification, wildlife exclusion fencing with underpasses and or overpasses, etc.

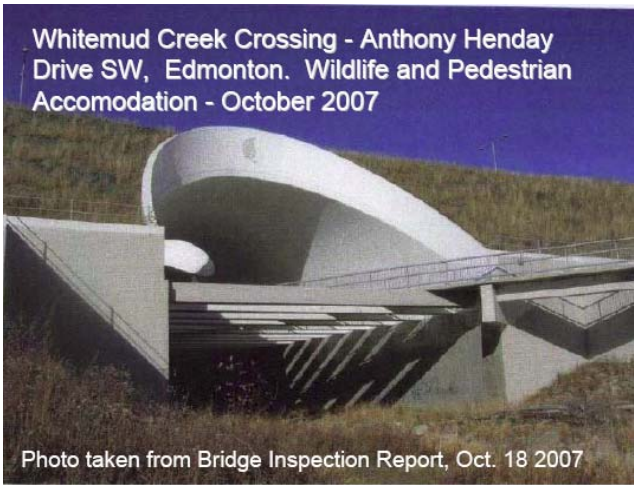
Consensus from the Workshop was wildlife exclusion fencing tied into underpass and/or overpass bridge structures have proven to be the most effective measure in reducing wildlife vehicle collisions. Other countermeasures were considered either ineffective or inconclusive. The use of wildlife exclusion fencing with crossing structures is consistent with Alberta's experience.

Alberta Transportation installed wildlife exclusion fencing with underpass bridge structures on the Trans Canada Highway from west of Canmore to Deadman's Flats.

The southwest portion of the Anthony Henday Drive in Edmonton - Whitemud Creek crossing in particular, is an example of where both wildlife and pedestrian passage have been accommodated under the roadway.

The final report on the Workshop proceedings is scheduled to be completed in December 2008.





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Winter Friction Testing

Sharla Griffiths
Highway Operations

The Transportation Association of Canada (TAC) is undertaking a project entitled *Winter Maintenance Performance Measurement Using Friction Testing*. Moh Lali, Director of Highway Operations, and Sharla Griffiths, Highway Operations Engineer, sit on the Project Steering Committee.

The Project Steering Committee chose Opus Hamilton Consultants Ltd. out of Vancouver, BC to conduct the project. The consultant will contact agencies in North America and Europe that are using winter friction testing devices, gather information about what methods they are using, and compile the advantages and disadvantages of each method. The final report will be a comprehensive list of all winter friction testing being done in these areas along with their strengths and weaknesses. The consultant will also recommend the next steps in developing a standardized method for measuring and quantifying winter friction.

Technical Standards Branch – Operations has done two winter friction pilot projects in the last several years. The first pilot project was done in 2005 on Highway 2 in the Red Deer area. Winter friction measuring devices from Halliday Technologies (Powell, Ohio) were used. The purpose of that pilot project was to evaluate the correlation between the measured winter friction and the highway conditions reported by AMA Road Reports. The conclusions were that winter pavement friction can be measured accurately on a network scale; the side-force friction measuring device produced consistent, repeatable results over time and space; and these winter friction measurements did not correspond well to AMA Road Report conditions of Poor and Fair (because of too much variance in what these road conditions encompass).

We just finished the field data collection of the second winter friction testing pilot project. We measured the winter friction on a highway circuit north east of Edmonton (Highways 16, 830, 15, and 21). Figure One shows the test circuit.

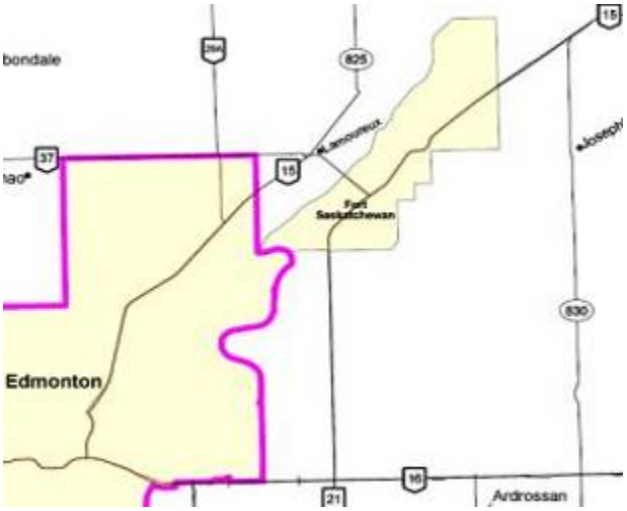

Figure 1: Test Circuit (Highways 16, 830, 15, and 21)

We rented the winter friction measuring equipment from a local Edmonton, Alberta company – IceChek Instruments Ltd. Their equipment is shown in Figure Two.

Figure 2: IceChek winter friction measuring equipment

The purpose of this pilot project was to determine if the equipment produced meaningful and repeatable winter friction measurements, to determine if there was a correlation between viewed road conditions and winter friction measurements, and to compare between the AMA Road Report conditions and the winter friction measurements.

We performed nine tests of the circuit, producing results for winter highway conditions ranging from bare dry pavement to extremely icy pavement. Figures Three and Four depict bare dry pavement conditions and extreme ice conditions, respectively.

Figure 3: Highway 21 South of Fort Saskatchewan – bare, dry pavement

Figure 4: Highway 21 South of Fort Saskatchewan – extremely icy pavement

The results from these tests for Highway 21 are shown in Figure 5. Roads with no ice present should have friction readings from 0.7 to 0.9. Very icy roads should have friction readings from 0.2 to 0.4.

The conclusions we've drawn so far are that:

- the device gave lower friction readings for slippery roads and higher readings for dry and wet roads, so there was a correlation between viewed highway conditions and winter friction readings,
- it was difficult to compare the AMA Road Report to the friction measurements as on the days we measured friction, the AMA Road Report was showing these highways as "unreported",
- sometimes a wet pavement gave a higher reading than a dry pavement; not what we expected (intuitively we think that wet roads are more slippery than dry roads), and
- the equipment did not repeat as well as we hoped (friction readings for bare dry pavement seemed to get higher each time we completed the circuit); more testing and work with the manufacturer is necessary.

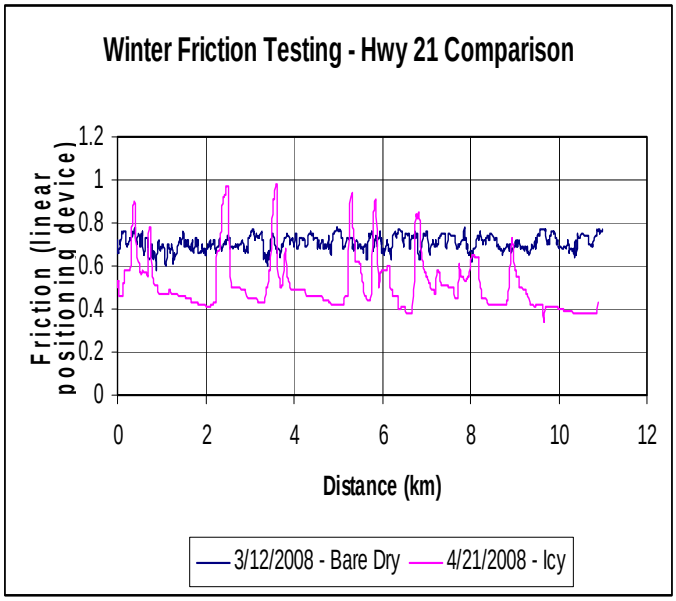

Figure 5: Friction Results for Highway 21 for different highway conditions.

Analysis of the data is not yet complete. We may work with the University of Alberta to perform some advanced analysis on the data.

Winter friction testing is being considered as tools to measure the performance of winter maintenance activities (plowing, applying sand/salt, using pre-wetted sand) and to inform the public of the highway driving conditions (not slippery, moderately slippery, very slippery). It is important to use testing equipment that produces accurate data. We hope that through doing pilot projects here in Alberta, and learning from the experiences of other agencies, we can add winter friction testing to snow and ice control program.

For additional information please contact:

Sharla Griffiths
by email: sharla.griffiths@gov.ab.ca
or phone: 780 415 1057

Technology Transfer // \\ Technical Training

Ron Stoski
Geotechnical and Material

The following Bridge Inspection training courses and dates will be arranged for delivery by TSB for the winter of 2008 / 2009.

TSB Training Courses……..…..Calendar of Events

BIM Field Training Course……..TBA
Class A BIM Course …….....TBA

Please contact Lloyd Atkin by email: lloyd.atkin@gov.ab.ca or by phone: 780 415 1080 for more information about the above BIM courses.

Technical training courses, as they are identified and developed, will be posted at Technical Resources, Technology Transfer, Courses Seminars and Event.

For additional information and/or if you have training course suggestions please contact

Ron Stoski Phone: 780 415 1020
email: ron.stoski@gov.ab.ca

C-TEP Training Courses

Neil Little
C-TEP

The Center for Transportation Engineering and Planning (C-TEP) is working with department staff and industry to arrange for the delivery of the following courses between November, 2008 and April 2009:

Bioengineering and Biotechnical Streambank Stabilization Techniques Workshop:
Nov 4, 5, 6, 2008

GEOMETRIC DESIGN - An Introductory Course
December 2-3, 2008

Roundabouts/Access Management
Rural Geometric Design
Roadside Design Guide
Work Zone Safety / Traffic Control
Bridge Construction Inspection
Functional Planning for highways
Intersection Capacity

Additional details about the above courses will be posted to the C-TEP website at they are available. For the latest information about C-TEP training courses go to the website at: http://www.c-tep.com/

Previous TSB newsletters can be viewed at:
http://www.infratrans.gov.ab.ca/1881.htm

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

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or Roger Skirrow	**780 427 5578**
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