

TSB NEWSLETTER

TECHNICAL STANDARDS BRANCH

VOLUME 3, ISSUE 2, OCTOBER 2004

Editor's Remarks

Information on Waterborne highway traffic paint, Alberta Transportation's new tourist signs, weigh in motion, and snowplow warning lights is in this issue.

The article on highway traffic paint provides you with information about why waterborne paint use is and will be increasing in Alberta and also compares the performance of waterborne traffic paint to alkyd traffic paint.

Tourist is a big industry in Alberta. This article on Alberta's new tourist signs will be of help to you, tourists, and motorists.

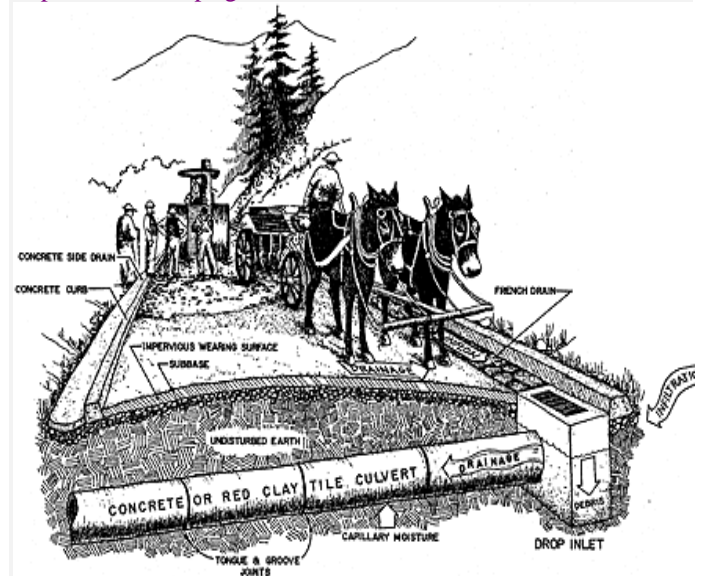
The weigh in motion article is an update on what the department is doing to keep track of vehicle loads and speeds on Alberta's highways.

Potential new "light" technologies are available to help motorists see "snowplows" during poor winter highway conditions. Are they better than the old "warning lights?" This winter research project will evaluate the effectiveness of some of the new technologies.

If you have comments or would like to forward articles to future editions of this newsletter please contact one of the newsletter members on page 8.

Allan Kwan
Editor-in-Chief

Photo from an Oregon National Park Service Report
<http://www2.cr.nps.gov/hli/currents/columbia/assessment.htm>



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Waterborne Highway Traffic Paint

Joe Filice

Geotechnical and Material Services

Introduction

Each year, over 2 million litres of paint are placed on our highways. Alberta Transportation uses alkyd traffic paints (solvent is the carrier) on most highways and also uses some waterborne traffic paints (water is carrier).

All traffic paints contain pigments, volatile vehicles (solvent or water), and non-volatile vehicles (resins—drying oils that cure by oxidation after evaporation of solvent). Today's alkyd paints contain three times the Volatile Organic Compounds (VOC) of available waterborne paints. Although alkyd paints are less expensive than waterborne paints, environmental regulations may mandate elimination or drastic reduction of VOC in all paints. Waterborne paint is a product that may be able to achieve future environmental targets.

Yearly Remarkings

Pavements require remarking due to line deterioration by traffic, snow removal activities and environmental forces. Failure modes for pavement markings include poor adhesion, chipping, abrasion, poor bead retention and discoloration. Factors affecting performance include paint formulation, surface preparation, weather conditions, traffic volume and type of surface (seal coated or ACP). On most highways roadway paint markings are applied once per year and 2 to 3 times a year on busy highways such as the Deerfoot Trail.

Test Track Trials

In 2000, Alberta Transportation set up a research test deck east of Hwy 21 on the Highway 16:20 to evaluate the performance of regular and durable waterborne paint. The goal was to find the best value environmental friendly roadway marking that meets performs and lasts a long time under Alberta conditions.

Fifty-eight white and yellow transverse test lines were placed on the test deck. Five different bead types, paint film thickness of 15-mil and 30-mil, and two different resins were applied on the test deck to determine the relative performance of the different materials, combinations and application rates.

Test deck compares the relative performance and service life of traffic marking materials under existing road conditions. They also accelerate the wear characteristics and bead retention of fluid traffic markings. The paint lines on the test deck were evaluated at 28 days, 151 days and 365 days for general appearance and luminous directional reflectance (glass bead loss).

Performance

The waterborne traffic paint lines performed very well on Alberta Transportation's test deck in terms of durability and bead retention. The test deck results showed that waterborne paint can provide multi-year service life on some roadways. The relative costs: regular waterborne paint competes in price with alkyd paints and durable waterborne paint competes with the durable markings.

2002 Durable Waterborne Trial

The possibility of using waterborne paints as durable paint markings with a multi-year service life was first tested on Highway 623. A new product HD-21A Durable Waterborne Paint, manufactured by Rohm and Haas Company, was applied in 2002.

Lafrentz Road Marking Ltd of Edmonton applied HD-21A Durable Waterborne white and yellow line paints on 10 kilometres of new pavement on Highway 623, E. of Hwy. 814 in September 2002. The application consisted of two thin layers on a new pavement instead of one layer due to the paint shrinkage that causes new asphalt to crack along paint lines. With two thin layers, cracking of the new asphalt is supposedly reduced. One 15 mil application (38 litres per kilometre) is recommended for remarking roads that are at least 1 year old.

Field Observation - HD-21A

The Highway 623 HD-21A paint lines were evaluated in 2003 and 2004. The HD-21A paint lines performed well and after 2 years of service provide good delineation. From a visual perspective, the 2-year old HD-21A durable waterborne paint lines performed better or equal to one year old Alkyd paints.

Mirolux Field retro-reflectometer readings were also taken in 2003 and 2004. The results are illustrated in Chart 1. Many retro reflective readings on HD-21A shoulder lines were over 100 millicandelas (MCD), the cut-off value for repainting white paint lines in the United States.

Millicandelas is the term used for measuring the light radiating capacity of the light source (head lights), in candelas per square metre (mcd/Lux/m²).

Retro reflectivity is the scientific term that describes the ability of a surface to return light back to its source. The glass beads in retro reflective pavement markings bounce light from the vehicle headlights back toward the vehicle and the driver's eye.

Highway 623 – Daylight - May 2004



Cost Effective Alternative

Alkyd markings on highways usually last 6 to 12 months and depend on traffic volumes and weather conditions. Durable markings such as thermoplastics, Methyl Methacrylate (MMAs), and epoxies usually provide multi-year service life. Technology advancements in durable waterborne paints such as HD-21 are designed to provide multi-year service.

HD-21A durable waterborne paint has demonstrated to provide superior performance to alkyd paints. Although the average cost per meter of HD-21A paint is a bit higher than standard traffic paint, the extra year or two of service life still results in significant cost savings.

Conclusion

Waterborne paints have performed well on highways and the test deck and several formulations have been approved for use. Alberta Transportation has yearly increased the use of waterborne paints since 2001.

The performance of HD-21A durable waterborne paint lines is encouraging. The HD-21A paint lines have provided very good delineation after two winter cycles and have provided additional service life on Highway 623. The HD-21A durable waterborne paint will be further investigated in 2005 to determine if a 3-year service life is attainable.

Recommendation

HD-21A durable waterborne paint provided good performance as a two layer application on a new pavement. Evaluation of a single layer application on older pavements is the next step.

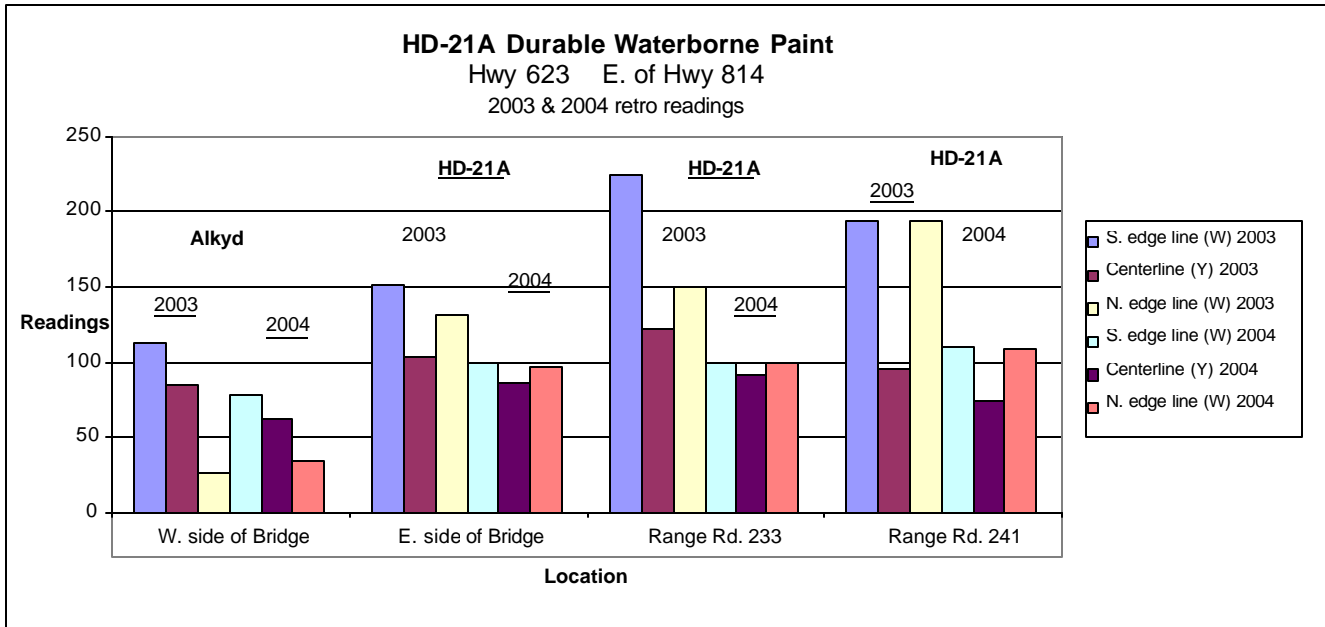
Night Time Photo - May 2004



The department continue to monitor and compare the performance and life cycle costs of durable waterborne paint with regular waterborne and/or alkyd paints.

For more information please contact
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Ron Stoski at 780 415 1020.

Chart 1



Alberta's New Tourism Signs ...showing the way...

*Robert Duckworth
Highway Operation Section*

Alberta's growing tourism industry prompted Alberta Transportation to change the tourist highway sign policy to **Sign Up Alberta**. Not only does this change promote tourism, it ensures consistent signing and provides motorists with information to make highway journeys safe and enjoyable.

Alberta's new tourist sign is based on two well known programs: Tourism Oriented Directional Signs (TODS) and Logo Signs.

Sign Up Alberta has started to and will continue to replace existing brown signs on Alberta highways with the TODS and Logo Signs that are currently used in many European countries, the United States, and some Canadian provinces.



The new signs provide an enhanced look for Alberta's tourism industry. Blue retro-reflective sheeting material on the sign face provides added brightness and increases the contrast ratio between a white legend and blue background. High intensity retro-reflective sheeting, the standard for traffic signs on provincial highways, resists premature fading, and gives signs the new look for longer periods.

Today's larger letter height in the legend addresses needs of increasing numbers of older motorists traveling our highways. Letter heights of 150 mm (6 in.) are standard on conventional two-lane highways and 200 mm (8 in.) letter heights are standard on multi-lane highways. In the

past, 100 mm and 150 mm letters were the norm for Alberta tourism signs.

The backing material consists of aluminum extruded panels. The extruded panels reduce the need for additional supporting steel and wood frames. Aluminum panels can be shipped in pieces and assembled on site, which reduces transportation costs and the need for special lifting equipment.

The aluminum panels can be recycled and re-used and are more environmentally friendly than plywood. If part of the sign becomes damaged in the field, an extruded strip can be replaced instead of the entire sign face.

Guide Sign Industries Ltd. was the successful contractor for accepting applications and administering the new program over the next five years. Guide Sign Industries Ltd. represents four government departments including: Transportation, Community Development, Economic Development and Agriculture; each having a vested interest in Alberta tourism signs. Clear operating guidelines and eligibility criteria ensure uniformity and consistency in the program.



Communities and private businesses are now provided with unique signage to display their attractions and essential services to traveling motorists.

Inquiries about the application process and businesses wanting to become part of this exciting sign program should contact Guide Sign Industries Ltd. at the toll free number 1-866-560-SIGN (7446).

More information about the program and application forms can be found on the tourism sign web site at: <http://www.signupalberta.com/>

Snowplow Warning Lights

Peter Ing

Geotechnical and Material Services

Safety equipment and roadway maintenance has always gone hand in hand. Winter maintenance is a prime example of this rule.

Every winter, snowplows have the extremely important task of clearing snow and ice off roadway surfaces and to keep roads open to traffic. Snowplow vehicles work in hazardous weather conditions and every winter numerous motorists collide with snowplow trucks during snow clearing operations. Most are rear-ended crashes due to poor visibility. Poor driving conditions combined with snow clouds generated by plow trucks create white-out conditions which reduce poor visibility even further for motorists.

It has been ten years since the last formal review of our standard for highway maintenance snowplow warning lights. With new technology and the availability of innovative lighting equipment in today's market, it is time to proceed with research and enhance safety for all road users. This research project is an opportunity to review and update Alberta highway maintenance specifications with the best alternative products.

The potential safety benefits of the enhanced warning attributes of the rear lighting equipment will be very significant to the driving public and to the 500 plus snowplow operators on provincial highways. There is also a potential for economic savings from new energy-efficient and lower-maintenance lighting equipment.

An engineering consultant firm was selected to conduct a literature research of all innovative lighting devices and to interview and survey other North American highway jurisdictions.

Based on the literature research, a work plan will be formulated by stakeholders to measure performance standards of rear lighting equipment.

Through an evaluation process, the work will

identify any other innovative lighting equipment and recommend acceptable configurations for snowplow trucks.

In recognition of the importance of the rear lighting for snowplow operation, and the newer technologies available to enhance safety at a reduced cost, this research will also investigate other lights such as the amber strobe light and red LED (light emitting diode) tail lights for suitability.

The equipment that meets or exceeds standards and the provincial traffic regulations will be tested in field demonstrations to determine performance standards. Within set criteria, the alternate lighting equipment will be reviewed for pros and cons under various ambient conditions in different locations. An evaluation panel will consist of members from the regions, the New Products Evaluation Committee, and maintenance contractors. Input from other stakeholders such as the police, commercial carriers and Alberta Motor Association will be part of the evaluation.

Maintenance contractors have been canvassed to assist with field demonstrations and evaluations.

Fieldwork is scheduled between January and April, and the project is to be completed by May 2005. A final report will document the literature research, "best practices" from other jurisdictions, technologies and equipment tested, results from the field trials, and the evaluation panel's recommendations.

Thank you to the Lethbridge region for sponsoring this Alberta Transportation funded research.

For additional information about this project or other research, please contact:
Peter Ing at (780) 415-1009
Ron Stoski at (780) 415-1020.

Alberta's Weigh in Motion

*Peter Kilburn
Highway Asset Management*

Weigh in Motion (WIM) instruments detect and measure moving vehicles on an axle by axle basis and record their speed, length and weight. System software can then collate measurements by vehicle records.

In September 1999, Alberta Transportation installed weigh in motion sensors on Alberta's Strategic Highway Research Program (SHRP) Long Term Pavement Performance (LTPP) test sections at:

Highway 3:08 km 13 eastbound slow lane
Highway 16:06 km 39 westbound slow lane.

Both sites have operated and produced 5 years of traffic data for SHRP LTPP and for department pavement management and vehicle compliance areas.

In August 2004, Alberta Transportation installed and tested new ECM Hestia-P WIM systems at:

Highway 2:24 km 18 4 lanes (Red Deer)
Highway 2:30 km 32 4 lanes (Leduc VIS)
Highway 2A:26 km 27 2 lanes (Leduc)
Highway 3:08 km 13 4 lanes (Fort MacLeod)
Highway 16:06 km 39 4 lanes (Edson)
Highway 44:00 km 06 2 lanes (Villeneuve)



WIM Highway 3:08 KM 13 Westbound Lanes

The systems consist of two piezo electric sensors on either side of a magnetic induction loop in each travel lane. The piezo electric sensors determine the axle weight, speed and length while the magnetic induction loop detects the presence of the vehicle.

The decision to expand Alberta Transportation's WIM operation was based on the following:

1. To improve the accuracy of vehicle load inputs data for the department's pavement design. Accurate inputs will enable Alberta Transportation to update a 10 year old equivalent single axle load (ESAL) design factors of 0.881 for single unit trucks and 2.073 for tractor trailers. The data will also verify the method used to estimate truck percentages via short term manual counts. This expansion also enables us to determine the load distribution between lanes on four lane highways. Currently we assume that 15 percent of loads are in the passing or left hand lane and 85 percent in the slow or right hand lane.
2. AASHTO is revising pavement design manuals to use an input known as "Load Spectra." Though this may not be adopted by Alberta Transportation in the near future, the additional WIM sites enable us to determine an Alberta load spectra so that the new AASHTO pavement design methodology can be evaluated for Alberta conditions.
3. Inspection Services are interested in the real time output of WIM sites for compliance enforcement. The expansion to six multi lane sites allows more vehicles to be checked.



WIM Hwy 3:08 KM 13 4 Lane Instrument Cluster (left)
Old cluster is on the right and will be recycled.

A five year consulting services agreement to install, repair, operate and collect WIM data is in place. A second consulting services agreement verifies weight calibration, dimension and speed measurements and provides reports on a monthly basis. September data and reports are expected by mid-October 2004.

If you would like further information please contact Peter Kilburn at (780) 415-1359.

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Thank you