


<b>Government of Alberta</b>  Transportation	<b>USE OF DURABLE PAVEMENT MARKINGS</b>		<i>Issued: SEPT 2010</i>
			<i>Revised:</i>
			<i>Page 1 of 6</i>
<b>RECOMMENDED PRACTICES</b>	PART	PAVEMENT MARKINGS	
	SECTION		
	SUB-SECTION		

## General

Pavement markings provide motorists with valuable guidance and roadway information. Pavement markings have specific functions; they guide the movement of traffic and promote safety on the highway. In some cases they are used to supplement the messages of other traffic control devices.

For many years, Alberta Transportation has mainly used conventional paint lines for highway markings. This type of marking quickly begins to wear as soon as the highway is open to traffic and generally requires painting within one year, depending on traffic volumes.

Guidance provided by conventional paint markings may be below recommended retro-reflectivity levels for many months of the year. Pavement markings play a critical role in roadway safety and driver comfort.

Durable pavement markings last much longer than conventional traffic paint markings (solvent or water based paints) before needing replacement. Durable pavement markings are divided into the following categories:

- Premium traffic paint;
- Traffic marking tape;
- Wet Night High Visibility traffic marking tape;
- Non-profiled durable plastic markings;
- Wet Night High Visibility durable plastic marking; and

- Snowplowable raised pavement markers.

Durability of the marking is judged by the lasting power of the marking material. It is most often based on a physical measure, such as the percentage of the marking material remaining and the annual retro-reflectivity of the marking.

Durable markings can be surface applied or inlayed (recessing of pavement marking flush or slightly below pavement surface). It is important to note that when surface applying durable markings the service life is greatly reduced, the major cause being snowplow damage.

Wet Night High Visibility durable plastic markings and traffic marking tape can provide highly visible pavement markings in various weather conditions throughout the year due to their being profiled. Non-specialized durable plastic markings and traffic marking tapes are non-profiled.

Installing durable pavement markings is estimated to reduce collision costs by 2.5% when compared to roadways with conventional paint markings.

The following are recommended practices for the selection and installation of durable pavement markings for longitudinal marking applications on Alberta highways.

## Standard

Several factors need to be considered when selecting a suitable material type for pavement markings (conventional paint versus durable markings). Factors to consider include:

- Traffic volumes and traffic composition;
- Type of roadway surface and condition;
- Complexity of traffic operations;
- Collision experience;
- Presence of overhead lighting;
- Life-span of the roadway;
- Product history; and
- Cost of marking material; and
- Material durability/retro-reflectivity.

All the above factors will either directly or indirectly affect the marking's visibility and durability, as well as application technique.

Considering the safety benefits and other advantages over conventional paint markings, durable pavement markings offer an excellent investment opportunity when traffic volumes are high enough.

Based on an economic analysis, durable pavement markings should be considered for application in the following cases (also refer to Table 1):

- On four-lane divided highways where the AADT exceeds 15,000 and the pavement condition is good (remaining service life of at least 8 years);
- On rural two-lane undivided highways where the AADT exceeds 5,000 and the pavement condition is good (remaining service life of at least 8 years);
- On urban two-lane undivided highways

where the AADT exceeds 8,000 and the pavement condition is good (remaining service life of at least 8 years); and

- At new traffic signal installations where the pavement condition is good (remaining service life of at least 8 years).

Urban areas are considered to be those with substantial development adjacent to the highway, and typically have reduced speed limits and/or raised curbs. Some sections of highway within community corporate limits may not be considered urban.

Where durable pavement markings are to be implemented, consideration should be given to implementing durable markings for all longitudinal marking types on that section of highway (i.e., center lines, edge lines, lane lines) using the same marking material.

The use of durable marking products for transverse and intersection markings should be evaluated on a site/project specific basis.

## Product Selection

Once the decision has been made that durable markings are to be used on a specific project, an appropriate durable marking type should be selected. Durable marking materials are listed on the Alberta Transportation Products List at the following website, under the heading Pavement Markings:

<http://www.transportation.alberta.ca/Content/docType253/Production/PAVEMENTMARKINGS.pdf>

### Marking Material Type

- PREMIUM TRAFFIC PAINT
- DURABLE PLASTIC MARKINGS
  - Non – Profiled
  - Wet Night High Visibility
- TRAFFIC MARKING TAPE
  - Non – Profiled
  - Wet Night High Visibility
- TEMPORARY PAVEMENT MARKINGS
- SNOWPLOWABLE RAISED PAVEMENT MARKERS (considered a wet night product)

Pavement markings are listed under the following three categories:

1. Proven products are markings that have provided adequate performance on department projects,
2. Trial products have been used on trial projects for Alberta Transportation and are being monitored for acceptability.
3. Potential products have not yet been used on Alberta Transportation projects.

When installing durable pavement markings, proven products from the Alberta Transportation Products List should be used. However, for trial applications, products classified as “trial products” or “potential products” may be used. The use of “trial” or “potential” products should be coordinated with Technical Standards Branch.

The product selected for use will depend on the roadway environment, required service life and desired retro-reflectivity.

The most economic alternative material choice should be determined through a “Life Cycle Cost Analysis” computation. Before any life cycle cost comparisons of materials can be made, the basic project life must be established (8 year time period is generally used).

The following provides guidance on the observed performance of durable marking products available in each category:

#### Premium Traffic Paint

- HD-21A
  - Is a more durable waterborne traffic paint that may be used in lower traffic areas and may provide 1 to 2 years of service life.
  - Initial retro-reflectivity (white): 350 Millicandelas (Mcd) to 400 Mcd
  - Initial retro-reflectivity (yellow): 150 to 250 Mcd
  - Surface applied.

#### Durable Plastic Marking

- System 300, System 400, System 600, IBIS Strip Cold Plastic are currently listed as proven products.
  - These markings are normally surface applied and may provide 2 to 4 years of service life on lower volume roads.
  - Initial retro-reflectivity (white): 300 to 350 Mcd
  - Initial retro-reflectivity (yellow): 250 to 350 Mcd

#### Traffic Marking Tape

- Stamark High Performance Tape 380I ES and Premark Tape are currently listed as trial products.
  - These markings are surface applied and may provide 2 to 4 years of service life on lower volume roads.
  - Initial retro-reflectivity (white): 400 to 500 Mcd
  - Initial retro-reflectivity (yellow): 300 to 400 Mcd

#### Wet Night High Visibility Durable Plastic Marking

- Rainline and Pathfinder durable markings are currently listed as proven products.
  - These markings are inlaid and may provide 4 to 8 years of service life on higher volume roads.
  - Initial retro-reflectivity (white): 350 to 450 Mcd
  - Initial retro-reflectivity (yellow): 250 to 350 Mcd

#### Wet Night High Visibility Traffic Marking Tape

- 3M Tape Series 380AW is currently listed as a trial product.
  - This tape marking is inlaid and may provide 4 to 8 years of service life on higher volume roads.
  - Initial retro-reflectivity (white): 500 Mcd to 600 Mcd
  - Initial retro-reflectivity (yellow): 300 to 400 Mcd
  - Initial trial failed, experiencing debonding and peeling. Re-installation is currently being evaluated.

#### Snowplowable Raised Pavement Markers

- Avery Dennison LifeLite Model 101LP, 3M NightLine and Stimsonite Model 98 are currently listed as trial products and should be advanced to Proven status in summer 2010.
  - These markings are snowplowable raised pavement markings which may provide 4 to 8 years of service life.
  - Placement typically 27 m apart of straight sections and 18 m apart on curves.

In the department's recent experience, surface applied durable marking products do not meet the department's retro-reflectivity performance requirements for the specified duration. For this reason, the inlaying of products where feasible is recommended. However, it should be noted that in lower speed and lower volume areas inlaid products may be subject to more dirt/grit build up which will impact marking visibility.

When considering an inlaid durable marking product, it is important to understand that pavement degradation (cracking, segregation of aggregate) may be accelerated as a result. In particular, pavement joints and older pavements may experience more degradation as they are weaker.

The value of the marking (i.e. the life cycle cost and benefits) needs to consider the impact milling has on the road surface when the durable marking is inlaid. Pavements need to be assessed to ensure the milled area will not deteriorate due to milling or fail prior to the life of the marking being realized. If markings are milled into pavement along longitudinal joints, problems can be expected. The joint will typically need crack sealing, and the application of crack seal will

obliterate the durable marking.

As well, the use of more costly durable markings can have an impact on surface patching in that markings are lost if overlaid. If the decision is to defer the patching to maintain the marking, road user ride quality suffers.

### **Guidelines for Placement**

Durable pavement markings should be installed using the proprietary installation method for that product. Recessing (inlaying) of durable pavement markings below or flush to the pavement surface will protect the markings from snowplowing operations and enhance their longer term performance.

Pavement marking configurations shall be applied in accordance with the Highway Pavement Marking Guide.

### **Performance Requirements/Warranty**

Surface applied durable pavement markings must meet the minimum dry performance level of 125 mcd/lux/m<sup>2</sup> for white markings and 100 mcd/lux/m<sup>2</sup> for yellow markings for a period of 24 months from the date of installation when exposed to normal roadway conditions, and must stay in place for a period of at least 24 months, regardless of average daily traffic.

Inlaid durable pavement markings must meet the minimum dry performance level of 125 mcd/lux/m<sup>2</sup> for white markings and 100 mcd/lux/m<sup>2</sup> for yellow markings for a period of 48 months from the date of installation when exposed to normal roadway conditions,

and must stay in place for a period of at least 48 months, regardless of average daily traffic.

Over the course of the warranty period, the retro-reflectivity will be evaluated over segments of 1 kilometre or the length of the line (whichever is less). All retro-reflectivity measurements shall be made on a clean dry surface using a 30 m geometry retro-reflectometer. Random measurements shall be taken throughout any 1 kilometre section with results averaged in order to determine any area to be repaired.

The evaluation of loss of line will be over 100 metre segments. For the purposes of warranty, a cumulative 10% or greater loss of line due to non-adhesion on any 100 metre segment of marking will constitute failure of the material on that segment.

### **References to Standards**

*Highway Pavement Marking Guide, 2<sup>nd</sup>  
Edition, 2003*

*Alberta Transportation Products List*

Table 1: Recommended Application Criteria for Durable Pavement Markings

Roadway Environment	Roadway Cross-section	AADT	Remaining Pavement Life	Consider Durable Markings?	Continuous Illumination Present?	Consider Wet Night Product
Urban	Divided	< 15,000	< 8 years	No	~	~
			>= 8 years	No	~	~
		>= 15,000	< 8 years	No	~	~
			>= 8 years	Yes	No	Yes
	Undivided	< 8,000	< 8 years	No	~	~
			>= 8 years	No	~	~
		>= 8,000	< 8 years	No	~	~
			>= 8 years	Yes	No	Yes
Rural	Divided	< 15,000	< 8 years	No	~	~
			>= 8 years	No	~	~
		>= 15,000	< 8 years	No	~	~
			>= 8 years	Yes	No	Yes
	Undivided	< 5,000	< 8 years	No	~	~
			>= 8 years	No	~	~
		>= 5,000	< 8 years	No	~	~
			>= 8 years	Yes	No	Yes
				Yes	No	

Note: Urban roadway environment is classified as having substantial adjacent development, and reduced speed limit. Raised curb may also be present.