Abstract
In an attempt to find more durable message marking materials, durable markings (System 400 and PolyCarb Mark-55.4) were applied in 1998 at various locations in Alberta. As a final conclusion durable message markings are recommended for future use in Alberta. Life cycle costs were not included as part of this study.

Key Words
Traffic markings
Durable Pavement Message Markings
System 400
PolyCarb Mark-55.4
Stop Bars
Arrows
Crosswalk
Rail crossing

Distribution
Unlimited

Project Co-ordinator
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Materials and Technical Services
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STUDY OF DURABLE MESSAGE MARKINGS

1.0 INTRODUCTION

Traffic markings provide motorists with valuable guidance and roadway information. Traffic 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. Pavement markings are installed and maintained to provide adequate performance year round. Pavement markings are classified as either longitudinal or transverse.

Longitudinal pavement markings define the boundary between opposing traffic flows, the edges of traveled way, multiple traffic lanes, turn lanes, and special use lanes.

Transverse pavement markings define pedestrian crossings and vehicle stopping point at intersections. They are also used to warn the motorist of approaching conditions, required vehicular maneuvers, or lane usage.

The subject of this study is the use and evaluation of Durable Pavement Message Markings (System 400 and PolyCarb Mark-55.4) which consisted of the following:

- Crosswalk lines
- Stop bars
- Traffic arrows
2.0 OBJECTIVES

The objectives of this project are to:

- Determine the effectiveness of the two types of pavement marking materials (System 400 & PolyCarb Mark-55.4).
- Monitor the durability and performance of the two products.
- Determine the performance of the message markings.

3.0 BACKGROUND

Paint is the most common pavement marking material used by the department. It is relatively easy to apply and dries quickly after application. However, it requires periodic remarking due to the deterioration caused by traffic, snow removal equipment and environmental forces. These paints are inexpensive to buy and apply, but typically last less than a year when used for transverse markings. Failure modes for painted pavement markings typically include poor adhesion, chipping abrasion, poor bead retention and discoloration.

In an attempt to find more durable pavement marking materials, durable pavement message markings (System 400 of Lafrentz Road Services Ltd. and PolyCarb Mark 55.4 of Poly-Carb Inc.) were applied at various locations in Alberta in 1998.

4.0 TRANSVERSE PAVEMENT MARKINGS

Transverse pavement marking define pedestrian crossings and vehicle stopping points at intersections. They are also used to warn the motorist of approaching conditions, required vehicular maneuvers, or lane usage. Typical transverse pavement markings are:

Crosswalk Line
a series of parallel solid white lines used to define a pedestrian crossing

Stop Bar
a solid white line used to indicate the stopping point at an intersection or railroad crossing

Traffic Arrow
a white marking used in storage lanes and two way left turn lanes to
denote the direction of turning movement. Arrows are also used at ramp
terminals and intersections on divided highways.

Railroad Crossing Symbol

a white marking used in advance of a railroad crossing where grade
crossing signals or gates are located

5.0 TYPES of DURABLE MESSAGE MARKINGS

Pavement marking materials can be divided into two common types: non-durable
(primarily paints) and durable, which include epoxy, thermoplastics, polyurea,
poly urethane, tapes and raised pavement markings.

The following are descriptions of durable pavement marking materials:

Thermoplastic

Thermoplastic material consists of resins and filler materials in solid form
at room temperature. The material is heated to a semi-liquid, molten state
(200°C) and is then applied to the roadway by spray or extrusion
methods.

Preformed Tape

Preformed tapes are composed of thermoplastic or other materials that
are fabricated under factory conditions. The material is applied to the
roadway with an adhesive or with heat to activate a pre-applied bonding
agent.

Methyl Methacrylate (MMA)

Methyl Methacrylate application can be either by spraying or extrusion.
The material is not heated (pure chemical reaction between two
components) and can be applied within a temperature range of 4°C to
40°C.

Epoxy Pavement Marking

Epoxy pavement marking material consists of 100% solids, two-
component system. The material is not heated (pure chemical reaction
between two components) and is applied by spraying at a temperature
range of 5°C to 45°C.
6.0 DURABLE MESSAGE MARKINGS EVALUATED

System 400

System 400 is a flexible, two-component, solvent-free, field reacting, road marking material.

The material is manufactured for application by extrusion onto pavement in liquid form, with glass spheres both mixed in and dropped onto the material after application. System 400 contains methyl methacrylate (MMA) as the primary resin.

The manufacturer’s material warranty for this product is 3 years.

PolyCarb Mark-55.4

PolyCarb Mark-55.4 is a hybridized polymer pavement marking system. It is a two-part, 100% solids, hybridized polymer coating available in traffic safety colors to be used as a long life pavement marking system.

A highly reflective surface visible over a long distance, is obtained by broadcasting reflective beads immediately after the application of the Mark-55.4 system.

The manufacturer’s material warranty for this product is 5 years.

7.0 LOCATION of DURABLE MESSAGE MARKINGS

The following table shows the locations of the durable message markings evaluated for this study:

<table>
<thead>
<tr>
<th>Highway No.</th>
<th>Location</th>
<th>Material Type</th>
<th>Message Type</th>
<th>Year of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>11A:04</td>
<td>Sylvan Lake at Shell Station</td>
<td>System 400</td>
<td>Arrows, line crossing &amp; stop bar</td>
<td>1998</td>
</tr>
<tr>
<td>11A:04</td>
<td>Sylvan Lake at Wild rapids</td>
<td>System 400</td>
<td>Arrow, line crossing</td>
<td>1998</td>
</tr>
<tr>
<td>12:08</td>
<td>Intersection of SH 792</td>
<td>System 400</td>
<td>Arrows &amp; stop bars</td>
<td>1998</td>
</tr>
<tr>
<td>38</td>
<td>Redwater</td>
<td>PolyCarb 55.4</td>
<td>Railway X-ing &amp; stop bars</td>
<td>1998</td>
</tr>
<tr>
<td>Hwy. 63 @ Int. of SH663</td>
<td>Boyle</td>
<td>PolyCarb 55.4</td>
<td>Arrows &amp; stop bars</td>
<td>1998</td>
</tr>
<tr>
<td>63</td>
<td>Grassland</td>
<td>PolyCarb 55.4</td>
<td>Line crossing</td>
<td>1998</td>
</tr>
</tbody>
</table>
8.0 EVALUATION of PAVEMENT MESSAGE MARKINGS

Each of the markings at the locations in ‘Table 1’ above were inspected and evaluated on the following dates (The date of each inspection is indicated):

- Hwy. 11A:04, Sylvan Lake @ Shell Station - June 29, 1999 and Sept. 20, 2001
- Hwy. 11A:04, Sylvan Lake @ Wild Rapids - June 29, 1999 and Sept. 20, 2001
- Hwy. 12:08, Intersection of SH 792 - June 29, 1999 and Sept. 20, 2001

The message markings were evaluated and documented on inspection forms (appendix A, B & C). The message markings were assessed based on the following:

1. Condition of message marking (amount of deterioration, % Intact)
2. Pavement condition (cracks, segregation, potholes, etc.)
3. Message condition (blistering, bleeding, chipping, staining, etc)
4. Condition rating (range: 1-very bad to 5-excellent)
5. Rating of bead (range: 1-very bad to 5-excellent)
9.0 FIELD RATINGS

The durable message marking ratings have been summarized as shown in the following table:

### Table 2

<table>
<thead>
<tr>
<th>Assessment Date &amp; Location</th>
<th>Condition of Message Marking (% Intact)</th>
<th>Condition Rating</th>
<th>Bead Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X-walk</td>
<td>Arrows</td>
<td>Stop Bar</td>
</tr>
<tr>
<td><strong>June, 1999</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System 400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hwy. 11A:04 (Wild rapids)</td>
<td>100%</td>
<td>100%</td>
<td>4</td>
</tr>
<tr>
<td>Hwy. 12:08@ Int. of SH792</td>
<td>100%</td>
<td>80%</td>
<td>3</td>
</tr>
<tr>
<td>Hwy. 11A:04 (Shell station)</td>
<td>90%</td>
<td>90%</td>
<td>3</td>
</tr>
<tr>
<td>PolyCarb Mark-55.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hwy. 63 @ Grassland</td>
<td>100%</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Hwy. 63 @ Int. of SH663</td>
<td>100%</td>
<td>85%</td>
<td>4</td>
</tr>
<tr>
<td>Hwy. 38 @ Redwater</td>
<td>(rail-x-ing) 100%</td>
<td></td>
<td>(rail-x-ing) 3</td>
</tr>
<tr>
<td><strong>June, 2000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PolyCarb Mark-55.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hwy. 63 @ Grassland</td>
<td>100%</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Hwy. 63 @ Int. of SH663</td>
<td>100%</td>
<td>80%</td>
<td>3</td>
</tr>
<tr>
<td>Hwy. 38 @ Redwater</td>
<td>(rail-x-ing) 100%</td>
<td></td>
<td>(rail-x-ing) 3</td>
</tr>
<tr>
<td><strong>September, 2001</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System 400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hwy. 11A:04 (Wild rapids)</td>
<td>80%</td>
<td>95%</td>
<td>3</td>
</tr>
<tr>
<td>Hwy. 12:08@ Int. of SH792</td>
<td>90%</td>
<td>10% (south)</td>
<td>70% (north)</td>
</tr>
<tr>
<td>Hwy. 11A:04 (Shell station)</td>
<td>70%</td>
<td>90%</td>
<td>2</td>
</tr>
<tr>
<td>PolyCarb Mark-55.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hwy. 63 @ Int. of SH663</td>
<td>100%</td>
<td>70%</td>
<td>3</td>
</tr>
<tr>
<td>Hwy. 38 @ Redwater</td>
<td>(rail-x-ing) 100%</td>
<td></td>
<td>(rail-x-ing) 3</td>
</tr>
</tbody>
</table>
10.0 DISCUSSION OF RESULTS

Field Results

The System 400 and PolyCarb Mark-55.4 Durable Message Marking materials were placed in 1998. These markings were visually assessed in 1999, 2000 and 2001 for appearance and bead loss (table 2).

Condition Rating (Appearance)

Results indicate that both the System 400 and PolyCarb Mark-55.4 message marking materials are performing adequately after 3 years in service and generally been given a ‘fair condition’ rating based on appearance only (Table 2). The message markings remained intact with the exception of some material loss at high vehicular turning movements (stop bars) and areas where pavement repairs have been undertaken.

Bead Rating (Bead Loss)

The System 400 marking exhibited rapid bead loss after only 1 year of service. Where as a slower rate of deterioration was observed for the PolyCarb Mark-55.4 markings (Table 2). The PolyCarb Mark 55.4 markings were still rated fair for bead loss after 3 years of service.

11.0 RECOMMENDATIONS

1. Continued long-term evaluation is recommended to determine the effective service life for the Durable Message Markings. This will guide us in determining when message markings will require replacement. The markings are generally performing adequately after three years of wear with the exception of the stop bars at high vehicular turning movements (this is expected).

2. The bead retention needs to be addressed for the System 400 marking material (may be a factor at non-illuminated intersections) or the department should limit the use of this material to illuminated locations.

3. The warranty requirements specified in Alberta Transportation Highway Maintenance Specification 53.22 states the following:

   • Warranty period for workmanship of the contractor shall be 1 year.
• The manufacturer’s warranty for the material shall be a minimum of 3 years.
• Warranty period for Stop Bars shall only be 1 year.

The two products discussed in this study have met specified warranty requirements for Permanent Pavement Markings. Therefore it is recommended that the department continue the use of these two products for durable message markings.
Appendix ‘A’

Highway 63 (Grassland)
PolyCarb 55.4 Durable Message Marking Assessments
MESSAGE MARKINGS

DATE of ASSESSMENT_June 23/99

HWY. NO._63____________________ MESSAGE TYPE_Crosswalk__(diag. Attached)

LOCATION_Grassland (Buddys)___ PLACED (YEAR)_1998_________________

NUMBER of MONTHS IN SERVICE____________

MATERIAL TYPE : PolyCarb

1. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed In-Laid Pre-Formed
   100% intact X___ 100% intact_______
   90% intact____ 95% intact_______
   80% intact____ 85% intact________
   80% intact_______

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering___ staining___ cracking(excessive)_SL__ discoloration_X___
   bleeding___ spalling___ smearing or spreading___ pigment loss___
   chipping_SL(off rock surface) poor adhesion___ deterioration or damage___

4. CONDITION RATING
   
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)
   
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A cloudy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. COMMENTS
   
   Non uniform application

7. RECOMMENDATIONS

8. PHOTOGRAPHS YES___X_____ NO__________
MESSAGE MARKINGS

DATE of ASSESSMENT__June 21, 2000

HWY. NO._63 _______________ MESSAGE TYPE_Crosswalk___(diag. Attached)

LOCATION_Buddy’s____________ PLACED (YEAR)__1998____________

NUMBER of MONTHS IN SERVICE____________

MATERIAL TYPE_PolyCarb_____________

2. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed          In-Laid Pre-Formed
   100% intact_X__          100% intact________
   90% intact____            95% intact________
   80% intact____            85% intact_______
   85% intact_______         80% intact_______

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering___  staining___  cracking(excessive)_sl__  discoloration_sl__
   bleeding____  spalling___  smearing or spreading___  pigment loss___
   chipping_sl(off rock surface)  poor adhesion___  deterioration or damage___

4. CONDITION RATING
   
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)
   
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

6. COMMENTS
   Not in bad shape

7. RECOMMENDATIONS

8. PHOTOGRAPHS        YES__X______  NO__________
Appendix ‘B’

Highway 38 (Redwater)
PolyCarb 55.4 Durable Message Marking Assessments
MESSAGE MARKINGS

DATE of ASSESSMENT_June 23/99

HWY. NO.___38__________________  MESSAGE TYPE__Railway X  (diag. Attached)

LOCATION___Redwater_________________ PLACED (YEAR)___1998_______________

NUMBER of MONTHS IN SERVICE__?___________

MATERIAL TYPE__Poly Carb_____________

2. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed   In-Laid Pre-Formed
   100% intact__X__   100% intact_______
   90% intact____     95% intact_______
   80% intact____     90% intact_______
   85% intact_______
   80% intact_______

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Plain

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering____ staining_X__ cracking(excessive)___ discoloration___
   bleeding____ spalling____ smearing or spreading___ pigment loss___
   chipping____ poor adhesion___ deterioration or damage___

4. CONDITION RATING
   1 (very bad)  2 (poor)  3 (Fair)  4 (good)  5 (excellent)
   X

5. RATING OF BEAD (retroreflectivity)
   1 (very bad)  2 (poor)  3 (Fair)  4 (good)  5 (excellent)
   X

6. COMMENTS
   Good

7. RECOMMENDATIONS

8. PHOTOGRAPHS   YES____X_____ NO__________
MESSAGE MARKINGS

DATE of ASSESSMENT: June 21, 2000

HWY. NO. ___38_____________ MESSAGE TYPE__Railway X (diag. Attached)

LOCATION___Redwater_______________ PLACED (YEAR)___1998_______________

NUMBER of MONTHS IN SERVICE__?_________

MATERIAL TYPE__Poly Carb_____________

2. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed In-Laid Pre-Formed
   100% intact__X__ 100% intact_______
   90% intact_______ 95% intact_______
   80% intact_______ 85% intact_______
   80% intact_______

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Plain

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering___ staining__X___ cracking(excessive)___ discoloration_sl_
   bleeding___ spalling___ smearing or spreading___ pigment loss___
   chipping_minor_ poor adhesion___ deterioration or damage___

4. CONDITION RATING
   1 (very bad) 2 (poor) 3 (Fair) 4 (good) 5 (excellent)
   X

5. RATING OF BEAD (retroreflectivity)
   1 (very bad) 2 (poor) 3 (Fair) 4 (good) 5 (excellent)
   X

6. COMMENTS
   Stop Bars intact, some pavement cracks. Good shape.

7. RECOMMENDATIONS

8. PHOTOGRAPHS
   YES__X_____ NO___________
MESSAGE MARKINGS

DATE of ASSESSMENT_Sept. 20, 2001

HWY. NO._38____________________ MESSAGE TYPE_Rail-Xing, Stop Bars

LOCATION_Redwater____ PLACED (YEAR)_1998_________________

NUMBER of MONTHS IN SERVICE____________

MATERIAL TYPE : PolyCarb Mark 55.4

3. CONDTION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed
   100% intact_X___  90% intact____  80% intact____
   90% intact____  95% intact____  85% intact____  80% intact____

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering___  staining___  cracking(minor)_X__  discoloration_X__(slight)
   bleeding___  spalling___  smearing or spreading___ pigment loss___
   chipping_X  poor adhesion___  deterioration or damage___

4. CONDITION RATING

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. COMMENTS

Message marking material is standing up very well (low traffic volumes)

7. RECOMMENDATIONS

8. PHOTOGRAPHS YES____X______ NO__________
Appendix ‘C’

Highway 63 at SH663 (Boyle)
PolyCarb 55.4 Durable Message Marking Assessments
MESSAGE MARKINGS

DATE of ASSESSMENT_June 23/99

HWY. NO. 63 @ SH663 MESSAGE TYPE_Stop Bars (663), Arrows NBL63, X-SBL63) (diag. Attached)

LOCATION__Boyle__________________ PLACED (YEAR)__1998________________

NUMBER of MONTHS IN SERVICE___?________

MATERIAL TYPE_PolyCarb

1. CONDITION OF MESSAGE MARKING (amount of deterioration)
   - Surface Sprayed
     - 100% intact__X__
     - 90% intact____
     - 80% intact____
   - In-Laid Pre-Formed
     - 100% intact____
     - 95% intact____
     - 90% intact____
     - 85% intact____
     - 80% intact____

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   - Plain

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   - blistering___
   - staining___
   - cracking(excessive)___
   - discoloration___
   - bleeding____
   - spalling____
   - smearing or spreading___
   - pigment loss___
   - chipping____
   - poor adhesion___
   - deterioration or damage_Slight

4. CONDITION RATING
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
   N/A – cloudy

6. COMMENTS
   - Stop Bar Left side, severely chipped and deteriorated.
   - All others in good condition some worn spots (slight)

7. RECOMMENDATIONS
   - Stop Bar should be repaired under warranty.

8. PHOTOGRAPHS
   - YES____X______ NO________
Rail crossing on W. side (EBL)

Stop Bars on E. side of tracks (EBL)
Stop Bar on W. side of tracks (WBL)
Note missing section of marking material due to asphalt patching
Message Markings

Hwy. 63 @ SH 663 - Boyle

By: Joe Filice

File:
Date: June 23/99
By: Joe Filice
Page: 1
Message Markings
Hwy. 63 @ SH 663 - Boyle

By: Joe Filice

Date: June 23/99

Page: 2
MESSAGE MARKINGS

DATE of ASSESSMENT: June 21, 2000

HWY. NO. _____63 @ SH 663  MESSAGE TYPE: Stop Bars (663), Arrows NBL63, X-SBL63

LOCATION: Boyle  PLACED (YEAR): 1998

NUMBER of MONTHS IN SERVICE:

MATERIAL TYPE: PolyCarb

3. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed  In-Laid Pre-Formed
   100% intact X (arrows)  100% intact
   90% intact
   80% intact X Stop Bar
   80% intact
   85% intact

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good

4. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering
   staining
   cracking(excessive)
   discoloration
   bleeding
   spalling
   smearing or spreading
   pigment loss
   chipping(sl)(arrow)
   poor adhesion
   deterioration or damage

4. CONDITION RATING

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
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</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)

<table>
<thead>
<tr>
<th>1 (very bad)</th>
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<tbody>
<tr>
<td>X</td>
<td></td>
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</tbody>
</table>

6. COMMENTS

7. RECOMMENDATIONS

8. PHOTOGRAPHS  YES X  NO
MESSAGE MARKINGS

DATE of ASSESSMENT_ Sept. 20, 2001

HWY. NO._63 @ SH663__________________ MESSAGE TYPE_ Stop Bars, Arrows

LOCATION_Boyle       PLACED (YEAR)_1998

NUMBER of MONTHS IN SERVICE____________

MATERIAL TYPE : PolyCarb Mark 55.4

1. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed  In-Laid Pre-Formed
   100% intact X_(arrows)  100% intact________
   90% intact_______      95% intact________
   80% intact_______      90% intact________
   70% intact X_(stop bar) 85% intact_______
   80% intact________

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering____  staining____  cracking(excessive)_X(sl)_ discoloration_X_(sl)_
   bleeding____  spalling______  smearing or spreading____ pigment loss____
   chipping_X  poor adhesion____ deterioration or damage_X (stop bar)

4. CONDITION RATING

<table>
<thead>
<tr>
<th>1 (very bad)</th>
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<th>3 (Fair)</th>
<th>4 (good)</th>
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</tr>
</thead>
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<tr>
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</tbody>
</table>

   (stop bar) (arrows)

6. COMMENTS

   Stop bar wear in turning pattern. 2 metres of the stop bar on north end is complete gone, due to heavy trucks stopping and turning.

7. RECOMMENDATIONS

8. PHOTOGRAPHS
   YES__X_____ NO__________
Stop Bar (S.E. end of intersection)

Stop Bar showing section worn off
EBL Right Turn Arrow

EBL Through Arrow
Appendix ‘D’

Highway 11A:04, Shell Station (Sylvan Lake)
System 400 Durable Message Marking Assessments
DATE of ASSESSMENT_June 29, 1999

HWY. NO. ___ 11A:04  MESSAGE TYPE_X-walk, Arrows (diag. Attached)

LOCATION__Wild Rapids  PLACED (YEAR)__1998

NUMBER of MONTHS IN SERVICE ____________

MATERIAL TYPE_System 400

1. CONDITION OF MESSAGE MARKING (amount of deterioration)

<table>
<thead>
<tr>
<th>Surface Sprayed</th>
<th>In-Laid Pre-Formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% intact <strong>X</strong></td>
<td>100% intact ______</td>
</tr>
<tr>
<td>90% intact _____</td>
<td>95% intact ________</td>
</tr>
<tr>
<td>80% intact ______</td>
<td>90% intact ________</td>
</tr>
<tr>
<td>85% intact ______</td>
<td>85% intact ________</td>
</tr>
<tr>
<td>80% intact ______</td>
<td>80% intact ________</td>
</tr>
</tbody>
</table>

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
Good some cracks

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)

<table>
<thead>
<tr>
<th>blistering____</th>
<th>staining____</th>
<th>some cracking_X____</th>
<th>discoloration_X(some)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bleeding______</td>
<td>spalling____</td>
<td>smearing or spreading___</td>
<td>pigment loss___</td>
</tr>
<tr>
<td>chipping_X____</td>
<td>poor adhesion_</td>
<td>deterioration or damage__</td>
<td></td>
</tr>
</tbody>
</table>

4. CONDITION RATING

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
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</thead>
<tbody>
<tr>
<td>X</td>
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</table>

5. RATING OF BEAD (retroreflectivity)

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>X</td>
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</tr>
</tbody>
</table>

6. COMMENTS
Only travel lanes were laded.
Arrow has more beads than stop bars

7. RECOMMENDATIONS

8. PHOTOGRAPHS
YES__X__(#1 to #3)  NO_________
MESSAGE MARKINGS

DATE of ASSESSMENT: Sept. 20, 2001

HWY. NO. 11A:04  MESSAGE TYPE: X-ing, arrows, stop bar

LOCATION: Sylvan Lake (Shell Station)  PLACED (YEAR): 1998

NUMBER of MONTHS IN SERVICE

MATERIAL TYPE: System 400

1. CONDITION OF MESSAGE MARKING (amount of deterioration)

   Surface Sprayed  In-Laid Pre-Formed

   100% intact X__(Stop Bar)  100% intact_______
   90% intact X__(X-ing)  95% intact_______
   80% intact____  90% intact_______
   70% intact X__(Arrows)  85% intact_______
   80% intact_______

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)

   Segregation, some cracks

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)

   blistering____  staining____  cracking(excessive)_X_  discoloration____
   bleeding____  spalling_X_  smearing or spreading____ pigment loss____
   chipping_X__  poor adhesion___  deterioration or damage_X_

4. CONDITION RATING

   1 (very bad)  2 (poor)  3 (Fair)  4 (good)  5 (excellent)

   (Arrows)  (X-ing, stop bar)

5. RATING OF BEAD (retroreflectivity)

   1 (very bad)  2 (poor)  3 (Fair)  4 (good)  5 (excellent)

   X

6. COMMENTS

   Beads have worn off, minimal beads left.
   X-ing at turning movement shows more wear.
   Only one of 7 arrows is in bad shape.

7. RECOMMENDATIONS

8. PHOTOGRAPHS  YES__X_______ NO__________
50% of arrow gone in WBL.

Through and turn arrow 85% intact.
WBL through arrow 90% intact

Stop bar and x-ing East side of intersection
X-ing west side of intersection

X-ing at turning movement showing more wear
EBL arrows, through & right turn – 50% intact
Appendix ‘E’

Highway 11A:04, Wild Rapids (Sylvan Lake)
System 400 Durable Message Marking Assessments
MESSAGE MARKINGS

DATE of ASSESSMENT: June 29, 1999

HWY. NO. 11A:04  MESSAGE TYPE: X-walk, Arrows (diag. attached)


NUMBER of MONTHS IN SERVICE: 

MATERIAL TYPE: System 400

1. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed
   In-Laid Pre-Formed
   100% intact X  100% intact
   90% intact
   80% intact

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good, some cracks

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering X  staining___  some cracking X  discoloration X (some)
   bleeding___  spalling____  smearing or spreading___  pigment loss___
   chipping X  poor adhesion___ deterioration or damage X

4. CONDITION RATING
   1 (very bad)  2 (poor)  3 (Fair)  4 (good)  5 (excellent)
   X
   (X-walk) (Arrows)

5. RATING OF BEAD (retroreflectivity)
   1 (very bad)  2 (poor)  3 (Fair)  4 (good)  5 (excellent)
   X

6. COMMENTS
   Only travel lanes were laded.
   Arrow has more beads than stop bars.

7. RECOMMENDATIONS

8. PHOTOGRAPHS  YES X   NO ________
MESSAGE MARKINGS

DATE of ASSESSMENT_Sept. 20,2001

HWY. NO. 11A:04

MESSAGE TYPE: X-walk, Arrows

LOCATION: Sylvan Lake (Wild Rapids)

PLACED (YEAR): 1998

NUMBER of MONTHS IN SERVICE__________

MATERIAL TYPE: System 400

1. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed  In-Laid Pre-Formed
   100% intact____  100% intact____
   90% intact_X__(arrow)  95% intact____
   80% intact_X__(X-walk)  90% intact____
   85% intact____
   80% intact____

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good, some cracks

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering___ staining___ cracking(excessive)_X_ discoloration_X_(slight)
   bleeding____ spalling___ smearing or spreading___ pigment loss___
   chipping__X_ poor adhesion__ deterioration or damage_X_(X-walk)

4. CONDITION RATING
   
<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>(X-walk)</td>
<td>(Arrows)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)

<table>
<thead>
<tr>
<th>1 (very bad)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
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</tr>
</tbody>
</table>

6. COMMENTS
   Most of wear is in turning movement from side street to EBL.

7. RECOMMENDATIONS

8. PHOTOGRAPHS
   YES__X______ NO________
Rt. Turn arrow

Cross walk
Appendix ‘F’

Highway 12:08 at Int. SH792
System 400 Durable Message Marking Assessments
MESSAGE MARKINGS

DATE of ASSESSMENT_June 29/99

HWY. NO._12:08 MESSAGE TYPE_Stop Bars, Arrows (diag. Attached)

LOCATION__SH792 PLACED (YEAR)_1998

NUMBER of MONTHS IN SERVICE____________

MATERIAL TYPE_System 400

2. CONDITION OF MESSAGE MARKING (amount of deterioration)
   Surface Sprayed   In-Laid Pre-Formed
   100% intact__X__  100% intact_______
   90% intact_______  95% intact_______
   80% intact__X(stop bars)  90% intact_______
   85% intact_______  80% intact_______

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)
   Good

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)
   blistering____ staining_X(stop bars)cracking(excessive)X__ discoloration_X(stop bars)
   bleeding____ spalling____ smearing or spreading___ pigment loss___
   chipping__X poor adhesion___ deterioration or damage_X(Stop bars)

4. CONDITION RATING

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X(stop bar)</td>
<td>X(Stop)</td>
<td></td>
<td></td>
<td>X(Arrows)</td>
</tr>
</tbody>
</table>

5. RATING OF BEAD (retroreflectivity)

<table>
<thead>
<tr>
<th>1 (very bad)</th>
<th>2 (poor)</th>
<th>3 (Fair)</th>
<th>4 (good)</th>
<th>5 (excellent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X(stop bar)</td>
<td></td>
<td></td>
<td></td>
<td>X(Arrow)</td>
</tr>
</tbody>
</table>

6. COMMENTS
   Arrows look good, snow plow scrapping
   Excessive cracks and wear at stop bars-turning path damage.

7. RECOMMENDATIONS

8. PHOTOGRAPHS YES____X(#14 to#19) NO___________
MESSAGE MARKINGS

DATE of ASSESSMENT: Sept. 20, 2001

HWY. NO. 12:08
MESSAGE TYPE: Stop bars, Arrows

LOCATION: SH792
PLACED (YEAR): 1998

NUMBER of MONTHS IN SERVICE

MATERIAL TYPE: System 400

1. CONDITION OF MESSAGE MARKING (amount of deterioration)

<table>
<thead>
<tr>
<th>Surface Sprayed</th>
<th>In-Laid Pre-Formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% intact</td>
<td>100% intact</td>
</tr>
<tr>
<td>90% intact</td>
<td>95% intact</td>
</tr>
<tr>
<td>80% intact</td>
<td>90% intact</td>
</tr>
<tr>
<td>70% intact</td>
<td>85% intact</td>
</tr>
<tr>
<td>10% intact</td>
<td>80% intact</td>
</tr>
</tbody>
</table>

2. PAVEMENT CONDITION (cracks, segregation, potholes, etc.)

   Good, rutting on north side of SH792

3. MESSAGE CONDITION (blistering, bleeding, chipping, staining, spalling, poor adhesion)

<table>
<thead>
<tr>
<th>blistering</th>
<th>staining</th>
<th>cracking(excessive)</th>
<th>discoloration</th>
<th>pigment loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>bleeding</td>
<td>spalling</td>
<td>smearing or spreading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chipping</td>
<td></td>
<td>poor adhesion</td>
<td>deterioration or damage</td>
<td></td>
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</table>

   (X-walk) (Arrows)

5. RATING OF BEAD (retroreflectivity)

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<tr>
<td>X</td>
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</tbody>
</table>

6. COMMENTS
   Arrows are in very good shape. Excessive loss of beads.

7. RECOMMENDATIONS

8. PHOTOGRAPHS
   YES__X______ NO__________
EBL right turn arrow

EBL left turn arrow
Stop Bar, excessive wear, vehicular turning movements (EBL)

Stop Bar showing excessive wear at turning points
WBL Stop Bar, excessive wear due to pavement rutting

WBL arrows