Ontario's Minimum Maintenance Standards (MMS) and Pavement Edge Drop-Off

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Minimum Maintenance Standards (MMS) have been legislated in Ontario specifically to defend entities responsible for road maintenance from liability in civil court proceedings. In part these standards address the permissible amount of pavement edge drop off before maintenance efforts are required. The Ontario regulation defines the requirements as noted below:

Shoulder drop-offs

7. *(1) If a shoulder drop-off is deeper, for a continuous distance of 20 metres or more, than the depth set out in the Table to this section, the minimum standard is to repair the shoulder drop-off within the time set out in the Table after becoming aware of the fact. O. Reg. 239/02, s. 7 (1).*

(2) A shoulder drop-off shall be deemed to be repaired if its depth is less than or equal to that set out in the Table. O. Reg. 239/02, s. 7 (2).

(3) In this section,

"shoulder drop-off" means the vertical differential, where the paved surface of the roadway is higher than the surface of the shoulder, between the paved surface of the roadway and the paved or non-paved surface of the shoulder. O. Reg. 239/02, s. 7 (3).

TABLE
SHOULDER DROP-OFFS

Class of Highway	*Depth*	*Time*
1	*8 cm*	*4 days*
2	*8 cm*	*4 days*
3	*8 cm*	*7 days*
4	*8 cm*	*14 days*
5	*8 cm*	*30 days*

In an article posted to the Gorski Consulting website on in September of 2012, we described the deficiencies of the MMS via an example of our observations of the development of an edge drop-off at the S-curve Clarke Road north of Fanshawe Park Road in the north-east of London, Ontario. Commencing with the initial grading of the shoulder, the edge drop-off was measured each week for eleven weeks. The results of the

observations were presented in a chart. We expressed our concern that the MMS were worded such that the threshold for maintenance would never be reached. As a follow-up to that conclusion we will present another example of the failure of the MMS to address these concerns.

First, we will present some of the work of the September, 2012 article, as noted below.

Excerpts Taken From Gorski Consulting Article of September, 2012

Maintenance of the edge drop off was conducted on June 18, 2012. First a grader plows a gravel shoulder to heap the gravel back onto the pavement as shown in the two photos below.

Figure 1: View of road grader passing through the east shoulder of the curve on Clarke Road north of Fanshawe Park Road in London, Ontario.

Figure 2: After a first run by the road grader, the gravel and soil are mounted on the edge of the pavement.

Next the grader returns on a second pass and scrapes the loose gravel back away from the pavement as shown in Figures 3 and 4 below.

Approximately one month after this maintenance we conducted our first set of measurements of the edge drop off. A 20 metre section of drop off was divided by 5 equi-distant markers and measurements were taken at each marker.

Figures 5, 6 and 7 show the measurement procedure at the "Zero" marker.

The edge drop off of about 2.00 inches (shown in Figure 7) was obtained from the horizontal carpenter's level, placed at the pavement edge and measured down to the surface of the gravel adjacent to that edge. The same procedure was used at the 5, 10, 15 and 20 metre markers so that 5 measurements of the edge drop off were obtained over the 20 metre distance. This procedure was repeated for 11 weeks .

By the eleventh week the edge drop off had increased substantially. Figures 8, 9 and 10 show the edge drop off at the Zero marker on that 11th week. For example, it can be seen in Figure 10 that the drop-off has increased to just over 3 inches, as compared to the 2 inches of drop-off shown in Figure 7.

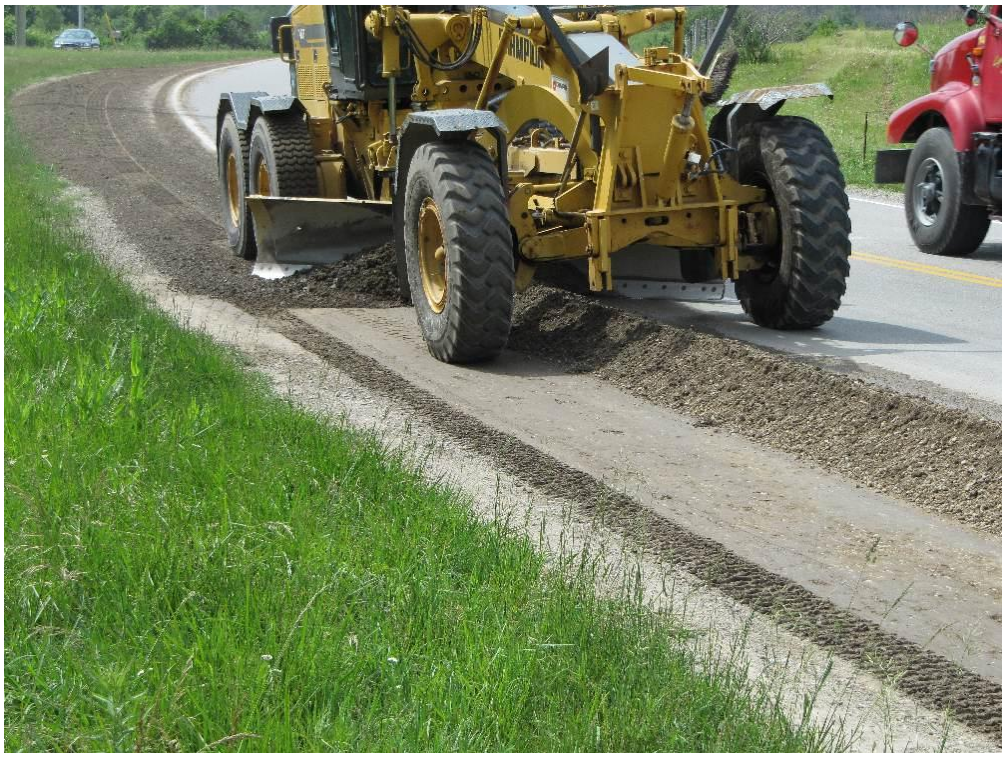

Figure 3: Upon completing the second pass the road grader pushes the gravel/soil back onto the shoulder and levels the material.

Figure 4: The final result of the re-grading is that the shoulder contains a level surface of loose gravel and soil.

Figure 5: Example of the procedure used to measure the edge drop-off at the first ("Zero") measurement station.

Figure 6: View of the 4-foot carpenter's level that is placed in a horizontal angle with its end placed on the pavement edge.

Figure 7: A measurement tape is used to measure the vertical difference between the pavement edge and the surface of the gravel shoulder.

Figure 8: View of the measurement procedure being conducted on the eleventh week of observations.

Figure 9: View of the measurement procedure being conducted on the eleventh week of observations.

Figure 10: View of the measurement procedure being conducted on the eleventh week of observations.

This procedure enabled the creation of the chart of edge drop off measurements as shown in Figure 11.

In the chart the horizontal axis shows the 11 weeks of measurements and the vertical axis indicates the extent of edge drop off measured in inches. The five lines indicate the progressive increase in edge drop off at each of the five markers.

For example, the yellow line indicates the depth of the edge drop off at the Zero marker. As can be noted in the above photos, the edge drop off was about 2.00 inches in Week 1 and then it grew to a depth of 3.00 inches by Week 11. This is a relatively low increase in depth when compared to measurements at some of the other markers.

For example, the green and purple lines indicate the edge drop off at the 10 and 15 metre markers. At Week 1 the drop off was 2.00 inches and 1.75 inches respectively at the 10 and 15 metre markers. Yet by Week 11 those depths had increased to 4.25 (10 metre marker) and 5.00 inches (15 metre marker).

Not surprisingly, at the two ends of the 20 metres of measurements the edge drop off was at its lowest and the greatest depth was at the middle three markers.

By Week 5 there was always a location within the 20 metre distance where the edge drop off was at least 4.00 inches. Yet, in almost every week there was always a location where the edge drop off was 3.00 inches or about 7.6 centimetres. Recall that the Ontario MMS require that every measurement in a 20 metre distance must be greater than 8 centimetres or about 3.15 inches. If one looks closely at our measurements then perhaps in Weeks 8 and 9 all the measurements just barely rose above the MMS requirements. But one can imagine that the values could be disputed by a lawyer at trial. So throughout the 11 weeks of measurements it could be argued that the municipality responsible for this road had no obligation to re-grade shoulder.

How reasonable is this? We have attached a number of photos of the area taken in Week 11, shown in Figures 11 through 14. The extent of the edge drop off in some of the photos can be appreciated by looking at the shadow cast by the carpenter's level (Figure 11) or by the edge of the pavement (Figure 12).

Figures 13 and 14 show the typical scrapes that are created when a deep edge drop-off causes the undercarriage of a vehicle to make contact with the pavement surface.

These conditions are what the Ontario MMS have deemed to be reasonably safe for Ontario's motorists.

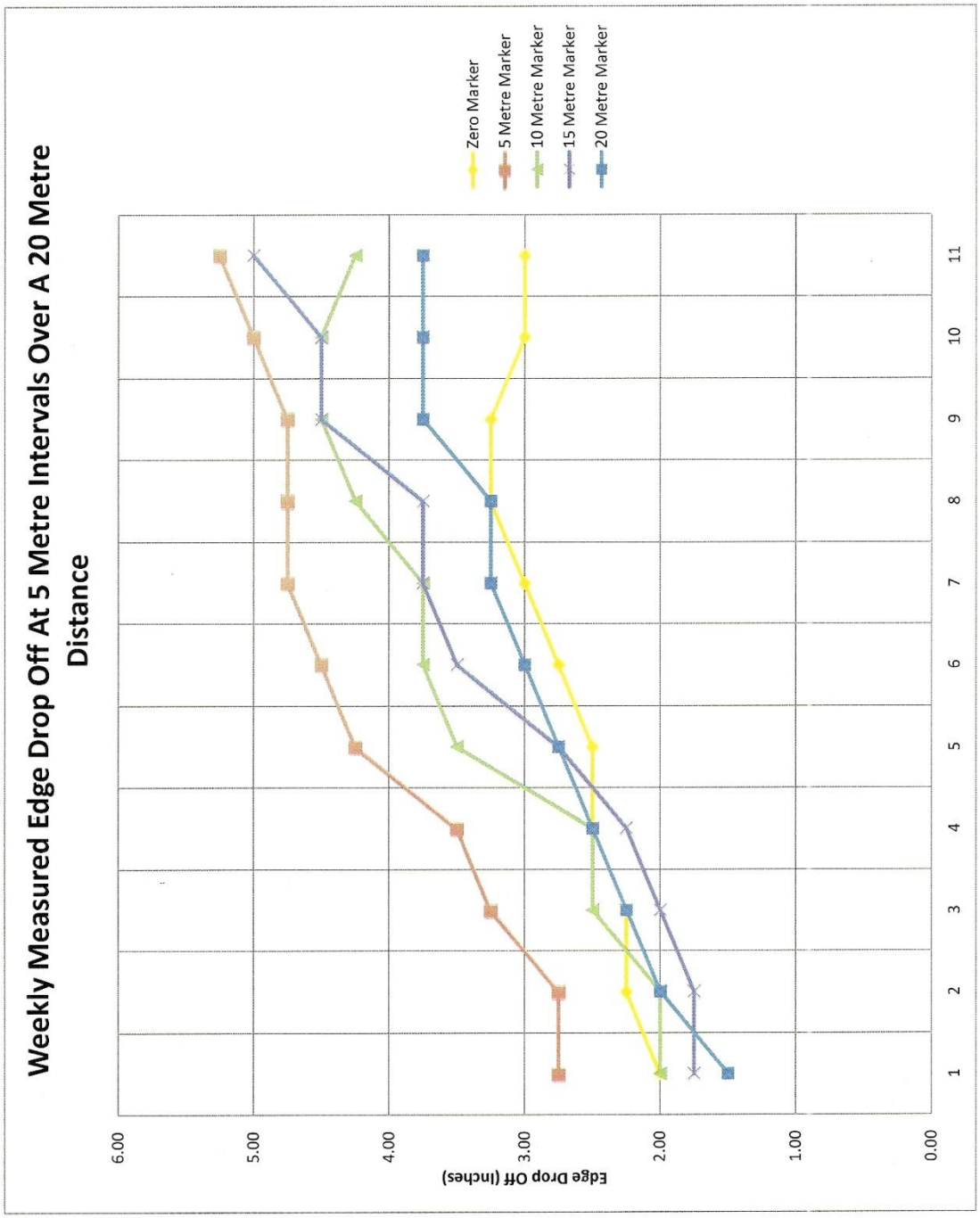
Weekly Measured Edge Drop Off At 5 Metre Intervals Over A 20 Metre Distance
Zero Marker
5 Metre Marker
10 Metre Marker
15 Metre Marker
20 Metre Marker
Edge Drop Off (Inches)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1
2
3
4
5
6
7
8
9
10
11

Figure 11: The extent of the edge drop-off can be appreciated by observing the shadow of the carpenter's level.

Figure 12: The shadow along the drop-off in this photo indicates the extent of the drop.

Figure 13: Evidence of scraping of the pavement along the asphalt edge indicates the undercarriages of vehicles have made this contact due to the extent of the drop-off of the shoulder.

Figure 14: Further evidence of scraping of the pavement at the edge of the drop-off.

A Current Example of the MMS Failure to Address Dangerous Edge Drop-Offs

Subsequent to the our discussion of September, 2012 (above), we present a current example of another edge drop-off that, under the definitions of the MMS, are deemed acceptable and do not require maintenance. This current example exists at the same S-curve of Clarke Road north of Fanshawe Park Road, but approximately 100 metres south.

Figure 15 shows a northbound driver's view upon entering the S-Curve. The edge drop-off of concern is on the east (right) edge of the northbound lane as seen in the background.

Figures 16 and 18 demonstrate that the edge drop-off is not continuous and therefore does not meet the threshold for repair as defined by the MMS. Yet, as shown in Figures 19 through 21, the edge drop-off within the individual crevices is deeper than the 8 centimetre threshold noted in the MMS. The obvious difference is that the 8 centimetre drop does not exist along the full 20 metres that is required in the MMS. Figures 22 and 23 show how the existence of the crevices has caused the undercarriage of vehicles to make contact with the pavement surface.

Figure 15: View looking north, as a driver approaches the first portion of the S-curve on Clarke Road. The edge drop-off of concern can be detected by the dark shadow along the right pavement edge.

Figure 16: View looking north toward the edge drop off along the east edge of the northbound lane of Clarke Road.

Figure 17: An interesting feature of the edge drop-off is that it is not continuous thus it would not meet the threshold of repair as defined by the MMS.

Figure 18: Because there are breaks within the edge drop-off this would not meet the threshold for repair since the MMS requires that the excessive drop-off exist over the full length of 20 metres.

Figure 19: View of a 4-inch edge drop-off within one of the crevices.

Figure 20: View of a 4-inch edge drop-off within one of the crevices.

Figure 21: View of an edge drop-off of over 4 inches in one of the crevices.

Figure 22: View of the typical, fresh scrapes in the pavement from contact with a vehicle's undercarriage.

Figure 23: Close-up view of the typical evidence of undercarriage contact when a vehicle's wheel drops into a crevice and vehicle makes contact with the pavement surface.

This is an example of bureaucratic insanity as the intermittent edge drop-off could be a greater potential for causing a vehicle's loss-of-control than a continuous drop-off.

The historically recognized danger of edge drop-off is that, when a wheel slips off the pavement, the driver will attempt to steer back onto the pavement. It is the scrubbing of the sidewall of the tire which creates the so-called dangerous lateral force which leads to loss-of-control of the vehicle. Nothing has ever been said that, if the wheel remains in the relatively-level hollow of the shoulder, that there is any significant danger, as the driver can simply reduce speed and re-enter the road when the vehicle speed is lower.

However, when the drop-off is intermittent, as shown in the above example, there will be a vertical force introduced, likely to both of the right side wheels, even if no attempt is made to steer back onto the paved road.

What could one expect in a scenario where the co-efficient of friction is low, such as when snow has fallen or the roadway is wet? Not only will the suspension be compromised but these deep crevices will cause a higher drag in a rearward direction on the right side of the vehicle, precisely when there is little tire force available to keep the vehicle in a steady state. Common sense would demonstrate that an unbalanced force applied away from the centre-of-gravity of a vehicle in an environment of low tire force

will likely result in rotation. Yet the authors of the MMS would deem this condition acceptable.

The travelling public has no appreciation of these issues. When a vehicle travels out-of-control and a collision occurs there is little attention paid to the fact that an edge drop-off may have been a factor. Police investigations are biased toward documenting and reporting driver failures such as drug impairment, speed and inattention. When driver fault exists there is essentially no publicity in a reported police investigation whether additional factors such as an excessive edge drop-off could be a contributing factor. The reporting of such complicating factors can only mean the weakening of the potential to obtain a conviction. Similarly, when a serious or fatal collision occurs the roadway is shut down to all persons except those investigating police and often the roadway maintenance personnel who may be called in to repair a deficiency before the roadway is opened to the public.

Similarly, news media reporters have no understanding of the questions they need to ask or what factors need their attention. Photographs of a crushed vehicle at its final rest position provide much greater readership interest than whether there is a roadway deficiency several hundred metres away from where all the "important" evidence is located. As such edge drop-off is simply not on the news media radar.

The authors of Ontario's MMS unabashedly admitted that their purpose was to minimize the liability of defendants in civil actions. Many of those authors were representatives of the defendants such as Ontario municipalities and the Ontario government. Not only would this legislation affect the general public, but the authors themselves, their families and acquaintances would also bear the consequences of the unreasonable thresholds that they placed into law. The standard for maintenance of edge drop-off in Ontario remains the weakest in North America as only the State of Texas has a standard that is similar. Historically, an edge drop-off of two inches, regardless of the length of roadway it encompassed, was the threshold where liability could be triggered. That is a far cry from the 8 centimetres (3.15 inches)and "continuous 20 metres" required under the MMS.

The population of victims of these actions is small and voiceless compared to the population at large that may obtain a small tax benefit from preventing the judicial process from determining liability based on the unique facts of a claim. In fact, the savings to these deep-pocketed defendants does not necessarily result in a direct reduction in taxes but, as is often the case, the saved money disappears into an unaccountable, bureaucratic, black hole.

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