



Ontario Hot Mix Producers Association

365 Brunel Road, Unit 4, Mississauga Ontario L4Z 1Z5
Phone: 905-507-3707 Fax: 905-507-3709 www.ohmpa.org

QUALITY OF ASPHALT PAVEMENT TASK FORCE

May 2015

Re: SPECIAL BULLETIN #2 | Asphalt Cement Quality and Specifications

This bulletin focuses on asphalt cement quality and specifications as they relate to pavement cracking identified as a high priority issue in the inaugural bulletin of the Task Force (TF) released in March 2015. Presented is a summary of actual pavement cracking performance data and the corresponding correlations observed with the various tests used to assess the quality of the asphalt cement in their respective studies. It is important to note that comprehensive reviews of the latest studies and data will continue to be undertaken by the TF as they become available.

The attached matrix shows the correlation between asphalt cement properties and pavement cracking performance observed to date based on a number of Ministry of Transportation (MTO) trials. While it is acknowledged that asphalt cement quality affects cracking performance, based on the results of the studies it is clear that the asphalt cement binder properties measured in the trials are not sufficient to predict and control pavement cracking performance. In addition, the data infers that implementation of the Extended BBR does not appear to significantly enhance pavement cracking performance beyond the current specification provided that the low temperature PG rating of the binder is properly specified. In some of the studies, the low temperature of the pavement experienced during winter may have dropped below the low temperature PG rating of the binder. Moreover, the performance data shows that the rehabilitation treatment may have played a role in the distress

MTO implemented major changes to asphalt cement specifications in 2012. These new specifications included DENT and MSCR Percent Recovery which assure polymer modification, and Ash Content intended to limit the use of certain additives such as Re-refined Engine Oil Bottoms (REOB), also known as Vacuum Tower Asphalt Extenders (VTAE). Since the implementation of the new specifications, it is noted that the pre-mature cracking attributed to the quality of asphalt cement have not been reported at the time of the release of this bulletin. While these specifications have been used on MTO highways for three years there has not been substantial use of polymer modified asphalt cement in municipal and private projects.

Any research considered should be properly validated. As the objective of the TF is to achieve better pavements, it goes without saying that the findings of the research and analyses will be an essential step to accomplish that goal. So, it is the consensus of the TF that while definitive causes are difficult to identify conclusively, the noted pre-mature cracking can be attributable in some cases to other issues such as poor mix design, irresponsible use of RAP, lack of or improperly applied tack coat, inadequate design of the pavement structure or construction-related issues (insufficient compaction, aggregate segregation, poor drainage, etc.) and these factors need to be evaluated.

At this time, the TF strongly recommends the use of polymer modified asphalt cement where enhanced performance is required. Analysis of recent temperature data has also revealed that the PG Zones set out originally for Ontario should be re-assessed as some areas have been experiencing much lower temperatures leading to the selection and use of essentially the wrong low temperature PG.

A caution should be warranted on the use of prescriptive language to control modification technologies. Chemical analyses may actually not have been fully validated so far. Consequently, they could be subject to complications, or lead to potential errors, if they are used to assess conformance to specifications.

Work is ongoing to study improvement to the PG specifications. The TF is very supportive of ongoing research including the studies carried out in Ontario by the MTO. New proposed test methods should be properly validated prior to their implementation. The MSCR, for example, is being fully supported by industry primarily because the test has gone through rigorous testing, has been properly validated and polymer modified asphalts that meet the specified requirements of the MSCR test have been shown to be more strain tolerant. This bodes well for improving the performance of the asphalt cement and ultimately the HMA.

The Quality of Asphalt Pavement Task Force re-iterates that implementing the MSCR specification alone is not sufficient to ensure long term pavement performance. A composite approach addressing binder, mix, pavement design, and construction factors is required.

The Quality of Asphalt Pavement Task Force

In response to concerns about the quality of asphalt pavement in Ontario, OHMPA formed the Quality of Asphalt Pavement Task Force. The purpose of this group comprised of industry experts, consultants and academics is to assess these concerns and propose workable solutions that are scientifically sound and also practical. In responding to this challenge, the task force has road owners' concerns in mind and has drawn on the expert opinions of the members of the group.

These and other findings and recommendations of the Quality of Asphalt Pavement Task Force will be published on the OHMPA website (www.ohmpa.org). For more information, please contact the OHMPA office at 905-507-3707 or by email at info@ohmpa.org.

CRACKING PERFORMANCE CORRELATION MATRIX

TRIAL/STUDY	TEST CONDUCTED	CORRELATIONS WITH CRACKING	COMMENTS
<p style="text-align: center;">Hwy 655 Ph 1 2003 6 trial sections (3,500 tonnes of HMA)</p>	<p style="text-align: center;">1 Hr BBR (M 320)</p> <p style="text-align: center;">ExBBR LTLG (72 hr)</p> <p style="text-align: center;">ExBBR Grade Loss</p> <p style="text-align: center;">DENT</p>	<p style="text-align: center;">None</p> <p style="text-align: center;">Moderate</p> <p style="text-align: center;">Moderate</p> <p style="text-align: center;">Poor</p>	<p>Correlation to transverse cracking after five years. Pavement temperature exceeded failure limits of binders. Binders were rated for -34°C (PG 64-34 & 52-34) were specified for region where pavement temperature drops below -34°C. One section passed Extended BBR LTLG and had good cracking performance after five years. Trial did not answer what would happen if PG minus 40 binders were specified so that failure limits of binders were not exceeded. Tests on recovered binders after five years showed excellent correlation to transverse cracking for both 1hr BBR and Extended BBR (recovered binder results).</p>
<p style="text-align: center;">Hwy 417 2006 7 trial sections</p>	<p style="text-align: center;">1 Hr BBR (M 320)</p> <p style="text-align: center;">ExBBR LTLG (72 hr)</p> <p style="text-align: center;">ExBBR Grade Loss</p> <p style="text-align: center;">DENT</p>	<p style="text-align: center;">Poor</p> <p style="text-align: center;">Poor</p> <p style="text-align: center;">Poor-Moderate</p> <p style="text-align: center;">Moderate</p>	<p>Correlation of MTO QA test results (at time of construction) to total cracking after eight (8) years in service (based on MTO ARAN cracking data).</p>
<p style="text-align: center;">Hwy 655 Ph 2 2007 8 trial sections</p>	<p>Review is outstanding pending availability of field trial results.</p>		<p>Trial results to be analyzed.</p>
<p style="text-align: center;">Hwy 427 2008 5 trial sections</p>	<p>Review is outstanding pending availability of field trial results.</p>		<p>Trial involved asphalt over concrete. Relevance to binder performance specification will need to be assessed.</p>
<p style="text-align: center;">Study of Pavement Performance in Eastern & NE Ontario 2009 20 pavements</p>	<p>Tests conducted on recovered asphalt. Both 1hr BBR (M320) and Extended BBR (72hrs) testing on recovered binders predicted similar performance cracking.</p>		<p>Virgin binders were not tested. Pavements were 8 to 20 years old when cored.</p>
<p style="text-align: center;">2011 MTO Acceptance Methodology Initiative 2011-2015 38 Contracts</p> <p>(results from 18 contracts representing 600,000+ tonnes are available for review at this time)</p>	<p style="text-align: center;">1 Hr BBR (M 320)</p> <p style="text-align: center;">ExBBR LTLG (72 hr)</p> <p style="text-align: center;">ExBBR Grade Loss</p> <p style="text-align: center;">DENT</p> <p style="text-align: center;">MSCR % Recovery</p> <p style="text-align: center;">Ash Content</p>	<p style="text-align: center;">Moderate</p> <p style="text-align: center;">Poor</p> <p style="text-align: center;">None</p> <p style="text-align: center;">None</p> <p style="text-align: center;">Poor</p> <p style="text-align: center;">None</p>	<p>Correlation on total cracking for mill and pave 2-lift pavements after three years (ARAN data) as there was insufficient data to correlate for other construction types. Correlation to longitudinal and transverse cracking showed similar results. Construction type appeared to influence cracking: Pulverize (3 lifts), FDR (2 lifts), and CIREAM (2 lifts) performed better than Mill (1, 2 and 3 lifts), Overlay (1 lift) and Pulverize (1 lift).</p>