



Quality of Asphalt Pavement Task Force Report

Steve Smith

Vice President, Paving and Construction,
The Miller Group

2015 OHMPA President



TASK FORCE HISTORY

- *OHMPA Board decided to tackle the ongoing quality concerns head-on!*
- Concept of setting-up a Quality of Asphalt Task Force was first discussed at October 2014 OHMPA Board meeting.
- OHMPA Board Special Meeting was held on November 6, 2014.
- Task Force was established and first meeting held in February 2015.
- Terms of Reference were developed to ensure proper governance in accordance with OHMPA By-laws.

MANDATE

- Owners as well as OHMPA members expressed serious concerns with pre-mature cracking.
- OHMPA formed the Quality of Asphalt Pavement Task Force; made up of some of the most highly regarded industry experts.
- Main objectives are to review and investigate the factors causing the cracking and...
- To provide practical solutions to ensure long term pavement performance in keeping with OHMPA's mission.

Dedicated To Excellence In Asphalt Pavements



Terms of Reference

Reminder from the Quality of Asphalt Pavement Task Force's Terms of Reference

- **Mandate:** The Ontario Hot Mix Producers Association recognizes and supports the need to continually improve and enhance the performance of asphalt pavements in Ontario. The purpose of the Quality of Asphalt Pavement Task Force will be to investigate all issues affecting asphalt pavement quality and make recommendations to the Board of Directors with a goal of furthering OHMPA's commitment to "Excellence in Asphalt Pavements." Items for this group to review will include, but not be limited to, best practices, hot mix design, procedures/specifications, RAP and RAS volumes in mixes, recycled binder ratios and AC specifications.
- **Accountability:** The Task Force reports to the Executive Committee and Board of Directors through oral and/or written reports by the Chair, Vice-Chair or staff liaison at Board meetings and through quarterly reports and annual reports to OHMPA members. Task Force members understand they will be working to ensure excellence in asphalt pavements and not in the best interests of their own organizations.

SPECIAL BULLETIN #1

March 2015

Re: QUALITY OF ASPHALT PAVEMENT TASK FORCE

Since its formation in 1974, the Ontario Hot Mix Producers Association (OHMPA) has recognized and supported the need to continually improve the performance of pavements in Ontario.

In recent months, we have become acutely aware of some hot mix asphalt performance problems that are in need of our attention immediately. Specifically, both provincial and municipal road owners as well as OHMPA members have expressed serious concerns with pre-mature cracking.

In response to these concerns, OHMPA has formed the Quality of Asphalt Pavement Task Force. Made up of some of the most highly regarded industry experts from across the province, the group's singular goal is to review and investigate the main factors impacting pavement quality in Ontario and to make recommendations to road owners, asphalt producers and road builders that will help to ensure good quality, long lasting pavements.

The Quality of Asphalt Pavement Task Force is composed of a formidable group of asphalt practitioners representing all facets of the industry including producers, contractors, consultants, asphalt cement suppliers and academics. Although only formed in early 2015, the group has already met twice with a third meeting scheduled very soon and has determined that the problems currently facing Ontario's roads are diverse and varying with an equally diverse list of possible causes.



The Task Force

- Vince Aurilio - Chair (ex-officio)
- Steve Smith Miller Group - Co-chair
- Bruce Armstrong (Canadian Asphalt),
- Hassan Baaj (University of Waterloo),
- Salman Bhutta (Engtec Consulting),
- Jim Karageorgos (Steed and Evans),
- Fernando Magisano (K.J. Beamish),
- Steve Manolis (Coco Asphalt Engineering),
- Kevin Martin (Fermar Paving),
- Murray Ritchie (The Murray Group), and
- Ludomir Uzarowski (Golder Associates)
- Sandy Brown ex-officio

The Internal Audit

- It was decided that the first step was to take a hard look at what OHMPA was doing - 'the internal audit'
- This was the rationale for not including owners at the start of the process; however the discussion regarding the inclusion of owners was ongoing throughout the initial stages.
- The first meeting involved the identification of the types of cracking and prioritizing the potential causes (no-holds barred brainstorming).
- Very aggressive meeting schedule.
- 10 key factors were ranked and three were identified as requiring immediate attention (or top priority).

High Priority Factors

- Asphalt Cement (AC) Quality and Specifications
- Increasing the AC Content in Superpave mixtures
- The Responsible Use of Recycled Materials

Special Bulletins

Key presentations were made by Task Force members:

- Municipal Owners Perspective by Ludomir Uzarowski
- AC Research Efforts by Steve Manolis & Sandy Brown
- Increasing AC Content by Fernando Magisano
- Use of Recycled Materials by Salmam Bhutta & Steve Smith

MUNICIPALITIES' POINT OF VIEW (Uzarowski)

- Extensive, premature failures of asphalt pavements are due to materials problems, mainly quality of asphalt cement and other asphalt mix issues
- Failures cost municipalities millions of \$
- Immediate action is required
- Municipalities cannot afford any further failures

MUNICIPALITIES' POINT OF VIEW

- Asphalt industry is very slow or not interested at all in solving the current serious problems
- Trust in asphalt industry including foreign experts and organizations seriously shaken
- Current very aggressive competition - suspicion how an industry member can produce quality asphalt at extremely low prices

AC Quality & Specifications

- Industry analysis of performance data to-date indicates poor or no correlation with new asphalt tests being proposed
- In some cases the wrong PGAC was used
- The pre-mature cracking may be attributed to a number of others factors
- Caution is warranted with making spec changes - may lead to 'unintended consequences'
- Stakeholders need to work together to come up with practical solutions

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.



What are the concerns? - Owners' Perspective (Magisano)

Comments from owner agencies:

- Superpave mixes tend to have lower A.C. contents than Marshall mixes
- HMA producers tend to purposely design lean mixes (low bid system)
- Some producers further reduce the A.C. content during production
 - Taking advantage of OPS 310 production tolerances
- Use of RAP further reduces the proportion of new A.C. in the mixes

What are the concerns? - Owners' Perspective

Low A.C. content mixes are said to have:

- Coarser gradations
- Lower film thickness
- Minimum or low VMA
- Lower in-situ density - due to greater resistance to field compaction

Which can lead to:

- Less resistance to fatigue damage - premature cracking
- Poorer longitudinal joint performance
- Lower overall long-term durability

Summary List of Possible Solutions

1. Target A.C. bid values
2. Higher maximum Nini requirements
3. Use fine graded mixes
4. Call for minimum A.C. content
5. Reduce the allowable acceptance for Air Voids and/or A.C. Content
6. Reduce or ban the use of RAP
7. Lowering the design Air voids
8. Reduce or cap the design gyration levels
9. Raised VMA requirements
10. Specify gyration level depending on binder type
11. Add a minimum density at Nini gyrations
12. Add a minimum lab permeability requirement
13. Develop a new methodology to establish mixing & compaction temperatures

QUALITY OF ASPHALT PAVEMENT TASK FORCE

June 2015

Re: SPECIAL BULLETIN #3 - Asphalt Cement Content

This bulletin deals with asphalt cement (AC) content and how it relates to pavement performance. It is the third in a series of bulletins from OHMPA's Quality of Asphalt Pavement Task Force.

The introduction of Superpave Technology in Ontario provided us with a possibility of improved volumetric mix design methodology and enhanced quality requirements for aggregates used in HMA mixes. Superpave designs have significantly improved the performance of our pavements in terms of resisting rutting, shoving and flushing on our high volume highways, major arterial roads as well as intersections and bus lanes. However, there has been growing concern over the last several years that the AC content of many Superpave mix designs have been reduced to below optimal levels.

Asphalt content or more specifically Effective Asphalt Content of HMA mixes can significantly influence pavement performance in terms of fatigue and stress cracking and therefore there have been many owner agencies throughout North America looking at ways of increasing AC in their mixes.

This Bulletin will outline the various parameters that have been explored to try and increase the effective asphalt content and give direction to finding the proper solution for Municipal owner agencies.

The Responsible Use of Recycled Materials in Hot Mix Asphalt (Bhutta)

- The continued use of RAP/RST in hot-mix asphalt is environmentally responsible and offers good value and benefits to all the stakeholders.
- Proper mix design and production adjustments of the virgin PGAC grade must be made for mixes with RAP in excess of 20% as outlined in OPSS.
- Ontario mix design procedures assume that 100% of the AC in the RAP/RST is available for the mix design.

The Responsible Use of Recycled Materials in Hot Mix Asphalt

- It is accepted that the recycled materials do not behave like “Black Rock” in the mix. However the contribution of the AC in the RAP/RST needs to be re-evaluated particularly with proportions $> 25\%$ are used in HMA.
- The Recycle Binder Ratio (RBR) better reflects the contribution from the old AC in RAP/RST. This becomes a concern when RAP is fractionated into Fine RAP and Coarse RAP and Fine RAP is incorporated into the hot mix.
- Industry is more than willing to work with road owner agencies with an ‘open door’ policy to further develop appropriate controls that ensure that the proper amount of RAP/RST is being utilized by the HMA producer at all times.

QUALITY OF ASPHALT PAVEMENT TASK FORCE

August 2015

Re: SPECIAL BULLETIN #4 - The Responsible Use of Recycled Materials in Hot Mix Asphalt

This bulletin deals with fostering the responsible use of recycled materials, which includes Recycled Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS), in hot mix asphalt (HMA).

Research has shown that the responsible use of RAP enhances pavement performance. In addition to RAP, both RAS consisting of post-industrial Recycled Shingle Tab (RST) and tear-off waste from roofs have been incorporated in HMA. In light of some recent performance issues with HMA in Ontario, the Task Force agrees that as an industry, we need to review the proper use of both RAP and RAS in HMA to ensure that quality asphalt pavements are being constructed.

The use of RAP in HMA has a long and proven track record in Ontario and around North America producing quality pavements while at the same time promoting sustainability and creating environmental benefits. In Ontario, the current specifications governing mix designs allow the use of RAP and RST in hot mix asphalt.

New Task Force Members

Municipal

- Gary Kocialek - Peel (GTHA)
- Andrew Lewis - Windsor (Western)
- Charles Croll - Stirling-Rawdon (Eastern)
- David Euler - North Bay (Central/Near North)
- Patrick Seguin - Timmins (Northern)
- James Smith ex-officio (OGRA)

MTO

- Becca Lane ex-officio

Next Steps

- Fully understand the owners concerns
- Continue to investigate the causes of the pre-mature cracking
- Revisit top priority factors with all stakeholders at the table
- Develop workable solutions to address these concerns to ensure durable long lasting asphalt pavements

Possible Solutions?

- Increase AC Content in Superpave mixes
- Implement the Recycle Binder Ratio (RBR) for RAP Mixes
- Re-assess PGAC requirements based on RBR
- Proper inspection and testing
- Use the proper PGAC based on actual weather data
- More education - OHMPA can help!
- Resolving these concerns will require a collaborate effort between industry and owners