OPSS 310 DRAFT PAYMENT ADJUSTMENT CALCULATION WORKSHEET

(aka, PAYING FOR WHAT YOU GET)

MARK EBY, CONSTRUCTION MANAGER
COUNTY OF WELLINGTON

OHMPA FALL SEMINAR
DECEMBER 8, 2014
WHAT IS OPSS 310

• Construction specification for hot mix asphalt
• Includes criteria for acceptance
• Acceptable, Borderline and Rejectable
• The current method used in OPSS 310 to accept hot mix asphalt is cumbersome and may result in the removal of acceptable mix
• Needs to be a better method of accepting mix for Municipal work
MUNICIPAL CONCERNS

• Only pay for what we receive
• Quality of Hot Mix being placed can be highly variable from day to day and project to project
• What does “borderline” mean?
• Not all Municipalities have qualified staff that understand QA test results
In November of 2013 the Municipal Hot Mix Liaison Committee (18 representatives from Municipalities and OHMPA members) accepted the proposed draft adjust calculation worksheet.

The intent is to provide Municipalities an easier method to accept hot mix outside the acceptable range per the current approved specification.
The spreadsheet was created to complete the calculation for Municipalities wishing to use it. It generates a payment reduction for hot mix laid that does not meet the laboratory J MF tolerances for gradation, asphalt cement content and air void content. Voids in the mineral aggregate (VMA) can also be evaluated. The spreadsheet is intended to replace OPSS 310 Tables 7 and 9.
• The spreadsheet is intended to help resolve payment disputes related to laboratory test results on Quality Control (QC) and Quality Assurance (QA) samples
• The methodology is intended to replace the evaluation of single results with the evaluation of the results of a lot divided into a number of sub-lots
• Lot results that are close to the average and also exhibit low variability (as measured by the range) are not penalized.
TABLES 7 AND 9 OF OPSS 310 REPLACED

• Based on the average of at least 3 samples (Sub-lots) in a Lot for acceptance
• Lot size is left to the owner but should be decided at the pre-pave meeting
  – Sub-lots typically no bigger than 500 tonnes
  – Lots typically no bigger than 3000 tonnes
  – Lots can be smaller (day, street, etc. as required) but
every Lot needs at least 3 sub-lots (samples)
• Samples (QA, QC and Referee) should be taken at the time of paving
COUNTY OF WELLINGTON

- QA, QC and referee samples are taken at the same time by a qualified geotechnical engineering firm.
- Quarter master or splitter box is used to create 4 equal samples of the same material.
- This procedure was adopted in 2012 to improve consistency with sampling.
## Draft OPS 310 Hot Mix - Acceptance and Price Adjustment Sheet

<table>
<thead>
<tr>
<th>Number of Sublots</th>
<th>3</th>
<th>AC</th>
<th>DLS (1)</th>
<th>4.75 mm</th>
<th>600 μm</th>
<th>75 μm</th>
<th>Air Voids (2) Acceptable Range</th>
<th>VMA (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>A Sample Location</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main St</td>
<td>1</td>
<td>4.71</td>
<td>84.5</td>
<td>48.7</td>
<td>30.1</td>
<td>3.9</td>
<td>3.90</td>
<td>13.20</td>
</tr>
<tr>
<td>Maple Ave</td>
<td>2</td>
<td>5.12</td>
<td>86.0</td>
<td>47.5</td>
<td>29.0</td>
<td>4.1</td>
<td>2.70</td>
<td>12.80</td>
</tr>
<tr>
<td>2nd Street</td>
<td>3</td>
<td>4.35</td>
<td>83.0</td>
<td>48.7</td>
<td>30.8</td>
<td>3.8</td>
<td>3.20</td>
<td>12.75</td>
</tr>
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<tr>
<td>B Lot Mean</td>
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<tr>
<td></td>
<td></td>
<td>4.73</td>
<td>84.50</td>
<td>48.30</td>
<td>29.97</td>
<td>3.93</td>
<td>3.27</td>
<td>12.92</td>
</tr>
<tr>
<td>C Departure from JMF [A-B]</td>
<td></td>
<td>0.03</td>
<td>0.5</td>
<td>1.7</td>
<td>2.1</td>
<td>0.4</td>
<td>0.00</td>
<td>0.58</td>
</tr>
<tr>
<td>D Allowable Mean Tolerance (AMT)</td>
<td></td>
<td>0.35</td>
<td>5.80</td>
<td>5.80</td>
<td>4.00</td>
<td>2.30</td>
<td>0.40</td>
<td>0.60</td>
</tr>
<tr>
<td>E Percent outside AMT [C-D]</td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>F Lot Maximum</td>
<td></td>
<td>5.12</td>
<td>86.0</td>
<td>48.7</td>
<td>30.8</td>
<td>4.1</td>
<td>3.90</td>
<td>13.20</td>
</tr>
<tr>
<td>G Lot Minimum</td>
<td></td>
<td>4.35</td>
<td>83.0</td>
<td>47.5</td>
<td>29.0</td>
<td>3.8</td>
<td>2.70</td>
<td>12.75</td>
</tr>
<tr>
<td>H Lot Range [F-G]</td>
<td></td>
<td>0.77</td>
<td>3.0</td>
<td>1.2</td>
<td>1.8</td>
<td>0.3</td>
<td>1.20</td>
<td>0.45</td>
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<tr>
<td>I Allowable Lot Range (ALR)</td>
<td></td>
<td>0.60</td>
<td>10.0</td>
<td>10.0</td>
<td>7.0</td>
<td>4.0</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>J Percent outside ALR</td>
<td></td>
<td>0.17</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>K Mean Adjustment Points</td>
<td></td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>L Range Adjustment point</td>
<td></td>
<td>3.40</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>M Sub-Total Adjustment Points [K+L]</td>
<td></td>
<td>3.40</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Adjustment Points</th>
<th>Payment Reduction Factor</th>
<th>Total Price Adjustment Points</th>
<th>Payment Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal to 0</td>
<td>Nil</td>
<td>3.40</td>
<td>98.3%</td>
</tr>
<tr>
<td>Less than or equal to 20</td>
<td>P * 0.005</td>
<td>3.40</td>
<td>98.3%</td>
</tr>
<tr>
<td>Greater than 20</td>
<td>(0.03 * P) - 0.5</td>
<td>3.40</td>
<td>98.3%</td>
</tr>
<tr>
<td>Greater than 30</td>
<td>Rejectable</td>
<td>3.40</td>
<td>98.3%</td>
</tr>
</tbody>
</table>
FACTORS SHOWN ON SPREADSHEET

- Price adjustment points show the relative importance of deviations from the Mean and the Range.
- Air Voids and VMA are also included (not in the original 1997 MTO spreadsheet).

<table>
<thead>
<tr>
<th>Item</th>
<th>1% Deviation from Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Asphalt Cement</td>
<td>80</td>
</tr>
<tr>
<td>DLS</td>
<td>1</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>5</td>
</tr>
<tr>
<td>600 μm</td>
<td>2</td>
</tr>
<tr>
<td>75μm</td>
<td></td>
</tr>
<tr>
<td>≤ 1%</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 1%</td>
<td>20</td>
</tr>
<tr>
<td>AV</td>
<td></td>
</tr>
<tr>
<td>≤ 0.5%</td>
<td>20</td>
</tr>
<tr>
<td>&gt; 0.5%</td>
<td>40</td>
</tr>
<tr>
<td>VMA</td>
<td></td>
</tr>
<tr>
<td>≤ 0.5%</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 0.5%</td>
<td>20</td>
</tr>
</tbody>
</table>
It was hoped that several municipalities would ‘mirror’ the new procedure for the 2014 construction season.

To date, ‘mirror’ results have been received by the Liaison Committee from three Municipalities.

In total, 32 lot results have been reviewed. The results from these lots are:

- 15 at 100% payment
- 12 between 90 and 100% payment
- 1 between 60 and 90% payment
- 4 that are considered rejectable (less than 60% percent)
CONTRACTOR CONCERNS

• That the payment reduction is reasonable for what the outcome of the asphalt is

• Profit (not a dirty word) is anywhere between 3 and 10 percent for typical projects, payment less than 90% goes against overhead

• That the cost does not escalate to cover reductions (currently no bonus for good work)
ADDITIONAL ACTIONS

• Review the payment reduction and ensure it is appropriate for the asphalt supplied

• Additional education for Municipalities interested in specifying the payment adjustment

• Encourage more Municipalities to “mirror” the specification so statistical analysis can be completed
MORE ADDITIONAL ACTIONS

• Additional education for Contractors to ensure that they understand the purpose of the specification

• Additional education for Geotechnical Firms of the importance of proper sample taking and testing and sufficient number of samples

• Encourage all parties involved that this specification will only work with proper buy in and use by all
CONCLUSIONS

• That OPSS 310 will include the payment adjustment calculation in the Municipal special appendix in the future for use if specified

• Hopefully this will lead to easier decision making and better higher quality pavements on all projects that last the expected lifetime
MGAC

THE ELOSTOMER WAY TO GO

MARK EBY, P.ENG.
COUNTY OF WELLINGTON

OHMPA FALL SEMINAR
DECEMBER 8, 2014
WHAT IS MGAC?

- Multiple Stress Creep Recovery Graded Asphalt Cement (MGAC or MG) means asphalt binder graded according to the Multiple Stress Creep Recovery (MSCR) procedure outlined in ASSHTO T350 (formerly TP70)

- MGAC would replace PGAC (performance graded asphalt cement) in a regular hot mix asphalt contract

- MGAC includes an elastomer in the make up for grades where enhanced performance is needed
WHAT IS AN ELASTOMER

• Elastomer is a big fancy word, and all it means is elastic

• What makes elastomers special is the fact that they bounce back

• What makes elastomers really special is that they can be stretched to many times their original length and can bounce back to their original shape without permanent deformation

• When included as a portion of the asphalt cement, they increase the strain tolerance of the pavement and its ability to resist cracking
WHY DOES THIS MATTER?

• The Municipal Hot Mix Liaison Committee has created a draft specification for inclusion of MGAC in future contracts as required

• The specification is entitled – “Draft Contract Language for Material Specification for MSCR Graded Asphalt Cement”

• This is only a Municipal specification

• It is intended to replace OPSS.MUNI 1101 dated November 2013
WHAT IS INCLUDED IN THE SPECIFICATION?

• Design and testing requirements
• Approved materials
• Production sampling and testing
• Quality assurance basis of acceptance
• Referee testing
WHAT IS IT FOR?

- MGAC will replace the old practice of “temperature bumping” AC grades for traffic volumes.
- MGAC starts with one of five grades depending on the zone that paving is to be completed in and the percentage of RAP to be used in the mix.
ZONES AND GRADERS

• Zone 1 - northern Ontario
  – 52L-34 for mixes with RAP from 0 to 20%
  – 52L-40 for mixes with RAP from 21 to 40%

• Zone 2 - central Ontario
  – 58L-34 for mixes with RAP from 0 to 20%
  – 52L-40 for mixes with RAP from 21 to 40%

• Zone 3 - southern Ontario
  – 58L-28 for mixes with RAP from 0 to 20%
  – 52L-34 for mixes with RAP from 21 to 40%
WHAT IS THE “L” FOR?

• The “L” refers to the traffic volume and based on the type of the road
• Standard MGAC is \textit{xxS-yy}
  – Lower volume roads is no change
• Rural freeway / urban arterial is \textit{xxH-yy}
• Rural arterial / urban collector is \textit{xxH-yy}
• Urban freeway is \textit{xxV-yy}
• Extremely heavy traffic is \textit{xxE-yy}
WHO HAS USED MGAC?

• Wellington County completed two projects in 2014

• Wellington Road 124: 50 mm of SP-19 placed over FibreMat on the existing road, 16,000 AADT

• Wellington Road 7: 60 mm of HL-8 base and 50 mm of HL-4 surface placed over 100 mm FDR with expanded asphalt stabilization, 10,000 AADT
WELLINGTON SPECIFICATION

• MGAC 58H-28 was specified to account for the higher traffic volumes and large agricultural equipment

• Form of tender set up with an optional asphalt cement change, requested pricing for the premium to substitute MGAC for PGAC

• Tender pricing was $3.00 to $8.75 per tonne of asphalt supplied for WR 124 project

• Tender pricing was $1.75 to $7.46 per tonne of asphalt supplied for WR 7 project
PROJECT COST INCREASES

• Cost increase on the WR 124 project was $25,000 on $1,100,000
• Equates to a 2.3% increase for the project
• Cost increase on the WR 7 project was $50,000 on $2,500,000
• Equates to a 2% increase for the project
WHO DID THE WORK?

• Cox Construction Limited of Guelph completed both projects in Wellington County
THE COX EXPERIENCE

• No issue with ordering, supply and delivery of the specified MGAC

• Dedicated storage tank use at the asphalt plant was not an issue as they were fortunate that both projects were large and continuous

• Could see possible issues with smaller projects with multiple mobilizations
THE COX EXPERIENCE

• The MGAC asphalt did adhere to tools and equipment slightly more.

• Trucks used to transport asphalt to the jobsite had to spray down with release agents every load to ensure asphalt did not stick in the boxes and to mechanisms.

• The paver and shuttle buggy augers and hopper had to be cleaned and sprayed down thoroughly at the completion of each day's shift to ensure no residual was left behind.
THE COX EXPERIENCE

• Crews did find the asphalt slightly more difficult to manipulate when it came to hand work
• The asphalt plant also had related issues with the product adhering in parts of the plant, piping, gates etc.
• Off loading the product from the transport tanker was more difficult and slightly more time consuming
THE COX EXPERIENCE

• Four new mix designs were created for these two projects, they were however variations of existing new designs modified slightly to allow the MGAC to be included

• Turn around time for the mix designs were no longer than a standard design, either Superpave or Marshall mix design.
THE COX EXPERIENCE

• “We feel the additional premium for this MGAC was good value given the anticipated benefits of the MGAC performance for the asphalt pavements.”

• Cox Construction Limited also hopes that other municipalities and agencies will specify MGAC on future projects.
THE CANADIAN ASPHALT INDUSTRIES EXPERIENCE

- MSCR grading has been field validated and is based on fundamental science
- MSCR test methods are more reproducible between labs than other proposed specifications so the potential for costly disputes between QC and QA labs is reduced
- MSCR graded 58H-28 is elastomer modified and is tested in a more practical, effective and timely manner which is less costly than other proposed specifications
The Canadian Asphalt Industries Experience

• Most AC suppliers are well equipped to produce elastomer modified asphalt cements meeting MSCR requirements.

• MSCR grading ensures that elastomeric polymers are used which will result in a more durable binder where pavements are subject to heavier loads.

• MSCR grading is being implemented throughout the US so it will be easier to source base asphalt and formulate for modified asphalts than it will for other proposed specifications which are not being adopted elsewhere.
THE CANADIAN ASPHALT INDUSTRIES EXPERIENCE

• Refineries will be manufacturing MSCR grades as AASHTO adopts the system, but they will not manufacture to meet other proposed specifications, thus increasing availability and reducing cost.
• MSCR will not require significant additional plant equipment.
• The biggest difference from a manufacturers perspective is testing.
• Less than an hour for MSCR vs 5-7 days for extended BBR.
THE CANADIAN ASPHALT INDUSTRIES EXPERIENCE

• MSCR uses existing reliable test equipment unlike the DENT test which requires modifications to the old and temperamental ductility equipment.

• The established and effective MSCR test methods make it easier for manufacturers to reliably supply product meeting the MSCR specification, and costs can be managed by not having to do unnecessary over-engineering to ensure that test repeatability is not an issue.

• Like most technologies as volume increase costs should decrease to a degree.
WHAT’S NEXT?

• Hopefully more Municipalities give it a try so additional observations can be done

• Should make designers life easier to specify the correct asphalt mix based on region and traffic volume

• No more guessing what grade to specify or “bump” to make

• Elastomers will provide improved durability and performance on routes where a higher standard of performance is required.
THANKS FOR THE HELP
Members of the OGRA/OHMPA Hot Mix Liaison Committee
QUESTIONS???????