

PRESENTED BY



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Engtec Consulting Inc.

2023 OAPC ASPHALT TECHNICAL SYMPOSIUM

Mix Asphalt Program (O-MAP) Testing Study Round 2 Updates and Next Steps.

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Director, Pavements and Materials Group



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Open to all industry stakeholders





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Identify improvements to binder and mixture specification and testing methods *Ontario-specific climate and traffic conditions*

OUR MANDATE I-ABC Act as an advisory group Recommending and/or perform asphalt research interests and needs

Brainstorm asphalt-related and emerging issues Particularly on subjects of RAC and Mix Performance acceptance

Contribute to content development and organization of the Asphalt Technical Symposium (ATS)





OAETG's approach to I-ABC ACTIONS

Ability to recommend & advise on contract spec development and contract language

Bridging Knowledge Gap in "Performance Testing" Ex. High RAP Project Lit. Review Literature Search on Short-Term Req's Industry-Wide practice-ready Project; Exchange Program performance **EFFORT** Volunteer-led thresholds by OAETG (Part of 5-Year Vision) **Members IMPACT** ORBA ontario rides on us asphalt

MIX ASPHALT PROGRAM (MAP) ROUND-2

OBJECTIVES

Understanding Variability/Risk

Inherent variability within test method - test variability

Interlaboratory variability

Bridge the knowledge gap in "Performance Testing Methods and Acceptance" within the Industry







OBJECTIVES RESOURCES

Plant-Produced Loose-Mix

MTO Superpave Hot Mix Inter-Laboratory Testing Program [Round 4] SP12.5 "CAT-D" – Zone 3 (PGAC 70-28 XJ)

Test Methods

Hamburg Wheel Tracking Test (**HWT**) Semi-Circular Bend Test – Flexibility Index (**FI**) Disk-Shaped Compact Tension Test (**DCT**) IDEAL type of test methods.

Nine Labs each with partial or full testing capabilities

Info kindly provided by the MTO

		Sam	ple:	MTO-	Q
TEST	Thi	s Lab	All Partie	cipants	Lab
	Result	Z-Score	Mean	Standard Deviation	Rating
MIX COMPOSITION					
% A.C. Content					
•			5.129	0.073	
Aggregate Gradation (% Passing Sieve, mm)					
• 25.0					
• 19.0					
• 12.5			97.54	0.76	
• 9.5			84.31	1.44	
• 4.75			55.44	1.58	
• 2.36			48.05	1.22	
• 1.18			32.80	0.75	
• 0.600			21.18	0.42	
• 0.300			12.66	0.29	
• 0.150			7.23	0.21	
• 0.075			4.46	0.18	







MIX

(MAP)

ASPHALT

PROGRAM

ROUND-2

MIX ASPHALT OBJECTIVES PROGRAM (MAP) **ROUND-2**

RESOURCES

Procedures and Instructions Developed

Controlling consistency

Sample Fabrication and Testing Instructions (SFTIs)

Interactive Reporting Forms (IRFs)

Large Input from MTO's round of correlations

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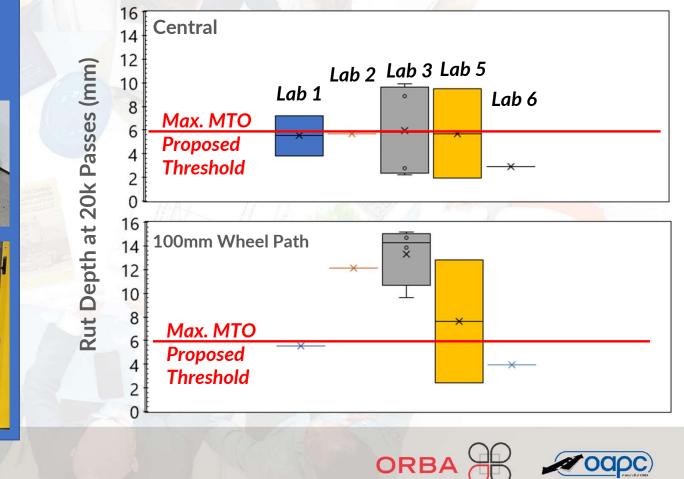
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Hamburg Wheel Tracking (HWT) Device

TEST INFO

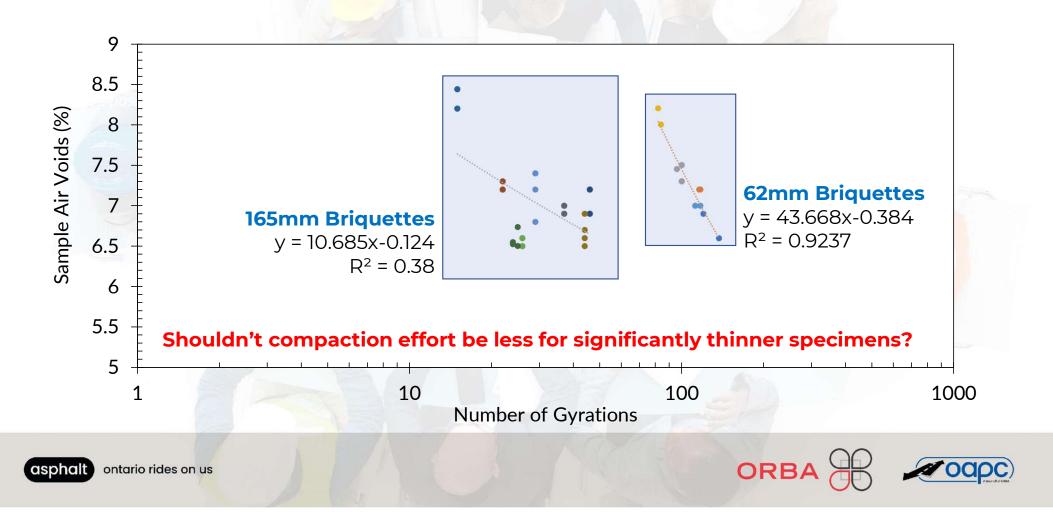
SG compacted (60-mm thickness) Tested at **50°C** or **44°C** MTO preliminary spec Max. 6 mm or 12.5 after 20k passes







OMAP GYRATORY RESULTS



Let's Talk About Gyratory Compactor

NOT all SGCs the same!





Gyrocomp Gyratory Compactor







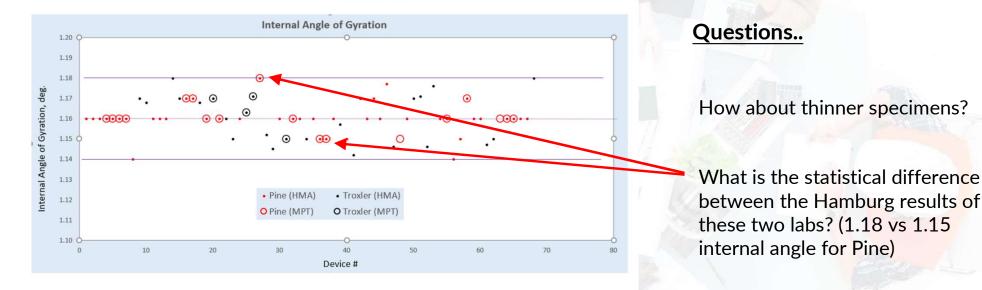


DIE

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Let's be assured...

Gyratory equipment in Ontario are <u>well calibrated for their intended</u> volumetric-only mix design purposes



MTO Bituminous Section - May 8, 2023

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Semi-Circular Bend Test (Flexibility Index)

TEST INFO

asphalt

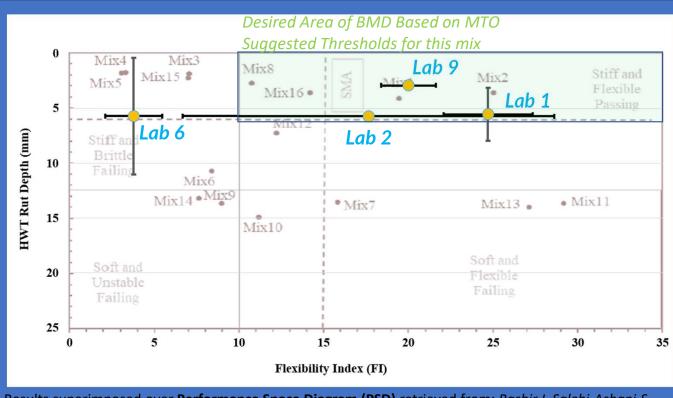
SG compacted **160-mm+** thickness and then cut into 50mm disks Flexibility Index (FI) **Min. 10** Tested at **25°C**

otch

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40 35 30 Flexibility Index (FI) 25 × Lab 9 Lab 3 Lab 1 20 × × 0 15 Lab 4 Min. MTO 10 Proposed Lab 2 **Threshold** 5 Lab 6 0 ORBA ODDC

Performance Space Diagram (PSD)



Mixes Studied By MTO

Mix No.	Mix Type ¹	%RAP ² Content	Specified PGAC ³	Traffic Category	
1	SMA 12.5	•	70-28	E	
2	SMA 12.5		70-28	E	
3	SP12.5 FC2		70-28	E	
4	SP12.5 FC2	20	70-28	E	
5	SP12.5 FC2	20	70-28	E	
6	SP12.5 FC2	20	64-28	C	
7	SP12.5 FC2	20	64-34	D	
8	SP12.5 FC2		64-34	E	
9	SP12.5 FC2		58-28	D	
10	SP12.5 FC2		58-28	D	
11	SP12.5 FC1	-	58-34	D	
12	SP12.5 FC1		58-34	D	
13	SP12.5	-	58-34	C	
14	SP12.5		52-40	В	
15	SP12.5	-	52-40	В	
16	SP12.5		52-40	C	

Error bars represent one standard deviation from the average value of four replicates tested per mix ($\approx 68\%$ reliability)

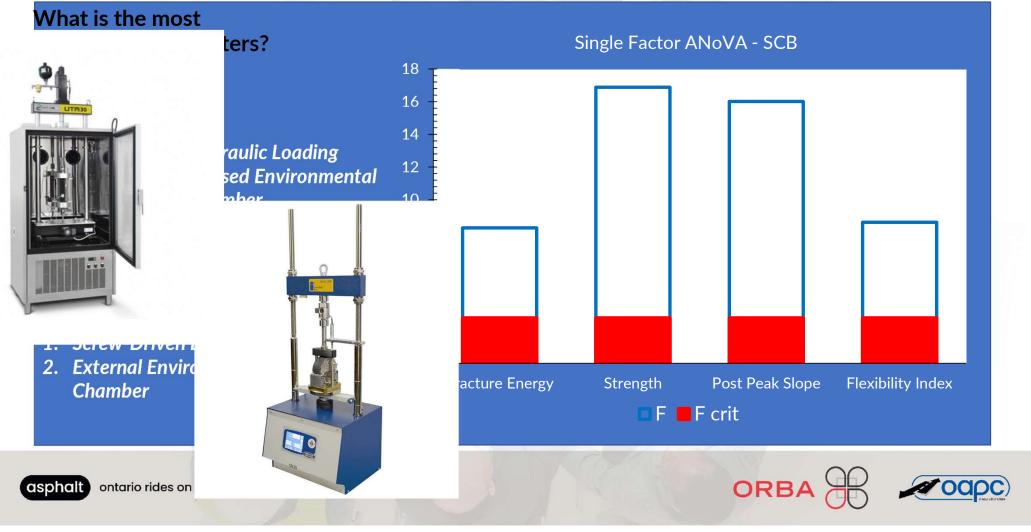
Results superimposed over **Performance Space Diagram (PSD)** retrieved from: *Bashir I, Salehi-Ashani S,* Ahmed D, Tabib S, Vasiliu G. "MTO's Experience with Post-Production Asphalt Mixture Performance Testing". Proceedings, Canadian Technical Asphalt Association, 65. 316-344 (2020).

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Semi-Circular Bend Test (Flexibility Index)



Disk-Shape Compact Tension Test (DC(T))

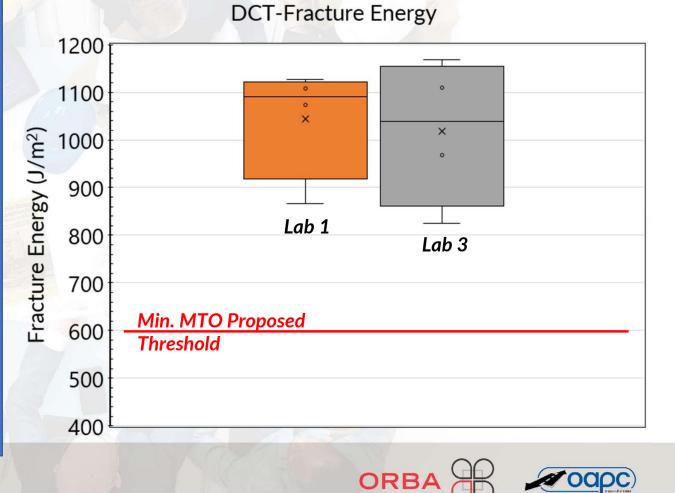
TEST INFO

SG compacted **160-mm+** thickness and then cut into 50mm disks Tested at 10°C above PG -YY









Let's Rethink ...

STANDARD (AASHTO, or ASTM) to conduct performance tests

MINIMAL GUIDANCE to consistently fabricate laboratory specimens (i.e.: aging conditions and acceptance criteria) given lab can have unique way of sample prep..

> ••• Loose asphalt mixture (laboratory or plant-produced) made into finalized test specimens for mechanical characterization.

> > Reheating, compaction, conditioning, cutting/ notching, air void determination, etc.



Studies have shown that different specimen **fabrication methods** can significantly **affect** measured performance properties, which will impact design, evaluation, and acceptance of asphalt mixtures

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Slide Retrieved from "Industry Standardization of Asphalt Mixture Sampling Preparation and Aging for Performance Testing" CTAA 2022



FINDINGS

Mix Properties

Mix properties do play a role in performance, especially during fabrication of HWT thinner briquets – need more research to adjust internal angle per mix type

Procedures and Instructions

Controlling consistency needed – **CCIL** or MTO technician certification required Sample Fabrication and Testing Instructions (SFTIs) requires specifics on sample heating, splitting, compaction temp. tolerances and cutting

Collaboration

MTO and other agencies must collaborate with academia and industry in researching on sources of variability....Minimizing risk to all parties involved.

Thresholds still need to be evaluated for their practicality

Certified Technician Training Program

MTO and industry need to establish hands-on technician certification training course... through Good Roads, ORBA Academy, or Local Universities





MIX ASPHALT PROGRAM (MAP) ROUND-2



OAETG members for their contributions to the success of the group Contractors donating materials and local testing labs Special thank to Oversite Study Team (OST) for help with data analysis and reporting:



Yashar Azimi Alamdary, WSP

Mike Aurilio, Yellowline Asphalt



ptec Con<mark>sulting Inc. – Sample Delivery</mark>

bheep Lubana, Engtec, Sample collection and storage

Amin Mneina, Good Roads Mehran KafiFarashah, York Region Saied Salehi, Engtec Consulting Inc.





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Questions and Discussions



Sina Varamini, Ph.D., P.Eng., MCSCE

Chair, Ontario Asphalt Expert Task Group (OAETG) Chair, Soils & Materials Committee (Transportation Association of Canada) Director, Pavements and Materials Group (Engtec Consulting Inc.) Adjunct Assistant Professor (University of Waterloo/McMaster)







Thank you



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