

How Hot Mix Asphalt Helps MTO Meet its Goal of “the Greenest Roads in North America”

Chris Raymond
 Head, Bituminous Section
 Ministry of Transportation

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Presentation Outline

- Introduction
- Recycling
- Incorporation of waste materials
- Quality materials and workmanship
- Warm Mix Asphalt
- Long lasting pavement design
- Quietness
- Minimized traffic delays
- History of innovation
- GreenPave Rating System
- Closing Remarks

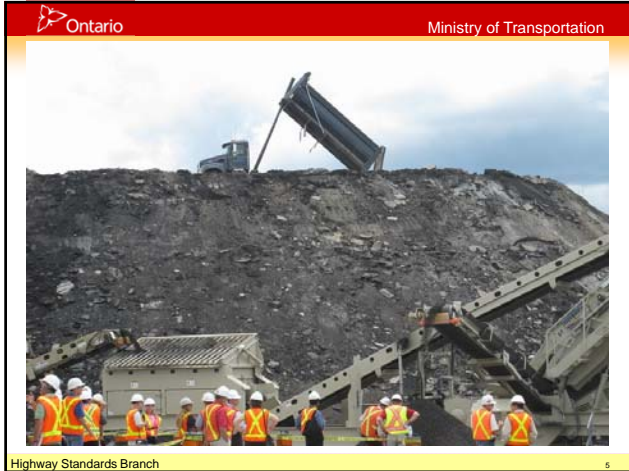
PHM Strategic Directions 2010 - 2015

1. A provincial expansion plan developed in collaboration with Policy & Planning Division.
2. A strengthened policy capability to influence ministry and government activities in support of division initiatives.
3. A workforce that is poised to meet our changing business directions.
4. **The greenest roads in North America.**
5. A quarter of our business delivered in innovative and improved ways.
6. Seventy-five cents of every construction dollar spent directly on pavements and bridges.
7. In collaboration with industry, develop performance-based specifications for all contracts.

Reclaimed Asphalt Pavement (RAP) is the Most Recycled Product

- RAP is a valuable high quality construction material – not a waste material
- Industry recognizes the value of RAP
- Recycled Hot Mix (RHM) has a long history of demonstrated performance
- Optimizing RAP use makes pavements more sustainable
- MTO increased its limits on RAP use in 2009 including allowing premium RAP in premium HMA (ie. SP 12.5 FC2)





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Want a Second Opinion ?

US Federal Highway Administration (FHWA) RAP User Guideline

- “RAP is routinely used in HMA by nearly all 50 states”
- “Use of RAP is considered standard asphalt paving practice”
- “There are abundant technical data available indicating that properly specified and produced RHM asphalt is equivalent in quality and structural performance to conventional HMA”

The FHWA supports and promotes the use of recycled highway materials in pavement construction in an effort to preserve the natural environment, reduce waste, and provide a cost effective material for constructing highways.

- FHWA/EPA report RAP is the most frequently recycled material

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In-Place Recycling Techniques

- In-situ recycling technologies
 - Optimize the use of natural resources
 - Reduce energy consumption
 - Reduce greenhouse gas emissions
 - Limit pollution
 - Ensure a high level of user comfort and safety

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Full Depth Reclamation - FDR

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FDR with Expanded Asphalt Stabilization

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Hot In-Place Recycling - HIR

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Cold In-Place Recycling - CIR

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CIR with Expanded Asphalt

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Asphalt Pavements Incorporate Waste Materials

2009-2010

- 7.3 million tonnes of aggregates (sand, gravel and crushed stone) came from recycled road building or recovered waste materials
- MTO has been a leader in recycling, since the early 1980's

Benefits of Recycling Road Building and Waste Materials in New Construction

- Recycling saves natural non-renewable aggregate resources
- Reduces CO₂ emissions (greenhouse gases)
- 10 to 30 percent energy savings through production, transportation and placement, compared to the energy used for conventional hot mix asphalt
- Provides possible savings over conventional materials
- Recycled materials when used appropriately have repeatedly demonstrated performance equal to or superior to conventional materials

MTO Granular Specifications Encourage Aggregate Conservation

- Aggregates in road base / sub-base may include the following materials, depending upon granular type:
 - Up to 100% reclaimed concrete material (RCM)
 - Up to 100% air-cooled blast furnace slag aggregate
 - Up to 50% pulverized pavement (full depth reclamation)*
 - Up to 30% reclaimed asphalt pavement (RAP)
 - Up to 15% crushed glass and/or ceramics

Right-of-Way Rock

- Rock from the highway corridor is used as aggregate
- Surplus rock is used instead of extracting the aggregates from local pits or quarries



Rock Cut Near Parry Sound

Tire Rubber in Hot Mix Asphalt

- MTO experimentally added rubber from tires as an aggregate in asphalt pavements from late 80's to mid 90's
- Renewed interest in Rubber Modified Asphalt
- Progress is being made through MTO's partnership with Ontario Tire Stewardship (OTS) and OHMPA
- Rubber tires are routinely recycled into rubberized crack sealant materials



Rubber Tires in Mass Embankment Fill

- Scrap tires have been successfully used as mass embankment and lightweight fill in other jurisdictions
- MTO recently completed a demonstration project on Highway 401 near Cornwall using tire derived aggregate for construction of approach embankments to a new bridge



Roofing Shingles (RST) in Hot Mix Asphalt

- Ground roofing shingle manufacturing waste is comprised of fibre, fine aggregate and hard asphalt cement
- Use of RST conserves asphalt cement and aggregate
- MTO permits 2 to 4% RST in hot mix, depending on mix and highway type
- To date, an estimated 80 tonnes of shingle manufacturing waste has been diverted from landfills

Recycled Shingle Tabs (RST)



58% fine aggregate
25 % asphalt cement
17 % fibres

Quality Materials and Workmanship

- Quality materials and workmanship are an important part of sustainable infrastructure
- “Comprehensive” specifications promote quality materials and workmanship

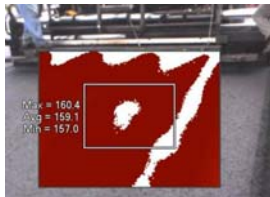


Warm Mix Asphalt (WMA)

Compared to HMA, WMA has the following benefits:

- Reduces energy use/fuel consumption
- Reduces asphalt plant emissions
- Improves compaction and joint quality
- Reduces asphalt binder aging (less potential for cracking)
- Reduces potential for thermal segregation
- Allows for earlier opening to traffic after construction
- Facilitates late season paving
- Facilitates longer hauling distances
- Potential for higher RAP content

Warm Mix Asphalt



HMA



WMA

- To foster increased use of WMA in Ontario, MTO will be tendering selected contracts in 2013 and 2014 with a requirement to use WMA

Long Lasting Pavement Design

- Perpetual Pavements provide designers the option for longer lasting pavements
- Benefits include: reduced fatigue cracking, smoother, no major reconstruction and minimized traffic disruption.
- Ministry has 3 perpetual pavement projects:
 - Hwy 406 (Thorold),
 - Hwy 7 (Carleton Place), and
 - Hwy 401 (Woodstock)

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Perpetual Pavement Design Concept

High Quality Rut Resistant HMA

Surface
Intermediate Layer
Fatigue Resistant HMA Base layer
Base/Subbase material
Subgrade

High Compression zone
Maximum Strain

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Instrumented Hwy 401 Perpetual Project

Monthly 90th Percentile
Cumulative 90th Percentile

MTO Partnership with:

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HMA Pavements are Quiet

- HMA provides a quiet riding surface
- Opportunities exist to further reduce tire-pavement noise through "quiet pavement" technologies

Type of Surface	No. Sites Tested	Average Noise Level (dB(A))	Maximum Noise Level Measured (dB(A))	Lowest Noise Level Measured (dB(A))
Transverse-tined PCC	25	103.6	106.5	100.6
Longitudinally tined PCC	15	99.8	103.6	98.1
Diamond-ground PCC	12	98.9	101.0	97.0
Dense-graded HMA	76	97.1	101.0	93.0
Stone Matrix Asphalt	22	98.0	101.0	95.0
Coarse-graded OGFC (5/8 inch minus)	29	97.0	99.1	92.6
Fine-graded OGFC (3/8 inch minus)	10	92.6	93.9	90.9

Source: Hot Mix Asphalt Technology, February 2005

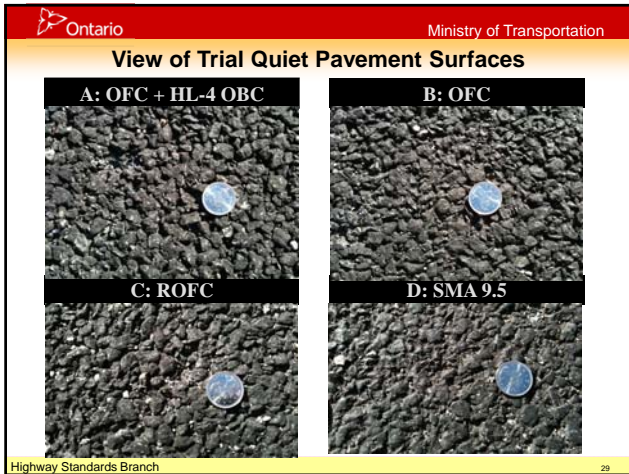
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Quiet Pavements

- MTO built five trial sections in 2009 on Highway 405 to investigate the tire-pavement noise level of several asphalt mixes
- Sections are being evaluated based on noise, permeability and pavement performance

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Minimized Traffic Delays

- Asphalt paving allows for fast rehabilitation thereby reducing traffic delays and Greenhouse Gases
- Lane closures to facilitate rehabilitation is often coordinated as night paving or paving during off peak hours to minimize traffic impacts

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Opportunities to Further Reduce Delays

- Hot on Hot paving is a new technology that allows for the placement of two asphalt layers in one operation providing the potential for improved quality and reduced delays

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Fostering Innovation for Greener Roads

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Fostering Innovation for Greener Roads

- MTO pursues innovation several ways:
 - Monitoring external innovations by other transportation agencies and researchers. Promising opportunities are investigated, trialed, and evaluated
 - Research partnerships with universities and colleges
 - Partnering with industry to trial innovations of mutual interest. Hot on Hot paving, CIREAM and RST are examples of industry led innovations
 - Continual review and improvement of current practices

"today's solutions will not address tomorrow's problems"

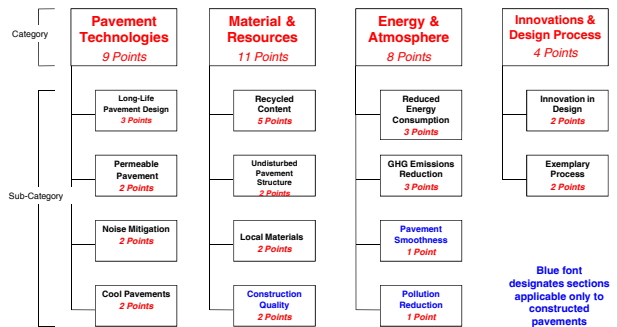
GreenPave Rating System

- A simplified rating system
- Evaluates pavement sustainability in design and construction
- A tool to raise awareness of 'green' technologies and processes
- In Design
 - Provides guidance to designers to incorporate 'green' pavement design alternatives
- During Construction
 - Encourages contractors to incorporate 'green' practices

GreenPave Categories

Category	Goal	Points
Pavement Design Technologies	To optimize sustainable designs. These include long life pavements, permeable pavements, noise mitigating pavements, and pavements that minimize the heat island effect.	9
Materials & Resources	To optimize the usage/reusage of recycled materials and to minimize material transportation distances.	11
Energy & Atmosphere	To minimize energy consumption and GHG emissions.	8
Innovation & Design Process	To recognize innovation and exemplary efforts made to foster sustainable pavement designs.	4
Maximum Total:		32

GreenPave Overview



GreenPave Rating Levels



Current Status

- GreenPave was formally launched to internal MTO staff on January 19, 2012
- Pavements & Foundations Section:
 - Rates all appropriate Regional pavement designs
 - Reports rating results to Regional staff, including an annual summary
 - Maintains a GreenPave database

GreenPave: Next Steps

- Set a target number of green pavement designs per year for each Region
- Work with MTO Operations to develop the process for obtaining construction-related points that feed into the overall GreenPave rating for each project
- Expand the MTO GreenPave model to incorporate other highway design components
- Implement a Green Paver of the Year award using the GreenPave rating system

Closing Remarks

- MTO is committed to having the greenest roads in North America
- HMA pavements contribute to achieving this goal
- There are many aspects of HMA pavements that contribute to their sustainability
- An active and flexible recycling program will assist in meeting this goal
- Innovation will allow for greater sustainability in the future
- Have a wonderful retirement Mike – we will miss you

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Questions ?

Chris Raymond, PhD., P. Eng.
Ministry of Transportation of Ontario
Tel: 416-235-3725
Email: chris.raymond@ontario.ca

