

Report
Ontario Superpave Implementation Committee (1997 – 2005)
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The Ministry of Transportation of Ontario working in close co-operation with the hot mix industry and with the Ontario Superpave Implementation Committee has been spearheading the implementation of Superpave in Ontario.

Superpave, which stands for Superior Performing Asphalt Pavements, was an initiative of the Strategic Highway Research Program in the United States. Started as a 5-year research program in 1987, Superpave is a new rational approach to the design of asphalt pavements that would result in extending the life of a pavement.

Superpave implementation began in 1997 and by 2005 the technology was in use on all MTO road construction contracts.

There have been a number of technical issues to overcome and there are still issues that need to be resolved but Ontario's Superpave implementation is in line with that of most jurisdictions in U.S. and continues to lead implementation in Canada.

BACKGROUND

The Ministry of Transportation of Ontario began Superpave implementation in 1997.

The binder portion of Superpave technology, Performance Graded Asphalt Cements, was started in 1997 and fully implemented by 2001.

In 2001, the use of the gyratory compactor for volumetric mix design was introduced and a timetable developed to allow the asphalt industry sufficient time to buy the testing equipment, train its employees, and introduce a full Superpave mix design program. .

The MTO developed an aggressive schedule to do "whatever it takes" to speed up the implementation of Superpave in Ontario. In 2002, 10% of the contracts were designed using the Superpave process. Two years later, 50 percent of the contracts were designed with Superpave. By the next year, 2005, all MTO contracts were based on Superpave technology.

THE OSIC

The Ontario Superpave Implementation Committee, a forum for all stakeholders involved in the hot mix industry, was established to assist MTO and municipalities in Ontario in the implementation of Superpave.

The OSIC addresses issues such as specification development and the implementation strategy, reviews the technical and administrative challenges, and helps develop the industry's capability for implementing the new technology.

The OSIC Membership

- The Ministry of Transportation of Ontario
- The Ontario Road Builders' Association
- The Ontario Hot Mix Producers Association
- The Municipal Engineers Association
- The Canadian Council of Independent Laboratories
- The Consulting Engineers of Ontario
- The Aggregate producers' Association of Ontario
- The Ontario Good Roads Association
- Representatives of asphalt cement suppliers

Co-chairs:
Kai Tim (MTO)
Vince Aurilio (industry representative)

Members provide input into technical matters, discuss contractual implications of the decisions, and are responsible for disseminating the information to their respective organizations.

OSIC SUB-COMMITTEES ACTIVITIES

The OSIC created five sub-committees to address specific issues.

Education Sub-committee:

The educational sub-committee assists with technology transfer through the development of brochures and papers and through presentations and training sessions.

The committee started early in the process with presentations on Performance Graded Asphalt Cement to help educate the industry as it moved from penetration grade to PGAC. In conjunction with OHMPA, the committee produced technical reports dealing with PGAC and mixes. OHMPA has now published a third edition of the Superpave flyer including more aggregate and mix related information. The reports, in an easy to read format, have been widely distributed.

QC/QA Sub-committee:

The QC/QA sub-committee has been working on harmonizing MTO specifications with Superpave requirements

The sub-committee has reviewed:

- recompaction temperatures;
- the use of Reclaimed Asphalt Pavement (or RAP);
- the use of PG 52-XX in some northern locales;
- testing equipment issues such as degassing ovens;
- reheating procedures during testing;
- reviewed PGAC testing frequency; and
- the zone boundaries for PGAC.

AC Suppliers Sub-committee

The AC supplier sub-committee deals with issues concerning the supply of asphalt cement components for Superpave mixes including:

- the applicability of allowing a 3°C latitude PGAC acceptance;
- tracking PGAC properties in the mix;
- tracking RAP usage;
- revision of OPSS 1101 to reflect the use of PGAC;
- the status of a AASHTO MP1 and MP1a specifications;
- the use of elastic recovery in an End Result specification (the conclusion: not for use in Ontario at present);
- temperature to viscosity charts for reheated sample compaction;
- asphalt recovery test procedures for forensic work; and
- the effect of anti-stripping on PGAC grades.

Aggregates and Mix Design Sub-committee

The aggregates and mix design sub-committee reviews technical issues relating to aggregates and Superpave mix design using the gyratory compactor:

The sub-committee headed up a project studying the potential of replacing the FAA test specified by Superpave and oversaw a major inter-laboratory correlation study on voids versus mix compactability.

Contractors Sub-committee

The contractor's sub-committee monitors the impact of Superpave implementation on contractors through surveys and interviews.

ISSUES AND CHALLENGES

Switching the entire road building industry to Superpave technology is a massive undertaking involving hundreds of consulting engineers, material suppliers and contractors and as a result there have been issues to deal with and challenges to overcome.

Laboratory and Technician Certification

The Canadian Council of Independent Laboratories certifies labs and technicians for Superpave capability. Technicians must be CCIL asphalt certified to qualify for the Superpave technician certification which includes testing for consensus properties. Over 40 of the 100 labs that apply for CCIL certification on an annual basis also apply for the lab certification for their Superpave gyratory compactor.

For PGAC testing, it was generally agreed that the AASHTO Materials Reference Laboratory (AMRL) program was a good source for checking lab proficiency, but that participation and satisfactory performance in the MTO's correlation programs should continue to be required.

As part of Superpave implementation, CCIL will also monitor test procedures involving the Superpave Gyratory Compactors.

Testing Capacity

While the capability of the hot mix industry to design and test mixes using Superpave technology was a consideration when Superpave was first introduced, considerable progress has been made. After two years of implementation, all referee laboratories and most testing laboratories are equipped with Superpave Gyratory compactors.

Training

Training has been an on-going process and has been widely disseminated.

The MTO, various industry associations, and several consulting engineering firms have developed and provided training courses. MTO conducted in-house workshops for its own employees in all regions.

OHMPA and MTO jointly introduced the Asphalt Institute's Mix Design Course to Ontario. Four workshops were held with 90 people, including 29 MTO staff, participating.

Partners in Quality sessions also provided an opportunity for additional seminars and workshops on Superpave.

Municipalities:

While Superpave implementation has been primarily focused on the construction of provincial highways, municipalities can also benefit from Superpave.

An OPS Specification has been developed by the OPS committee to assist municipalities that want to introduce Superpave for their roads.

OGRA and MEA provide Superpave courses at the Scott McKay Road School for municipalities and contractors.

Specification Changes:

Even though Superpave technology has been developed to meet a wide variety of requirements, some adjustments are needed to meet local requirements and to conform to local standards, practices, requirements and experience.

- The MTO has developed two mix types, 12.5 mm FC1 and 12.5 mm FC2, to ensure the use of aggregates with demonstrated frictional properties.
- Superpave mix gradations were amended slightly to allow the continued use of HL 4 aggregates.
- The sand equivalent test will be maintained, as it may have merit for some Northern Ontario aggregates.
- The current requirements for N_{ini} may be problematic due to breakdown of aggregates in the design process as well as during construction.

As a result of this work, MTO was able to maintain its End Result Specifications without much change. ERS penalties were phased in over the implementation period: 40% for 2003 contracts, 60% for 2004, and 100% for 2005.

MTO and the hot mix industry continue to work through the appropriate sub-committees to make changes in Superpave as required.

- There is no equivalent Superpave mix for HL 4
- Improvements to ERS specifications need to be made
- SP 103F40 was created to account for all the Superpave mix types and specifies the mix properties.
- MTO SP 31347 addressed the optional use of RAP in Superpave mixes
- Aggregate specifications were covered through SP 110F12M. The FAA aggregate requirement of 45% minimum has been amended to 43% provided all the mix volumetrics are met.
- SP 103F34 (ERS) had been modified, specifying larger samples for testing and allowing alternate sampling methods.
- Moisture Sensitivity of the mix is assessed using the AASHTO method.
- The use of SP 313F03 as warranted (with an appropriate fill-in for % AC content for bid purposes) will continue. Some contractors disagreed with the use of this specification but since this is a contractual matter rather than a technical issue, it was resolved through separate discussions with the industry.

Superpave - Marshall Parallel Mix Study:

Given the diversity of aggregates in Ontario, MTO wanted to ensure that aggregates and mixes which had provided satisfactory performance in the past would not be excluded by Superpave specifications.

The ministry carried out a parallel testing study to assess the impact of Superpave specifications on MTO contracts and develop a better understanding of the implications of switching from Marshall to Superpave in the Province of Ontario.

The study involved 22 contracts covering all mix types, all aggregate and PGAC types, and with different traffic conditions and compaction effort. Samples were tested for Superpave aggregate consensus properties, mix volumetrics and mix gradations.

The study, which finished in March 2002, found that:

- aggregates in the study met or exceeded Superpave requirements.
- mix gradations met the appropriate Superpave gradation control points, but tended to be on the fine side.
- mix volumetrics data was mixed. When the lab and plant mixes (designed using the Marshall method) were tested against Superpave criteria, the resulting data looked very promising for mixes such as HDBC and HL 4. The Superpave voids data for HL 1 and DFC mixes, however, was significantly lower in comparison to Marshall.

TECHICAL CHALLENGES

The MTO, OSIC and the industry through co-operation and consultation have dealt with and overcome a number of technical challenges met during the implementation of Superpave in Ontario.

- Superpave does not cover existing mixes that have in the past provided the ministry with good frictional properties. *The Solution: new mix notations were developed to compliment Superpave specs.*
- Superpave does not have a mix type that readily accommodates 16.0 mm stone. HL 4 applications must be realigned to Superpave 19.0 and 12.5 or another Superpave gradation needs to be created. *The Solution: the Superpave spec was amended to allow for minor deviations to affected sieve sizes.*
- Oversize on Superpave sieves 12.5 mm and 25.0 mm deviate from ministry sieves of 13.2 mm and 26.5 mm. *The Solution: allow about 2% oversize.*
- Superpave does not specify minimum asphalt cement or stone content and there is presently no mix performance test leading to a concern that some mixes are of questionable quality. *The Solution: specifications were amended to include percent stone and minimum asphalt content for bidding purpose.*
- There was an issue with lift thickness issue for Superpave mixes. *The Solution: minimum lift thickness guidelines were provided to the MTO regions.*
- Measurement of the Internal Angle used in individual Superpave gyratory compactor has raised the concern that the differences in the internal angles between QC and QA machines could lead to problems with ERS. *The Solution: The Ministry purchased the Rapid Angle Measurement devise for use when a problem is suspected. If a problem is suspected on a contract, the Ministry will offer the RAM to measure the machines involved. The issue will continue to be monitored.*
- There was a concern that support from the manufacturer who was supplying most of the gyratory compactors in Ontario was insufficient. Some software updates were not readily available to all owners of the machines involved. *The Solution: Representatives from the industry and the ministry reviewed the concerns with the manufacturer and received assurances that customer support will be a priority. Software updates are now available to all customers through the manufacturer's web site.*

Some technical issues still need to be resolved.

- Problems were encountered with BRD Testing of Fine Aggregates. Some laboratories experienced difficulty with the Superpave methodology. Because Superpave does not require fines to be washed from a sample, laboratories were finding that the testing results varied among multiple samples or when trying to duplicate the results. Large differences were found in BRD results between the two methods for high fines aggregates such as screenings, leading to a concern that low VMA findings in certain mixes may be incorrect. *The Solution: the issue is being monitored and a revised specification will be introduced.*
- Present Ontario limits require a PGAC lower temperature adjustment when using 20 to 30 percent RAP of one grade lower. Blend charts are to be used above 40 percent. NCHRP/AASHTO rules require both upper and lower temperature changes for mixes with 15

to 25 percent RAP. *The Solution: the PGAC sub-committee has done studies concerning the use of RAP in Ontario but additional studies need to complete.*

- The Ministry is concerned with the hazardous chemicals that have to be kept in laboratories for the Sand Equivalent Test. It is felt that very few, if any; Ontario aggregates will fail the test. *Solution: the test needs to be reviewed for applicability and replaced if necessary.*
- The Compacted Aggregate Resistance Test method in the U.S. takes into account both shape and texture properties and is particularly applicable for natural sands. Most laboratories in Ontario already have the necessary equipment to do this test. *The Solution: The MTO will review the test to determine if it is appropriate for use in the province.*
- The latest AASHTO and ASTM methods vary in terms of operating temperatures for ignition ovens. The methods do not address aggregate breakdown or the effect of RAP in mixes. *The Solution: continue to study and develop ignition oven procedures.*

FUTURE PLANS

With the experience and confidence gained so far, MTO has moved ahead to full implementation of Superpave in 2005 capital contracts and to full implementation in 2006 maintenance and district contracts.

Research: Studies carried out by Professor Hesp at Queens University are exploring issues of low temperature and fatigue performance of modified asphalt binders. The benefits of the PGAC studies could ultimately result in better binder specifications with improved performance and significant cost savings. (MinDOT is planning a similar project with a pooled fund of US\$750 thousand).

MTO will also review the "LTPP Bind" program to explore how XX-40 PGAC can best be utilized to address cracking problems experienced. MTO staff in the regions will determine monitoring sites.

Specifications: MTO will continue working with industry to resolve issues in the ERS and Superpave specifications.

Contract Management: MTO plans to provide its regional offices with a new Monitoring Guideline to ensure the adequate monitoring of Superpave contracts. The MTO will also finalize four new LS test methods for testing PGAC that will be introduced in 2006 for data collection purposes.

Traffic Categories: MTO intends to review appropriate traffic categories for the use of Superpave designs for lower traffic volume roads.