

Office of Materials and Road Research  
1400 Gervais Avenue  
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## Memo

**Date:** January 9, 2018

**From:** Rebecca Embacher – Advanced Materials and Technology Engineer

**RE: Intelligent Compaction (IC) and Paver Mounted Thermal Profile (PMTP) Deployment Schedule**

Thank you for your assistance in helping us meet our deployment goals! This memo documents the current state of MnDOT's implementation effort of IC and PMTP technologies.

### IC-PMTP Roadmap from 2014 through 2018

In 2014, a roadmap for deployment of IC and PMTP technologies was established as part of the Department's efforts to implement innovative technologies as a means of enhancing financial effectiveness. Numerous studies have been completed that evaluate the effects of uniformity on pavement performance. It has been repeatedly reported that the influence of spatial variability results in: increases in localized deflections, greater rutting depths and causes stress concentrations in the pavement, which lead to fatigue cracking (shorter fatigue lives) and other types of distress. A WSDOT study found that each one (1) percent of air voids in the pavement above seven (7) percent relates to one (1) year in loss of pavement life. Consequently, technologies such as intelligent compaction and thermal profiling will help the Department achieve greater uniformity in compaction efforts and as-built strength/stiffness properties.

The roadmap generated in 2014 projected full deployment for IC and PMTP technologies for the 2018 construction season. In collaboration with Department staff, the Minnesota Asphalt Paving Association, Association of General Contractors, contractors, consultants and local vendors / industry, it is with great pleasure to report that *the Department is moving forward with full deployment this construction season*. These technologies are being deployed on projects meeting the following project selection criteria requirements as outlined in the MnDOT Pavement Design Manual (Chapter 8 Documentation):

Technology	Specification
Intelligent Compaction Method	2215 (Stabilized Full Depth Reclamation) 2331 (Cold In-Place Recycling Bituminous) 2331 (Cold Central Plant Recycling Bituminous) 2353 (Ultrathin Bonded Wearing Course) 2360 (Plant Mixed Asphalt Pavement) 2365 (Stone Matrix Asphalt)
Paver Mounted Thermal Profile Method	2360 (Plant Mixed Asphalt Pavement) 2365 (Stone Matrix Asphalt)
Project Selection Requirements: <ul style="list-style-type: none"> <li>• ≥ 4 Net Lane Miles (and associated routes within the plan set, with a minimum, continuous length of 2-lane miles, unless waived by the Engineer);</li> <li>• Data cellular coverage (at least one time per day); and</li> <li>• 100 percent Global Navigation Satellite System (GNSS) coverage within project limits.</li> </ul>	

As a result of the deployment efforts to date, we have already seen the following improvements on process control by contractors: reduced paver speeds, steps to reduce the number of paver stops, additional rollers added to the rolling train to assist with compaction efforts, modification of rolling patterns to increase uniformity of in-situ properties, asphalt delivery method changes/equipment considerations (e.g., use of pickup machines, re-mixers, etc.), increased fleet management with respect to the number of trucks and spacing of trucks delivering asphalt to the project, tarping of trucks to help mitigate cooling of the asphalt material, monitoring of stockpiles for moisture, requesting paving crew summaries, and more!

## Anticipated Roadmap 2018 and Beyond

So, where are we going now? We will continue to put resources towards these technologies and associated tools. The following summarizes future deployment efforts and tasks for 2018 and beyond.

Year	Description
Winter 2018	<b>Lecturer-Led Veta Classes (Class #1)</b> Provide Lecturer-Led Veta classes to Contractors and Consultants.
Winter 2018	<b>Lecturer-Led Veta Classes (Class #2)</b> First year of Lecturer-Led Veta classes for Department, City and County Personnel. Objective of class is to teach agency personnel how to review submitted Veta projects and to discuss specification and construction highlights.
CY 2018	<b>PMTP Method – Pilot New Geospatial Statistic</b> Pilot new geospatial statistic for identification of thermal segregation with the Paver Mounted Thermal Profile method. Anticipating 1-2 years for full deployment.
Winter 2019	<b>E-Learning Class Available Online Containing Veta Simulations</b> Release of the E-Learning class has been pushed back to 2019 due to significant software improvements to Veta.
CY 2019	<b>District Review of Contractor Submittals</b> The AMT unit will continue to review contractor submittals until construction year 2019, after which time, the Districts are expected to provide contract administration for review of contractor submittals related to the IC and PMTP method. The AMT unit will randomly review contractor projects in 2019 and beyond depending upon needs.  The AMT Unit will refine the district review process during the 2018 construction season to ensure that it is documented and available for use prior to the start of district review in CY2019.

Year	Description
CY 2020	<p><b>Deployment of New IC and PMTP Submittal Requirements</b>  Veta projects and forms are currently submitted bi-weekly. The submittal requirements will be tightened in 2020. The Advanced Materials and Technology Unit will work with Department and Contractor personnel to determine a reasonable submittal schedule that is more frequent than the current requirements to allow for more near, real-time review of workmanship issues.</p>
2018 to 2021	<p><b>Implementation of a Field Verification Method of PMTP Data</b>  The FHWA has determined that field verification of PMTP data is required for continued payment of incentives. The FHWA is currently evaluating how these requirements will be established and anticipates deployment of this requirement by construction year 2020/2021.</p>
2018 to 2021	<p><b>Evaluate IC Measurements</b>  Determine IC parameters to potentially use as QC and/or QA.</p>
2018 to 2023	<p><b>Rolling Density Meter (RDM)</b>  The rolling density meter is still in development. There will be pilot projects in 2018. Deployment efforts will be based upon outcomes of field trials. It is anticipated that this technology is 3 to 5 years out.</p>
Research Needs	<p><b>IC Method – SFDR and CIR Applications</b>  Determine if IC stiffness values (ICMV measurements) can be used to evaluate compaction efforts on SFDR and CIR applications similar to a Proctor Curve. This would also allow for determination if re-rolling adds extra value.</p>
Ongoing	<p><b>Integration of New Vendor Systems</b>  Continue to provide support for the integration of new vendor systems into Veta and construction.</p>
Ongoing	<p><b>PMTP Method – Improvements to GNSS Accuracy</b>  Continue to work towards more accurate GNSS systems with the PMTP method. This would allow for an increased number of automated process within Veta and better correlations with other testing information (e.g., IC, core densities, material segregation, etc.).</p>
Ongoing	<p><b>Veta Enhancements</b>  Continue to enhance Veta with automation, dashboards, performance improvements, etc.</p>
Ongoing	<p><b>Streamline Deployment Efforts</b>  Continue to create tools, or enhance existing tools, to streamline the efforts needed to support the IC and PMTP technologies.</p>

*Again, we want to thank everyone for their time and resources put towards these deployment efforts and we look forward to continuing to work with everyone as the technologies continue to evolve.*