



Transportation Research Division



Technical Report 08-13

*Field Test of a Polyphosphoric Acid (PPA)
Modified Asphalt Binder on Rt. 1 in Perry*

Construction and First Interim Report, September 2009

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Introduction

The Maine Department of Transportation (MaineDOT) uses the Superpave hot mix asphalt process and specifies asphalt binder grades using the Performance Grade criteria. Our “workhorse” asphalt binder grade is PG64-28. This is an asphalt binder material that passes the performance tests for high temperatures (rutting potential) at 64 degrees Celsius and passes tests for low temperatures (thermal cracking) at 28 degrees Celsius. It is common knowledge that the addition of polyphosphoric acid to asphalt can increase the high temperature PG grade to the next higher grade. However, there are concerns among transportation agencies that this PPA could alter the long term performance of the asphalt binder. One of the major asphalt suppliers to MaineDOT paving projects uses PPA to alter their PG58-28 neat asphalt binder into a PG64-28.

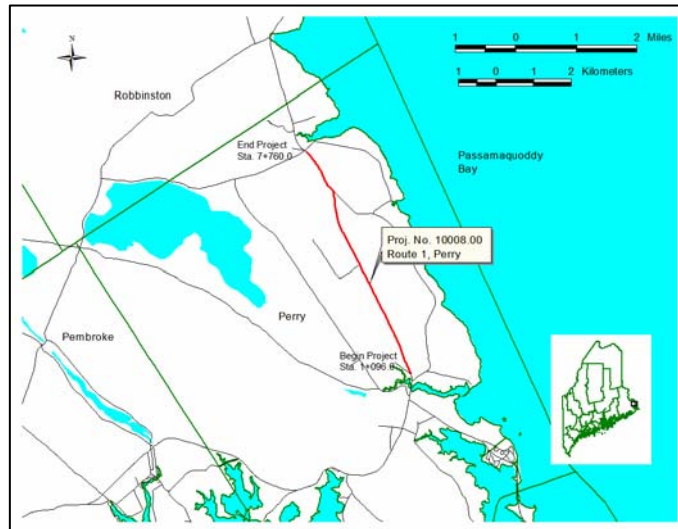
This experimental construction study was established to field test the long term performance of the PPA modified PG64-28 and compare it to the PG58-28 neat asphalt binder.

A highway reconstruction project, NH-1000(800)E, along Rt. 1 in Perry, Maine was selected as a suitable site.

Location

The project begins 6.53 km (4.05 mi) south of the Lake Road in Perry, Maine at station 1+096 and proceeds north 6.6 km (4.1 mi). Figure 1 contains a location map.

Figure 1: Project Location Map



Scope

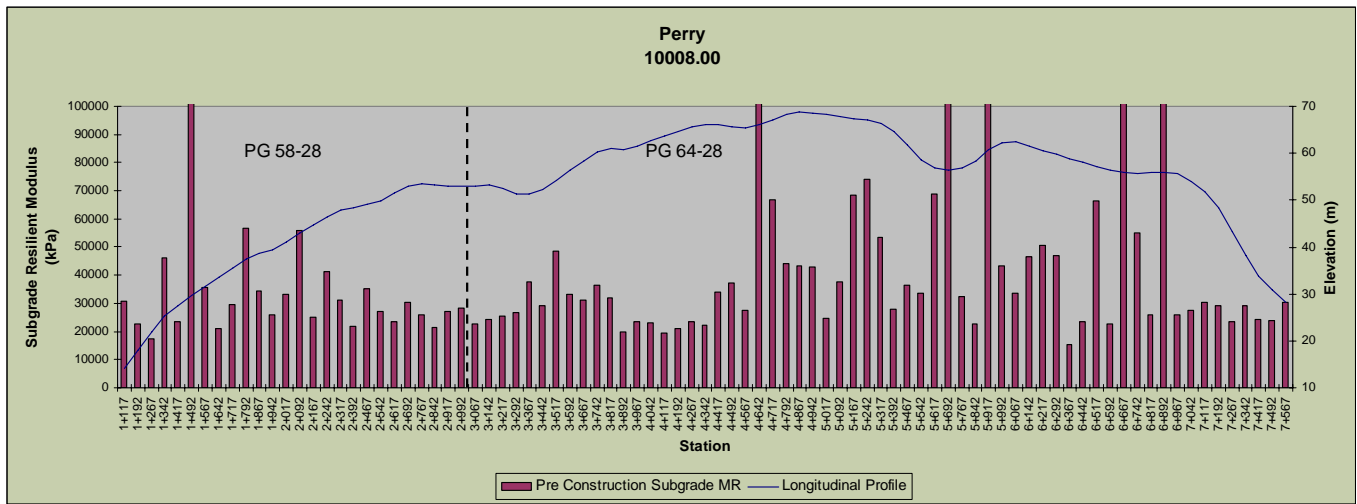
This full reconstruction project consists of 550mm (22”) Type B Aggregate Base Course, a 75mm (3”) Recycled Asphalt Stabilized Base layer and 135mm of Hot Mix Asphalt Pavement. The pavement consists of a 12.5mm nominal aggregate size 60mm thick base layer, a 12.5mm nominal aggregate size 40mm thick binder layer and a 12.5mm nominal aggregate size 35mm thick wearing surface.

The following table describes the location of the different PG Asphalt Binders being evaluated.

Pavement Layer	Stations	PG Binder		Completed
60mm Base	1+096 to 3+000	PG58-28		2007
	3+000 to 5+860		PG64-28	2006
	5+860 to 7+702	PG58-28		2007
40mm Binder	1+096 to 3+000	PG58-28		2007
	3+000 to 5+809		PG64-28	2006
	5+809 to 7+702	PG58-28		2007
35mm Surface	1+096 to 3+105 LT	PG58-28		2007
	1+096 to 3+040 RT	PG58-28		2007
	3+105 to 5+786 LT		PG64-28	2007
	3+040 to 5+786 RT		PG64-28	2007
	5+786 to 7+760	PG58-28		2007

As can be seen the base and binder sections for the PG64-28 material was completed in 2006. The rest of the project, base and binder for the PG58-28 and wearing surface for the entire project, was completed in 2007. In addition, areas of the final wearing surface had to be milled out and repaved. It was decided to

exempt these patched areas from the evaluation. Furthermore Falling Weight Deflectometer data was collected on the completed project to determine areas of uniformity that could best be used for a detailed comparison. The chart below shows subgrade modulus values back calculated from FWD deflection data. Also the roadway profile is shown.



The final test sections selected that will be used for comparison are:

Test Section 1 - Station 2+700 to 2+900 – PG58-28

Test Section 2 - Station 3+120 to 3+320 – PG64-28

This comparison will include pavement rutting, IRI and cracking.

Traffic data for this project is in the following table.

Current (2006) AADT	2590
Future (2026) AADT	3370
DHV - % of AADT	11
Design Hour Volume	371
% Heavy Trucks (AADT)	13
% Heavy Trucks (DHV)	10
Directional Distribution (DHV)	52
80 kN Equivalent P 2.0	319
80 kN Equivalent P 2.5	303
Design Speed (km/h)	90

Materials

Quality Assurance test results for the pavement were collected and reviewed and will be kept on file. Based on a review of the results there appear to be no anomalies.

Construction

The construction and paving operations were completed as planned. There were no notable problems encountered in placing the pavement layers that would impact this evaluation. The only caveat is the base and binder layers for Test Section 2 were placed in 2006 while the remainder of the project including wearing surface and base and binder for Test Section 1 were placed in 2007. This additional winter of exposure and traffic loads might have some impact on performance comparisons.

In addition the paving reports were reviewed and the following comments should be noted.

1. The HMA base and binder containing PG 64-28 from Station 3+000 to 4+600 was placed in late October 2006. Air temperatures in the 40's and light rain were noted in some of the reports. This might impact the long term performance of the HMA pavement.
2. The paving report dated 8/14/08 for HMA surface containing PG 64-28 beginning at Station 3+040 noted heavy tack was applied from Station 3+040 to 3+200. It was also noted that the paving screed was not adjusted properly resulting in thin pavement on the shoulder. The paver was set back to 3+040 and paving resumed.

The paving reports will be kept on file as a resource to assist with this evaluation.

First Year Evaluation

Ride and rutting data was collected in 2008 using the ARAN vehicle. The table below summarizes the results.

	2008 Average Rut Data	2008 IRI Data
2+700 to 2+900 PG 58-28 Test Section 1	2.27 mm	0.85 m/km
3+120 to 3+320 PG 64-28 Test Section 2	1.30 mm	0.85 m/km
1+120 to 2+900 PG 58-28	2.32 mm	0.90 m/km
3+120 to 5+700 PG 64-28	1.84 mm	0.92 m/km
5+900 to 7+600 PG 58-28	1.87 mm	1.16 m/km

Visual observation of the test sections show no pavement distresses to date. ARAN video dated 2008 was reviewed on the entire project. There were no pavement distresses observed.

Conclusions

The test sections are performing well. The ride and rutting values are very good as should be expected for a newly reconstructed highway. There are no pavement distresses as of yet.

Pavement performance will be evaluated and results reported for at least five years.

Prepared by:

Dale Peabody
Transportation Research Engineer
Maine Department of Transportation
16 State House Station
Augusta, Maine 04333-0016
Tel. 207-624-3305
dale.peabody@maine.gov