



**pennsylvania**  
DEPARTMENT OF TRANSPORTATION



**Pennsylvania ASphalt Improvement Network**  
**2009 Construction Pilot Implementation Update Report**  
**(Phase 3)**

**Submitted to:**

**PennDOT Deputy Secretary for Highway Administration**  
**and**  
**Pa Asphalt Pavement Association**

**By:**

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# EXECUTIVE SUMMARY

## Overview

Pennsylvania ASphalt Improvement Network (PASIN) is an initiative to *develop, pilot, and implement an ISO 9000-2000 based Quality Management System (QMS) from pavement design through qualification, procurement, manufacture, delivery of materials, installation, acceptance testing, and maintenance of asphalt pavement. This 2009 PASIN Pilot Update Report is an addendum to the 2007 PASIN Pilot Report (which includes the addendum for the 2008 PASIN Pilot Update Report).*

The Phase 3 PASIN initiative was piloted in 2009, by the following contractor, in the following construction project:

- District 10 – Armstrong County, SR 28 – 117, “The Allegheny Valley Expressway” ECMS #84293, let date 4-23-2009 Contractor \_ Derry Construction, Inc.

## Results

The results of the Pilot projects in 2007 and 2008 indicated that the contracting community was quite capable of adapting the PASIN Quality Management System (QMS) into their operations; however, the quality efforts were still focused on the Publication 408 standard acceptance thresholds. This would permit the contractor to focus improvement efforts on staying within these specified tolerances, but not necessarily drive concerns to process capability or improving quality consistency. To encourage the contractor to concentrate on consistency, the 2009 PASIN pilot merged the QMS implementation requirements with acceptance based on a 60 month warranty. Under the terms of the warranty specifications, the contractor is held accountable for the performance of the completed pavement to restrictive thresholds throughout a 5 year period. With this maintenance responsibility assigned to their firm, the contractor was quite concerned about the consistency of the quality of the pavement they were constructing.

Derry Construction, with the assistance of the PASIN representatives, successfully applied the PASIN process on this project. The templates were again helpful. They developed and implemented a management review structure, educated their staff and built communication lines. The focus this time was based on meeting quality requirements established by Derry, since this was a warranty project.

Derry Construction indicated that their average daily production increased from 2,400 to 3,000 tons per day over their efforts on an adjacent warranty project in 2007. Derry also indicated that their material quality consistency improved. Additionally, they received a 98% ride bonus in Phase I and 100% ride bonus in Phase II, with only a two lift operation. On the adjacent warranty project in 2007 Derry received a ride bonus of 82% with a three lift application of asphalt.

The results of this pilot, a summary of the results of the overall effort and recommendations for advancing the effort in the future have been presented to the Executive teams of PennDOT, PAPA and the FHWA.

## Conclusion

The PASIN Core Team, upon completion of Phase 3 PASIN pilot project, provides the following recommendations for PASIN implementation.

1. Complete the development of training materials that can be presented to groups of contractors or can be used as a self-taught online application.
2. Assist asphalt production and paving companies that wish to voluntarily develop an **HMA PASIN Implementation Plan** to include deployment of Quality Management System and Best Practices throughout their company.
3. Form a team with participation from PennDOT, PAPA and the FHWA to explore the use of a *QC Based Acceptance Specification* that would require a quality control process like PASIN to qualify to apply. This acceptance method also requires the development of a dispute resolution process.
4. Train PennDOT staff on the PASIN implementation process.

### 2011 and Beyond

Incorporate optional QC Based Acceptance with PASIN style QC requirements for all paving projects by completing the following:

1. Developing QC plan requirements to parallel the PASIN Quality Management System requirements.
2. Allowing use of the *QC Based Acceptance Specification* when the contractor's QC plan meets these requirements.
  - a) Pilot the specification with one project per district
  - b) With acceptable results, modify Publication 408 to include this optional acceptance method
3. Investigating development of a compliance tracking link to prequalification.
4. Establishing a joint PennDOT and industry management review process.

**Critical Success Factors** for successfully implementing the *Recommendations*, are listed in the **Phase 3 Update Section**.

# PASIN PHASE 3 UPDATE

## Overview

Pennsylvania ASphalt Improvement Network (PASIN) is an initiative to *develop, pilot, and implement an ISO 9000-2000 based Quality Management System (QMS) from pavement design through qualification, procurement, manufacture, delivery of materials, installation, acceptance testing, and maintenance of asphalt pavement. This 2009 PASIN Pilot Update Report is an addendum to the 2007 PASIN Pilot Report (which includes the addendum for the 2008 PASIN Pilot Update Report) to communicate:*

- Differences between the Phase 2 pilots in 2008 and the Phase 3 Pilot in 2009
- Results of Phase 3 pilot.
- Provide recommendations for advancing the effort.

While the results of the Pilot projects in 2007 and 2008 indicated that the contracting community was quite capable of adapting the PASIN Quality Management System (QMS) into their operations, the quality efforts were still focused on the Publication 408 standard acceptance thresholds. This would permit the contractor to focus improvement efforts on staying within these specified tolerances, but not necessarily drive concerns to process capability or improved quality consistency. In other words, since the Department has deemed any result within the acceptance range specified for a particular measure, the industry has grown accustomed to some extent to consider only single values that approach these tolerances to be of concern. As single values vary from the target to these “action points” corrective actions would occur to attempt to bring the results of the remainder of the day’s production back into the range between the action points. There was little attention brought to variability of processes as long as these parameters were adhered to.

The processes and materials utilized to construct asphalt pavements can be quite variable. PASIN provides failure modes and best practices to the industry to help them understand this variability and some ways to minimize the impacts. The PASIN QMS and the training efforts completed on the pilots to date did introduce the concepts of process capability to identify and control common and special causes of variation, and the gains that can be achieved from more consistent outcomes. However, with projects accepted by standard specifications the efforts to control their processes could seem unnecessarily burdensome.

To encourage the contractor to concentrate on consistency, the 2009 PASIN pilot merged the QMS implementation requirements with acceptance based on a 60 month warranty. Under the terms of the warranty specifications, the contractor is held accountable for the performance of the completed pavement to restrictive thresholds throughout a 5 year period. With this maintenance responsibility assigned to their firm, the contractor was quite concerned about the consistency of the quality of the pavement they were constructing.

## Pilot Project

The Phase 3 PASIN initiative was piloted in 2009, by the following contractor, in the following construction project:

- District 10 – Armstrong County, SR 28 – 117, “The Allegheny Valley Expressway” ECMS #84293, let date 4-23-2009 Contractor \_ Derry Construction, Inc.

## Features of the 2009 Pilot

Through discussions with The Deputy Secretary for Highway Administration, it was agreed that the restrictions applied to the contractor on previous pilots by requiring standard acceptance specifications could be alleviated by linking the PASIN QMS to a warranty acceptance specification. The project was bid with both the requirement to apply the QMS principles developed by PASIN while the standard acceptance specifications were replaced with the requirement that the contractor be held accountable for the performance of the pavement through the terms of a 60 month warranty.

The specifications for PASIN QMS implementation and 60 month warranty acceptance were adjusted to be used in conjunction with each other. As opposed to spelling out “Best Practices” for the contractor to address in their QMS, the contract required them to address the failure modes that spawned the best practices list. Under the warranty acceptance process, the contractor establishes their own processes, targets and quality control procedures. the “Best Practices” could not be prescribed under this circumstance. The contractor could claim that PennDOT dictated procedures that impacted their ability to be successful should a performance issue arise. The “Best Practices” list was offered for information only, therefore the contractor could choose to use them to address the failure modes, but they could structure their own means to offset the failure modes as well.

Under typical warranty specifications, the contractor was not required to divulge much of their quality control results. The specifications for this contract were clarified to indicate specific metrics as outputs that gave the department more insight of the efforts expended to monitor quality. the company’s quality management processes, while still theirs to structure and manage, had to follow the PASIN outline to comply with this specification.

The PASIN team was responsible for guiding the contractor through QMS development, assisting in the training of the contractor’s employees, evaluating the contractor’s status throughout implementation and conducting an external audit upon the project’s completion. The project required that Derry communicate their efforts to apply these principles and the quality results.

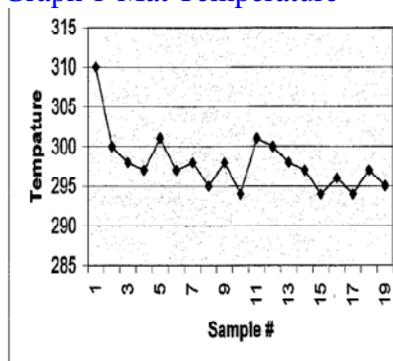
Derry Construction, with the responsibility for maintenance through the warranty period, had a well-vested interest in improving the quality and consistency of their processes and products, and saw the tools of the PASIN QMS to be a valuable mechanism to do so. The warranty acceptance criteria linked well with the QMS process, giving the PASIN team a greater understanding of the improvement efforts undergone by the contractor.

## Results

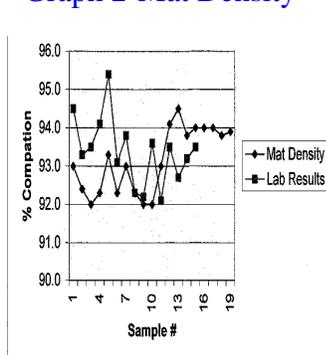
As is typical for all contracting companies, production was of high concern to this contractor. Derry Construction expressed that their operations were competitively productive prior to the Allegheny Valley Expressway project, but would always entertain opportunities to improve in this area. As with any contracting firm, their “bottom line” is the health of the organization. Derry felt they had strong gains in communication as a result of the PASIN effort, and, through implementing the management review element of the QMS, they were able to develop a stronger understanding of the interaction of the plant and field operations among all of their involved employees. The improvement in communication was evident by Derry's ability to maximize the efficiency in the delivery of HMA material from the plant to project site and minimize the cost of trucking. They indicated that their average daily production increased from 2,400 to 3,000 tons per day over their efforts on an adjacent warranty project in 2007, a 20% increase.

Derry also indicated that their material quality consistency improved. They also indicated that they felt the quality of the pavement constructed on this project exceeded that of the 2007 warranty project referenced above. Their graphical data required by the assigned PASIN metrics does depict a focus on reducing variability. Some examples are shown below:

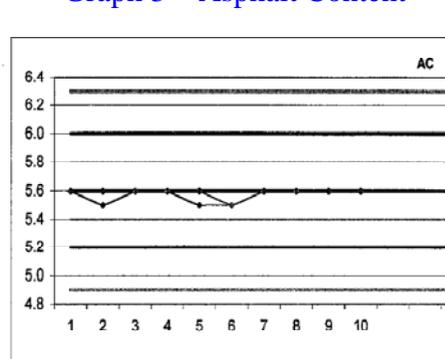
Graph 1-Mat Temperature



Graph 2-Mat Density



Graph 3 – Asphalt Content



The daily testing shown above for temperature and density indicate early variability that seem to focus to more consistency about their chosen target. On the graph of the asphalt content this day's results did not stray far from the Job Mix Formula. While not all daily data depicts these positions this clearly, Derry strongly feels they gained focus on quality consistency through PASIN.

Additionally, Derry improved their focus on maximizing their ride quality bonus on this project as compared to the 2007 project. They received a 98% ride bonus in Phase I and 100% ride bonus in Phase II, with only a two lift operation. On the adjacent warranty project in 2007 Derry requested to vary from the contract to place three lifts of asphalt to get another shot at improving ride quality, which was approved. Their result was a ride bonus of 82% in 2007. A similar request for a three lift approach was presented on the 2009 project but was discouraged. The results of the external audit conducted by experts on the PASIN team found that Derry had met the requirements for implementing each of the PASIN QMS elements. Derry communicated in a project after action review that they were confident that the better ride result came from the quality management system.

The results of this pilot, a summary of the results of the overall effort and recommendations for advancing the effort in the future have been presented to the Executive teams of PennDOT, PAPA and the FHWA.

# Recommendations

The efforts of the 2009 pilot concluded the testing of the concepts of the PASIN QMS. The PASIN team presented the following plan as an option for future implementation of this effort to the Executive teams of PennDOT, PAPA and the FHWA:

## PASIN II implementation-Wave 1

- Develop the Contractor Process Quality Control (CPQC) Special Provision with the involvement of FHWA and industry (PAPA).
  - CPQC will be in compliance with 23CFR.
  - Other states are using FHWA approved specs using QC for acceptance but without process control.
- Training
  - Train the Industry on applying the templates to their organization.
  - Train PennDOT on the review of the QC Plan requirements and acceptance and verification process.
- Apply CPQC on projects
  - One pilot project per District.
  - Apply as an optional acceptance method.
  - If contractors can justify that the required level of process control and process capability of QC is in place, PennDOT can approve their request to use the revised acceptance procedure.
  - If not, the standard acceptance processes will still be available.
  - Contractor can elect to remain with standard acceptance from the start.
  - One component of the dispute resolution process could be to revert acceptance back to the standard specification.

## PASIN II implementation-Wave 2

- Engrain the CPQC and PASIN Quality Management System into Standard Operating Practices
  - Incorporate specification into Pub. 408 as an alternate.
  - Delegate QC Plan approval to Districts.
  - Metrics will evaluate success.
- We are not proposing a “PASIN certification process” or requiring ISO certification.
- We are not impacting any prequalification requirements.

**CURRENT PROCESS TO PASIN COMPARISON**  
**Asphalt Pavement Testing and Acceptance Process**

| Current  | Proposed PASIN  |
|--|---|
| <ul style="list-style-type: none"> <li>• Managing for pay</li> </ul>   | <ul style="list-style-type: none"> <li>• Managing quality/consistency</li> </ul>  |
| <ul style="list-style-type: none"> <li>• Prescribed QC Plan</li> </ul>   | <ul style="list-style-type: none"> <li>• Prescribed QC Plan and PASIN Implementation Plan (Quality Management System)</li> </ul>  |
| <ul style="list-style-type: none"> <li>• Acceptance based on Department testing               <ul style="list-style-type: none"> <li>○ Testing results -17.5 avg. (21 days max.) after placement</li> <li>○ Not correlated with contractor's QC results.</li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>• Acceptance based on Contractor QC testing and Dept. verification               <ul style="list-style-type: none"> <li>○ Testing results-3 days</li> <li>○ Acceptance correlated with contractor's QC results.</li> </ul> </li> </ul> |
| <ul style="list-style-type: none"> <li>• Personnel and equipment stays same</li> </ul>   | <ul style="list-style-type: none"> <li>• Increase personnel and equipment for contractor</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Corrections not tied to acceptance process</li> </ul>   | <ul style="list-style-type: none"> <li>• Corrections tied to acceptance process</li> </ul>  |
| <ul style="list-style-type: none"> <li>• Identify overall responsibility for process (i.e. foreman)</li> </ul>   | <ul style="list-style-type: none"> <li>• Identify specific responsibility (by person) for implementing Best Practices and to avoid failure modes</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Consistency-same as current</li> </ul>  | <ul style="list-style-type: none"> <li>• Consistency improvement</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Documentation remains same</li> </ul>   | <ul style="list-style-type: none"> <li>• Increased documentation by contractor</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Plant QA               <ul style="list-style-type: none"> <li>○ Random review by BOCM QA</li> <li>○ District QA review-more frequent</li> </ul> </li> <li>• Field QA               <ul style="list-style-type: none"> <li>○ BOCM QA                   <ul style="list-style-type: none"> <li>▪ Major project-more frequent</li> <li>▪ Remaining-random</li> </ul> </li> <li>○ District QA-Daily inspection of procedures (not results)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Plant QA remains same</li> <li>• Field QA remains same</li> <li>• External audits-District QA</li> </ul>   |
| Prequalification   |   |
| Plant approval (inspection)  |   |
| Technician Certificate   |   |

## Critical success factors

### Provide funding

- Budget required for the training itself—Department and industry (2010/2011)
  - PennDOT provide training for PennDOT and industry as well as QMS follow-up support.
  - Industry provide training facility, send trainees, PAPA involvement in Management Review at the Executive level.
  - FHWA-provide involvement in developing specification, attending training, participation in Management Review, etc.
- Provide Question/Answer Support (as follow up to training)
- Provide support needed for CPQC spec development and implementation both by PennDOT and industry.
- We need to be sure that commitment to this change will be driven from the executive level in FHWA, PennDOT and the industry.
- We need to document the intent of the effort well, and how success will be monitored to ensure that a new administration will recognize the need to continue the effort until it becomes Standard Operating Procedure.