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Superpave™ Binders

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[Introduction](#)

[Availability of PG binders](#)

[Rule of 90](#)

[Do PG binders correspond to
AC binders?](#)

[Burden or Opportunity](#)

[The ASC Program](#)

[AASHTO Standard PP26-96](#)

[Another interesting concept is
beginning:](#)

[Agency Acceptance
Samples](#)

There are three major parts of Superpave technology. The asphalt binder, mixture design and analysis, and computer software. The asphalt binder technology is being implemented a little before the mixture technology. The performance grade (PG) binder is a very good tool for improving the quality of our roads and, even though it isn't 100 percent complete right now, there is a lot to be gained by implementing now. The Superpave asphalt test system is an extremely sensible one. The lab tests used to grade the asphalt correspond closely to actual conditions of the asphalt in the road. Temperature extremes of the asphalt on the road are matched with those in the lab. The age of the asphalt is also considered. The asphalt is tested in a fresh condition, in a slightly aged state, which corresponds with what comes out of the plant, and then in a more severely aged condition that corresponds to what it might be like in a road after several years of service. Temperature and aging are two areas where Superpave PG grades offer something that didn't exist before.

The basic issues between the asphalt suppliers and the state agencies are issues of supply and product quality. Can the agencies obtain the products they would like to use, and can the quality of the product be assured? By continuing the communications between the supplier and the agency that have gone hand in hand with the Superpave implementation activities, the answers to both of these can be yes!

Availability of PG binders

As the use of Superpave binders is implemented, it is important that the states are aware of the availability of PG binders. Many people want to know if certain PG grades will be available. Of course they will, but certain grades will be more readily available than others. States and suppliers do not want to have a bid letting and find out supplies are not available.

The supplier must know approximately what volume of the different PG grades is going to be required by the states. In some circumstances, the manufacturing process will have to be changed, and each supplier must determine if there is enough incentive to change the manufacturing process. Large changes in asphalt supplies take time. It would be difficult to

make a substantial change in asphalt supplies in a year. These changes can begin to be implemented now, but full implementation will take time. It is also important that the state understands the cost of the PG grade that it requests. The value of crude oils will probably change, and this may affect the price of certain grades of asphalt. Some grades of asphalt are considered beyond the manufacturing capability of today's refineries.

But with some changes, maybe they can be produced. To meet some grades, the binder will have to be modified, in turn increasing the cost. There are other things the states must consider:

climate, traffic severity, and reliability.

Reliability is the concept that a higher initial cost can be traded off for a longer pavement life. Because of these factors, a state or agency must use good engineering judgment in selecting the proper PG grade.

[Contents](#)

Rule of 90

Some people have heard of a "Rule of 90" that says if there is less than a 90 degree difference between the high and low temperature grade, the binder can be made "straight-run," or unmodified. In other words, if the difference is higher than 90, the asphalt will have to be modified. There are many things that invalidate this rule. Each refiner will have its own production arrangement for manufacturing asphalts. Higher viscosity asphalts tend to have a broader temperature range than softer asphalts. Asphalt from different crude oil sources will provide a different temperature range.

Some asphalts can be lightly modified to meet a specific grade, while others have to be heavily modified to meet the same grade. Another issue is "Are all PG 64-28 binders alike?" In the past, an agency may have specified an AC-20 modified with polymer. Is this different than a straight-run AC-20? Of course it is. But is a straight-run PG 64-28 different than an asphalt that required modification to meet the same PG 64-28 grade? The current PG specification assumes there isn't.

Research and field trials are now being conducted to answer this question.

Do PG binders correspond to AC binders?

When states began implementing the PG specification, they tested their viscosity or penetration graded asphalts to determine where they graded in the Superpave system. The relationship they developed was appropriate at the time the comparisons were made. However, suppliers may have since changed production processes and/or crude supplies to meet the PG system and, therefore, saying that a particular PG grade is the same as an AC grade is no longer valid. Each supplier has its own list of grades that are easy and difficult to make. Certain PG grades correspond with current AC grades and some are either impossible or difficult to make. In fact, those considered difficult for one supplier may be easy for another. There isn't a one-to-one correspondence between a viscosity or pen grade and a PG grade.

Burden or Opportunity

The first thing some asphalt suppliers thought about Superpave was that the increase in testing requirements was going to be horrible. But then, as time progressed, suppliers realized that this is an excellent opportunity to make a system work well for everyone. Suppliers just

needed to sit down and get the job done. That's what they did, largely through the Asphalt Institute. Suppliers sought to establish uniform specs across the U.S. that would help the states and the suppliers. States and regions had developed modifications to asphalt specs that were pertinent to their location. Working through alliances, such as user-producer groups, has helped address regional concerns.

The ASC Program

A concern of everyone was ensuring that the asphalt being supplied met the PG specification. States have different acceptance practices, and suppliers have unique facilities for providing materials.

Trying to get them all to agree on one certification program was a challenge, but it was accomplished.

What was developed was Approved Supplier Certification (ASC). In the ASC program, the supplier establishes a history of on-spec manufacturing of PG binders. The supplier develops a quality control (QC) plan tailored to its own circumstances and follows the plan. The agency reviews the plan, decides if it is acceptable, and makes any necessary changes. This QC plan is custom-fit to every agency-supplier relationship.

[Contents](#)

AASHTO Standard PP26-96

The ASC program went through reviews, comments, and voting before being brought to the American Association of State Highway and Transportation Officials (AASHTO). Now it fits in as AASHTO Standard PP26-96. Some of the main features of the standard include:

1. The manufacturer or supplier can supply asphalt under the ASC program. If he doesn't want to do that, he still has the option to pretest the asphalt.
2. The HMA producer has to follow the supplier's recommendations in the QC plan.
3. The agency checks to make sure the asphalt is delivered as requested. The agency takes field samples and can take split samples with the supplier or HMA producer if he chooses.

Initial certification is kind of difficult under certain circumstances. Sometimes we have to certify an asphalt we are not producing commercially. For that purpose, many states are allowing lab blends of asphalt to be used for at least some of the samples for initial certification. Then, checking the commercial batch with the lab tests confirms the results.

Another interesting concept is beginning:

some states are accepting supplier certifications from neighboring states. This practice eliminates some of the redundancy of testing and certifying. The main thing producers must do is follow the supplier's plan for handling the asphalt, including such issues as in-line blending for a polymer concentrate, or the use of solid additives. Whether or not the state accepts this type of material and how it is handled is really at the discretion of the agency. The AASHTO provisional standard is very flexible to accommodate lots of different situations. Under certain circumstances, the HMA contractor will have to be certified himself if new binder is being produced.

Agency Acceptance Samples

In PP26, there are also steps outlined if agency samples show the material is out of tolerance. It doesn't really explain what "out of tolerance" is, but the concept basically involves notifying the agencies responsible for the samples, reviewing testing and sampling procedures, and working together to decide on appropriate action. If the agency sample shows failure to comply with the spec, the action that should be taken, according to PP26 is clear: investigate the cause, correct the action. If there is a serious departure in properties of the material from the spec, the agency has a right to delay project work. It's pretty similar to what the industry has today. The asphalt industry is still conducting tests to determine what is off-spec. Round Robin testing programs are working on developing "precision and bias statements" -- statements that indicate the accuracy and possible sources of variability for specific tests. For all Superpave binder tests, there are probably half a dozen little things that contribute to test variability and are going to have to be hammered out to insure reproducibility. There has been a lot of success with smaller groups discussing where the problems may exist. The Asphalt Institute is preparing detailed, instrument-specific procedures for these binder tests that will hopefully help reduce variation from operator differences. In the meantime, it can't be stressed enough how valuable it is to do testing in somebody else's lab, or invite somebody else over to your lab to do testing. Perform not only binder tests, but aggregate and mixture tests. It's amazing how much can be learned by having two people familiar with the process compare how they do things. Superpave is on a fast track and it will offer many wonderful benefits.

Test precision will improve with time, experience and work, but until then, the industry must maintain an open dialogue to ensure the success of Superpave.

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[Contents](#)