Implementation
of
Superpave
in
Iowa

February 26, 1997

Report to the Iowa
Quality Management Asphalt Committee

Prepared by the
Iowa Superpave Implementation Task Group

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I. Introduction:

SUPERPAVE (SUperior PERforming Asphalt PAVEments) is the product of the Strategic Highway Research Program's (SHRP) $50 million investment in asphalt research. Unlike the current empirical Marshall mix design system, Superpave is a comprehensive method, based on performance characterizations tailored to project specific traffic, environment, and pavement structure. Because Superpave considers the interaction of traffic, climate, and pavement structure in the design process, it is a design procedure truly integrated into a single system. The three main components of the system are the asphalt binder specification, the mixture design and analysis system, and computer software programs.

The FHWA is now endorsing full implementation of the SUPERPAVE asphalt mixture design procedure. To promote and validate this large research investment, it is very important that SUPERPAVE implementation proceed in a controlled and consistent manner.

The Iowa Superpave Implementation Task Group was formed by the Iowa QM-A steering committee to identify issues and answer concerns about the implementation of Superpave in Iowa. The primary direction was to answer the following questions: "Does Iowa need Superpave?" If needed, is the complete Superpave process needed or can Marshall equipment be used to field control a gyratory design? If Iowa does implement Superpave, will it be necessary to modify Superpave criteria to allow continued use of locally available aggregates? Will the use of Superpave increase the cost of asphalt cement concrete in Iowa?

II. Group / Study Organization:

The nine member task group included representatives from the Iowa DOT, the FHWA, the asphalt paving industry, and asphalt and aggregate suppliers. Appendix E. lists the task group members.

The first meeting was held on September 5, 1996. At this meeting the group set a fixed meeting time of once every three weeks.

After the organizational meeting the group held a Superpave brainstorming session to identify the issues and questions that need to be addressed to implement Superpave in Iowa. The brainstorming session was an attempt to bring all concerns forward so they are at least identified if not resolved. At the close of the first meeting members were asked to continue to think about Superpave and possible additional issues so that necessary additional items could be added to the list at the next meeting.

At the second meeting held on September 26, 1996, additional issues to be added to the list were discussed. One key issue, which the group felt was the focus of the task force and not included in the previous list was the **Time Frame of Implementation**.

Also the key issue of **"Does Iowa need Superpave?"** was not included in the initial list developed. It was noted that this question is a fundamental reason for the existence of the task group. These two issues were added to the original list of issues.

The next task for the group was to organize the issues in a fashion in which they could be handled in a logical and orderly manner. This was done by first arranging the issues into similar groups. This resulted in seven major issue groups as shown below.

The next step was to establish priorities for each group. It was proposed that two different priority categories be used. One would consider importance of resolution. That is, what issue resolution, if any, is needed or should take precedence over another before implementation of Superpave could proceed.

The second priority ranking was to consider ease of resolution. This would take into account resolution of issues where sufficient information or data exists that an issue resolution could at least be proposed. For example, the issue of training can be resolved with a solution proposed fairly easily. All that is required is to decide who will perform the training, when the training will take place, and follow up with arrangements. An issue such as how to handle criteria adjustment for low volume roads is definitely more difficult because the data necessary to form the basis of a sound decision is not presently available.

After discussion the group agreed that all the issues are of equal importance and could not be ranked by order of importance. The issue groups were then ranked by ease of resolution.

The primary issue groups ordered by of ease of resolution follow this discussion. The primary issue groups are used as headings and form the outline for the remainder of this report. Discussion for each issue group includes three sections: 1) the question(s) and/or concern(s), 2) a brief summary of the group discussion concerning the issue, and 3), a proposed direction or recommendation.

III. Issues:

1. Time Frame for Implementation:

Question / Concern: What should the time frame for implementation be?

Discussion:

Various time frames for implementation of Superpave, considering all classifications (Interstate, Primary, Secondary, etc.) were proposed and discussed. A five-year time frame was the consensus of the group. This would start in 1997 at 10% of the Primary and Interstate construction projects with this 10% consisting of the six projects to be let by Special Provision this fall and winter.

It is recognized that this time frame will be reviewed as implementation progresses. This time frame is a balance between the extremes of no Superpave projects, and moving completely to Superpave by specifying all projects let after a certain date use Superpave. It is a moderate approach that will bring more projects under the Superpave design procedure as more information is gathered from Iowa projects constructed using materials available in Iowa. This approach defers the use of Superpave on low traffic secondaries and local roads until later in the five-year period allowing time to gather and

evaluate design data for these roads. This additional information will be necessary to evaluate properly the impact Superpave might have on these roadways.

Conclusion / Recommendation:

A five-year implementation from year 1997 to 2002 as follows:

1997	10% of Interstate and Primary [Note 1.]
1998	25% of Interstate and Primary
1999	50% of Interstate and Primary
2000	100% of Interstate and Primary
2000 to 2002, Counties, Cities, Other [Note 2.]	

[Note 1.] This 10% consists of the six projects identified for 1997 construction for which the Special Provision has been developed.

[Note 2.] This may require adjustment in Superpave mixture design criteria for lower volume roads.

2. <u>Training:</u>

Question / Concern:

How will we train QM-A mix designers and technicians for Superpave gyratory design, and testing (including field control)?

Discussion:

Superpave Gyratory training will be introduced in the recertification schools in the 1996/97 training year. The 1997/98 training year will include full Superpave design training possibly performed by an outside consultant (NCAT, Asphalt Institute, Superpave Center). See Appendix B.

Conclusion / Recommendation:

Proceed as planned with Superpave Training.

3. <u>Equipment & Equipment Specifications:</u>

Question / Concerns:

The North Central Asphalt User Producer Group is working on standardization. What will the standard for gyratory compactors be?

Concerning correlation of standard equipment gyratory equipment, What will the procedures be and how will the equipment be correlated between laboratories and field vs. Office laboratories.

How do contractors acquire gyratory compactors? Should the DOT compensate the contractors for purchasing the equipment?

Discussion:

What equipment will be considered the standard?

Iowa will consider gyratory equipment developed and approved during the SHRP program acceptable. At this time the Pine and Troxler gyratory compactors are the two recognized compactors.

The FHWA has recently stated that they do not intend to "Approve" Superpave gyratory equipment. Equipment manufactures wishing to validate that their equipment meets the Superpave equipment specification are being asked by the FHWA to hire an independent testing laboratory to perform validation testing for their equipment.

Iowa will consider additional equipment based on certified tests from independent laboratories and a successful correlation program with the DOT; that is, equipment that can repeatedly produce test results within the established DOT correlation.

How will correlation factors be established?

Iowa has purchased a total of seven Troxler gyratory compactors, one for the Central Laboratory and one for each of the six Transportation Center Laboratories. The Iowa DOT will establish correlation with this equipment in the same manner used to establish correlation factors for other equipment. The first step will be establishing correlation between the Central and Transportation Laboratories. This intra-DOT laboratory correlation for gyratory compactors will begin this winter (96/97) and continue on an on-going basis. This correlation will then be extended to the contractors' equipment as the contractors begin to acquire the equipment.

Work is also being completed nationally with the correlation of Superpave binder and compactor equipment. Organizations involved include AMRL, NCAT, the Superpave Center and other state agencies.

The Iowa information will be reviewed and used with the data obtained from national sources to establish initial correlation factors. This information will be further supplemented by data obtained from the six pilot Superpave projects proposed for the 1997 construction year.

Purchase of Gyratory Equipment:

This item was discussed under the premise that if the DOT intends to require gyratory compaction in the future, the DOT would provide some compensation for purchasing gyratory compaction equipment. This could be handled similar to contractor QM-A equipment purchases. The group agreed that additional equipment cost would be reflected in the project cost regardless of how it was paid for. Therefore, it would be better to be able to identify this cost and have an assessment rather than having the costs incidental to the total project. This compensation would also show the DOT's commitment to Superpave.

Two methods were discussed: 1) a bid item for gyratory compactors that would belong to the contractor at the end of the project, and 2) a set price per ton for Superpave work similar to the procedure used for QM-A. Variations on these two methods included setting a cap on the dollar amount received or limiting the gyratory units received by any one contractor.

Frank Howell (FHWA) provided information and noted that the FHWA is supportive of Superpave. They would not object to existing funds being used to provide contractor Superpave equipment using one of the methods discussed. Two comments that do need emphasis are: 1) no new or special funds are available–money would come from existing construction funds and 2) pooled funds were not available–pooled funds being reserved for special multistate research programs.

It was noted that a suitable plan for acquiring the equipment could be worked out, but DOT personnel were not sure how this would be received by DOT management under current budget restrictions.

Conclusion / Recommendation:

Task Group Recommendation for Equipment Purchase:

The group further discussed the purchase of gyratory compactors on November 7, 1996 and developed the following recommendation:

Use a method similar to that used for QMA and provide incentive for the contractors to move toward gyratory compaction projects. The DOT would compensate contractors at the rate of $0.20/ton of mix on designated Superpave projects for two years starting with the 1998 construction season. This item would only be paid during the 1998 and 1999 construction seasons.

The DOT should consider "Work Ordering" this payment on the six Special Provision gyratory pilot projects to be constructed during the 1997 construction season as an incentive for contractors to obtain gyratories for these projects. This would provide the advantage of making additional gyratory correlation data available during the 1997 construction season.

4. <u>Mixture Specifications:</u>

Questions / Concerns:

What are the impacts on present criteria and how will the Superpave system change existing criteria? How will Superpave impact low volume roads and the use of local materials?

Things that need to be considered include:

Volumetrics, VMA, air voids
Compactive effort, C_{ini}, C_{max}
Aggregate requirements:
    Consensus properties
    Source properties
    Gradation requirements including restricted zone

Discussion:

While the possible impacts of Superpave on present Iowa mixture criteria were discussed in general, the group did not discuss specific criteria in great technical detail. The Central Materials Laboratory has analyzed approximately 175 gyratory mixes and found that a significant number of local materials and sources can be used to complete satisfactory laboratory Superpave gyratory designs. A significant portion of this information has been summarized by John Hinrichsen and is available in a separate document (ref. Superpave Aggregate Data.)

Additional information will be gained from the six pilot Superpave projects to be let this winter for 1997 construction. See Section IV and Appendix D, which discusses the data that will be collected from these projects.

Also, a reference chart which compares current Marshall tests to equivalent Superpave tests is shown in Appendix C.

Conclusion / Recommendation:

Obtain additional data from the six Iowa pilot projects as they are constructed in 1997. Also, obtain and review information from other states as it becomes available to determine what, if any, modifications to Superpave specifications might be applicable to Iowa.

5. <u>Field Control (Field Management):</u>

Questions / Concerns:

Superpave Gyratory (design/field control), is it needed? Yes / No
Why do we need the gyratory? Can we correlate Marshall with Gyratory?

Discussion:

The DOT's position is that quality and longevity of asphalt cement concrete produced and placed in Iowa can be improved with the use of Superpave mixture design methodology. Because the gyratory compactor is an integral part of the Superpave methodology, it will be required to implement Superpave.

Additional discussion on this topic concerned the feasibility of Marshall hammers for field control of a Superpave gyratory design. Data from Superpave projects constructed during 1995 and 1996 shows that this is possible to a certain degree for some designs. However, these designs are probably the exception and not the rule. One primary reason for this is that the gyratory design procedure is more sensitive to traffic (it considers several traffic levels) where present Marshall practice uses only two compaction levels, fifty and seventy-five blow. If the compactive effort of the Marshall level being used does not reasonablely coincide with the gyratory compactive effort, the results from the two compactors will not agree. How different materials react to the different compaction mechanisms also contributes to the differences. Intuitively, compaction by impact, (Marshall), and compaction by constant pressure and gyration, (Gyratory), will not produce the same result.

For these same reasons it is doubtful that it will be possible to establish a universal Gyratory/Marshall correlation that will apply to all situations. Any correlation will be highly materials' dependent and will vary from mixture to mixture.

From an administration standpoint maintaining both gyratory and Marshall systems would logistically be very difficult.

Conclusion / Recommendation:

Gather additional data from the six pilot gyratory projects to verify the premise that the Superpave design procedure results in a higher quality pavement. In addition use the data gathered to further validate the correlation or lack of correlation between Gyratory and Marshall design compactive efforts.

6. <u>Cost / Benefit (C/B):</u>

Questions / Concerns:

What is the Cost/Benefit as related to traffic levels, County projects, County specifications?

What will be the increase in material costs?

Aggregate availability–How do we maintain current levels of production and meet Superpave aggregate criteria?

Binder, availability and increase in cost.

Discussion:

Data available concerning increased **aggregate costs** is limited to the few projects Iowa has completed by work order. This information shows the cost increase, per ton of mix, to design and place a Superpave gyratory design to be from $0.50 to $1.75. This is of course highly dependent on materials used, location of materials, materials availability, haul distance etc.

The table below summarizes information provided by Dave Humphrey of Martin Marietta on Superpave projects they were involved with in 1996.

Aggregate Cost per ton of Asphalt Mixture

Iowa 175, Hardin County

	Binder	Surface
Present Marshall Specification	$6.94	$8.27
Superpave Specification	$7.55	$7.94

Note: Asphalt plant was at the aggregate source, no haul costs are included.

US 71, Sac County

	Binder	Surface
Present Marshall Specification	$8.20	$9.39
Superpave Specification	$9.83	$9.83

Note: Asphalt plant at the sand/gravel/oversized source, no haul costs are included. Crushed stone haul is figured at $0.12 per ton mile.

For the Howard County US 63 project and the Douglas Ave. project in Polk County no companion Marshall mix designs were prepared so actual Marshall design cost data is not available. The contractor and supplier estimate the aggregate cost increase per ton of mix to be $1.00 for the U.S. 63 project and $0.90 for the Douglas Avenue Project.

Appendix C, is a complete copy of the information provided to the group by Dave Humphrey.

The potential increase in **asphalt binder cost** was discussed by Ken Simpson of Koch Materials at the October 17 meeting. Suppliers will provide PGAB graded asphalt after January, 1997. Ken speculated that the differential cost increase for supplying PGAB asphalt versus viscosity grade asphalt will be from $5 to $10 per liquid ton for non-modified binders. Modified binders will cost an additional $65 to $85 more per liquid ton than non-modified binders despite the classification system.

This approximate price increase has been the general increase recognized by suppliers and noted at the North Central Asphalt User Producer group meetings.

These price increase ranges were also those realized in the prices received on Iowa construction projects let with PGAB in the last two construction seasons (US 71 and the Black Hawk County projects.)

Additional cost information will be available after the six research projects are let.

Benefits:

The group discussed benefits in general noting the benefits attributed to Superpave to be very subjective and highly speculatively.

Conclusion / Recommendations:

Information about the cost of using Superpave on Iowa projects will be gained in the next year from the six research projects. It is expected that item unit prices for asphalt mixtures will fluctuate on these projects. It is also expected that this will stabilize as aggregate suppliers become more aware of what aggregate production changes are necessary to make products that will work well with Superpave and contractors become more knowledgeable about which aggregate combinations will best produce valid Superpave designs.

The possible benefits of Superpave to Iowa will be difficult to determine with a high degree of confidence until more data is available. The actual field performance, possible increase in the longevity, and in turn, true evaluation of potential benefits of Superpave projects may not be quantifiable or verifiable for a minimum of five to six years?

Additional action by the Iowa DOT concerning this issue will be to review Superpave projects and programs of other states and look at national studies of Accelerated Pavement Research.

7. Traffic:

Question / Concern:

Question: How do we adjust Superpave criteria (including N design) for the counties and lower traffic roads?

Will the use of Superpave gyratory design without criteria adjustment on lower traffic projects cause an unnecessary cost increase and reduce the use of locally available materials that have previously shown acceptable performance?

Discussion:

This concern is recognized by the group as a very important issue and very difficult to answer given the information available today.

The resolution of this issue will take the acquisition of additional information using local materials and lower compaction (gyration) levels.

If the time frame as presented in item one of this report is followed, laboratory work for lower

traffic designs will take place in the first three years along with possibly a few limited field trials. This will provide information upon which to base possible adjustments to the Superpave criteria. Things that may be considered include the restricted zone specification, mixture size specification, aggregate requirements, and void requirements.

The primary intent of this research will be to maintain the existing quality while maximizing the use of local materials currently used for these projects.

Conclusion / Recommendation:

Begin laboratory work with gyratory using typical local materials and lower traffic level gyratory design gyrations. Develop this information into a data base similar to the laboratory designs information recently compiled for higher traffic level mix designs. Supplement this information with data gathered from the six pilot projects to be completed during the 1997 construction season and possible field trials on lower traffic roads.

IV. Data to be Collected From the Pilot Projects:

Often in this report and during the meetings reference is made to the six pilot Superpave projects planned for construction during the 1997 season. The information obtained from these projects will be collected by the Transportation Center Materials Offices and will add to the knowledge base concerning Superpave mixtures in Iowa. The group believed that a standard format should be used to collect the information from these projects such that data could be compared from project to project. The result of this data collection is expected to be a summary report and analysis. For these reasons a standard outline was developed to organize the information collected.

This standard report format is shown in Appendix D.

V. Task Group Recommendation for the Implementation of Superpave:

Based on the Iowa asphalt paving industries successful implementation of the Quality Management Asphalt program, the industry is clearly capable of meeting the technical challenges of implementing Superpave. The challenge of Superpave will be to work cooperatively with aggregate and asphalt suppliers, the DOT, and FHWA to find economical ways of implementing Superpave and realize the potential quality benefits without a significant increase in costs.

Iowa should: 1) proceed with Superpave implementation in a planned, progressive, yet moderately conservative manner evaluating Superpave on pilot projects, 2) gather additional data on these projects as they are constructed, and 3) review completed projects annually to evaluated long term cost and benefits.

IOWA SUPERPAVE IMPLEMENTATION TASK GROUP

November 7, 1996

Aggregate Cost Comparison-Standard to Superpave

The only comparison that can be made at this time are on projects that have been completed using the Superpave system. These projects are Iowa #175 in Hardin County in 1995; Highway #71 in Sac County in 1996; Highway #63 in Howard County in 1996; and Douglas Avenue in Polk County in 1996.

Iowa Highway #175 - Hardin County 1995

Binder Mixes - standard — 60% crushed, 50 Blow Marshall

		Cost per ton @ asphalt plant	
40%	3/4" Gravel	$2.75	$6.94 per ton of mix
24%	3/4" Crushed Limestone	$9.59	
11%	3/8" Washed Chips	$9.84	
25%	Manufactured Sand	$9.84	

SHRP Mix - Binder

35%	3/4" Gravel	$2.75	$7.55 per ton of mix
26%	3/4" Clean Limestone	$10.59	
39%	3/8" Washed Chips	$9.84	

Surface Mix - standard 75% crushed
50 Blow Marshall

		Cost per ton @ asphalt plant	
18%	3/4" crushed oversized gravel	$9.00	$8.27 per ton of mix
35%	Manufactured Sand	$9.84	
27%	3/8" Washed Chips	$9.84	
20%	Screened Sand	$2.75	

SHRP Mix - Surface

15%	3/4" crushed oversized gravel	$9.00	$7.94 per ton of mix
7%	Manufactured Sand	$9.84	
53%	3/8" Washed Chips	$9.84	
25%	Screened Sand	$2.75	

On this project, the asphalt plant site was located at the sand/gravel/oversized source; therefore no hauls were included in their price. The crushed stone required hauling to plant site. This haul was figured at 12¢ per ton mile.

Highway #71 - Sac County 1996

Binder Mix - standard — 60% crushed, 50 Blow Marshall

		Cost per ton @ asphalt plant	
40%	Sand	$4.00	$8.20 per ton of mix
45%	3/4" Crushed Limestone	$10.70	
5%	Manufactured Sand	$12.15	
10%	3/4" Clean Limestone	$11.70	

Surface Mix - standard — 75% crushed, 50 Blow Marshall

25%	Sand	$4.00	$9.39 per ton of mix
50%	3/4" Crushed Limestone	$10.70	
25%	Manufactured Sand	$12.15	

SHRP Mix - Binder/Surface

23%	Sand	$4.00	$9.83 per ton of mix
30%	3/4" Crushed Limestone	$10.70	
32%	1/2" Washed Chips	$12.30	
15%	3/4" Clean Limestone	$11.70	

On this project, the asphalt plant site was located at the sand source; therefore no haul was required on sand. The crushed stone required hauling to plant site. This haul was figured at 10¢ per ton mile.

On the remaining projects:

Highway #63 - Howard County

No comparable mix design is available, but from previous projects with similar mix designs, Keith Bruening (Bruening Rock Projects) estimates an additional cost of material for Superpave at approximately $1.00 per ton.

Douglas Avenue - Polk County

In making comparisons with other mixes of like requirements, both the asphalt contractor and material supplier estimate an increase in material cost of approximately 90¢ per ton of mix.

It should be noted that for the Highway #175 and Highway #71 projects, the stone source had an abundant inventory of Man. Sand and Washed Chips. This may not be the case on all projects.

Training for Superpave Implementation

Current - 1997

1. Level III ACC-Recertify

   Course to be expanded from one day to two days to incorporate an introduction to Superpave. The first day's lecture covering Superpave may be attended by any ACC certified technician at no cost.

   3-sessions: 25-30 people each session

2. Superpave Workshop - The Future of Asphalt Mix Design

   One-day introductory workshop presented by the Asphalt Institute and the Asphalt Paving Association of Iowa in cooperation with the Iowa Department of Transportation.

   January 7, 1997, Ames
   Cost: $65-$70 each
   120-150 Students

3. Marshall Mix Design - Level III - March 17-21, 1997
   Cost: No additional cost to Mix Design Class Registration
   Includes a one to two hour overview of Superpave Mix Design with Gyratory compactor.

Future - 1998

1. Offer Iowa Superpave Volumetric Mix Design Short Course

   Three-day course covering introductions, mixture volumetrics, gyratory test machine, binder overview, mix-design, and a calculation workshop. Course would include hands-on training.

   Plan for two sessions of 16-20 people each.

   Consider contracting with the North Central Superpave Center for training at Ames using DOT equipment located at the Central Lab. and CITC Lab.

   Option - Use training personal from the National Asphalt Training Center the industry. Cost: $400 - $500 per student.

2. Outside Training

   Superpave training at North Central Superpave School or National Asphalt Training Center. Cost: $600 - $800 per student

3. Develop hands-on ACC short course for field control using gyratory compactor.

   Consider option of modification of Level II ACC - Hands-on - BLT course to include extra 4-8 hours of training.

1999

1. Offer Marshall Mix Design, and Superpave Volumetric Mix Design schools as separate certified classes.

2. Re-structure Level II ACC Lecture and Hands-on Lab to include both Marshall and Gyratory field control.

Superpave

Binder
Performance Grade

Aggregate Consensus Properties
Coarse Aggregate Angularity
Fine Aggregate Angularity
Flat and Elongated Particles

Clay Content

Source Aggregate Properties
Toughness
Soundness
Deleterious Materials

Gradation (.45 power chart)
Control Points
Restricted Zone

Mixture
Compaction, Gyratory
seven design levels based on ESALs

Criteria
Design Air Voids
Dust Proportion
VMA, Voids in Mineral Aggregate

VFA, Voids Filled with Asphalt

Moisture Sensitivity

Current Iowa Specifications

Binder
Viscosity Grade prior to 1997
Performance Grade after January 1997

Aggregate Properties
Crushed Content

Clay Content (PI, Type B)

Aggregate Source Properties
Freeze Thaw
LA Abrasion
Deleterious Materials

Gradation (.45 power chart)
Gradation Bands

Mixture
Compaction, Marshall
two design levels, based on ADT, ESALs

Criteria
Design Air Voids
Filler Bitumen Ratio
VMA, Voids in Mineral Aggregate

Film thickness
Minimum Asphalt Content

Superpave Projects Data Collection Outline:

The following outlines the information that will be collected for the six Superpave projects being let and constructed using the Superpave Gyratory Special Provision.

Existing Pavement Information:

Pavement History
Pavement Condition Before Construction

Mix Design:

Mix Design Report, (Form 956)

Gyratory Compactor Mix Design Results

Mixture Design Materials, (Form 955)

Number of Trial Designs necessary to establish a Superpave design, (Form 955 for trial designs)

Restricted Zone, Analysis, Decisions, Discussion of Decision

General discussion concerning final mix design, What were the major factors in the selection of the final design over other possible designs?

Equipment Correlation Marshall/Gyratory between Central Laboratory, District Laboratory, Contractor Laboratory

Marshall data obtained compacting Gyratory design when Marshall compaction is proposed for field control by contractor

Plant Control:

Marshall / Gyratory laboratory density data obtained from Transportation Center Laboratory and Contractor field laboratory

Field Control:

Contractor Laboratory density (Marshall/Gyratory) compared with DOT (Marshall/Gyratory) Laboratory density

Comparison of Voids, VMA

Mix Design Change Documentation

QMA Summary Sheets

Construction Information:

Equipment

Construction Practices

Changes in construction practice necessary for Superpave.

Constructability:

Surface Appearance
Segregation
Joint Quality

Project Costs Information:

Materials
Standard versus Special Required for Superpave

Post Construction Pavement Condition:

Performance
Cracks
Rutting
Friction

Appendix E.

Task group members are:

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