



**MINNESOTA DEPARTMENT OF TRANSPORTATION
STATE AID FOR LOCAL TRANSPORTATION**

Technical Memorandum No. 10-SA-02

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To: County Engineers (Distribution 618)
City Engineers (Distribution 650)
MnDOT District State Aid Engineers
MnDOT District Materials Engineers
SALT Consultant list

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Subject: Specification 2360 – Plant Mixed Asphalt Pavement - Design Guidelines

Expiration

This technical memorandum supersedes Technical Memorandum No. 04-SA-01 "Bituminous Specification Implementation" dated, February 20, 2004. This technical memorandum will expire on 8/9/2015, unless superseded prior to this date.

Implementation

Guidelines contained in this technical memorandum are effective immediately for all State Aid and Federal Aid projects that contain specification (2360) Plant Mixed Asphalt Pavement.

Modification(s) to specification 2360 - Plant Mixed Asphalt Pavement shall be requested by the local agency in a letter to the District State Aid Engineer. The request for modification letter shall include justification for the specification deviation(s). The request for modification to the specification shall include at a minimum an explanation of the situation, why the modification is necessary and how this modification will provide a better product. A copy of the request for modification letter shall be retained in the respective local agency project file.

Introduction

Over the past decade, MnDOT and local agencies have transitioned from Marshall mix design to gyratory mix design. Technical memorandum No. 04-SA-01 "Bituminous Specification Implementation" was a beginning directive toward moving Federal Aid and State Aid projects to gyratory mix design.

On November 9, 2009, a memo titled "2010 Bituminous Specification Implementation Reminder" http://www.dot.state.mn.us/stateaid/sa_construction.html was sent to cities,

counties and consultants reminding them that gyratory mix design is required on all State Aid projects in 2010.

Plan reviews for construction projects show that gyratory designed mixes are being specified; however, additional guidance is warranted to ensure that the correct gyratory mix and PG (performance graded) binder are specified for the application.

Purpose(s)

There are three main purposes of this memo: First, following established best design practices will ensure that public funds are spent as efficiently as possible. Second, is to provide designers with information regarding the appropriate choice of bituminous mixture(s) and asphalt binder grade(s) to specify on projects. Third, is to reduce bituminous specification ambiguities for contractors bidding on State Aid and Federal Aid projects.

Guidelines

To further standardize bituminous pavement specifications, all State Aid (including Federal Aid) projects should follow the most current criteria for design and PG binder selection. At the present time, the most current documents are: "Design Criteria 2360" dated January 2008 and "MnDOT PG Binder Guidelines" dated December 2007. Both of these publications can be found at the MnDOT Bituminous Engineering; Documents and Aids webpage.

Typically each year in January, the MnDOT Bituminous Unit prepares a memo which contains recent specification changes and reminders. Please see the "2010 Bituminous Specification - Updates" at the State Aid Construction webpage for this information and for the most current 2360 specification information before starting your bituminous pavement design.

The following is a list of items that designers should watch closely to ensure these items are correct in the plan.

1. Superpave (gyratory design) considers the top 4 inches (top 3" for local agencies with traffic levels < 3 million ESAL's) to be wear. Bituminous mixture placed below the top 4 inches or (top 3" for local agencies with traffic levels < 3 million ESAL's) is considered nonwear.
2. A PGxx-34°C should be specified in the top four inches (top 3" for local agencies with traffic levels < 3 million ESAL's) for new construction, reclaiming and cold in-place recycling projects. Pavement Management data shows that thermal cracking may be reduced up to 90% when a PGxx-34°C is used in the top four inches of the pavement structure. Reduced thermal cracking should lead to longer pavement life.
3. Do not specify a PGxx-34°C below four inches (top 3" for local agencies with < 3 million ESAL's) in the pavement structure. Typically, specify a PGxx-28°C below

4" (top 3" for local agencies with traffic levels < 3 million ESAL's) in the pavement structure. Research at MnRoad has shown that the pavement typically does not reach temperatures below -28 Celsius at these depths. The use of a more expensive asphalt binder below these depths is usually not warranted.

4. Be careful when specifying the aggregate size (A,B,C,D). Aggregate sizes **A** and **B** are specified most often. Aggregate size "A" is ½" minus and aggregate size "B" is ¾" minus. Aggregate size **B** seems to be the aggregate specified most often and will accommodate RAP more readily than aggregate size **A**. See specification 2360.1A3 **Mixture Designations** for further clarification.
5. Be careful when specifying air voids in the mixture. A nonwear mixture will always have 3.0% air voids (SPNWXX30X). Mainline wear mixtures have 4.0 % air voids and shoulder wear will have 3.0% air voids.
6. Use maximum density for bituminous compaction on the mainline of County State Aid Highways. Achieving the required density is essential to constructing longer lasting pavements. Do not write-out the ride specification as we do not want to sacrifice ride for density. We desire well compacted roads with good ride quality.

Ordinary compaction should be limited to layers identified in the typical sections with a minimum planned thickness of less than 1 ½ inches, thin lift leveling, wedging layers, patching layers, driveways and areas that cannot be compacted with standard highway construction equipment. See specification 2360.6C **Ordinary Compaction Method** for further information.

7. Bikeway trail mixture designation should be **SPWEB230B**. See the Bicycle Path Design State Aid web page for additional guidance.
8. Recycled asphalt pavement (RAP) shall be used in the nonwear courses of bituminous mixtures and is encouraged in the wear courses.
9. Warm mix asphalt use is permissible on both Federal Aid and State Aid projects provided that the requirements of the 2360 specification are met. There may be economical and environmental incentives to use this type of asphalt.

Rules of Thumb

- Minimize the number of mixtures and PG grades on any one project. Typically, it is not economical to specify another bituminous mixture less than 2000 tons.
- The top 4 inches (3" for local agencies with traffic levels < 3 million ESAL's) of bituminous mixture should have the same PG grade. Typically in the top four inches, (3" for local agencies with traffic levels < 3 million ESAL's) specify PG xx-34°C for new construction, reclaiming, and cold in-place recycling.

- Bituminous mixture below 4 inches from the surface (3" for local agencies with traffic levels < 3 million ESAL's) should be the same PG grade. Typically, specify PG 58-28°C.

Questions

For special or unique design considerations, please contact your District State Aid Engineer for guidance.

For information on the technical contents of this memorandum, please contact either John Garrity, Bituminous Engineer (651) 366-5577, or Joe Thomas, State Aid Project Engineer (651) 366-3831.

A link to all active and historic State Aid for Local Transportation Technical Memoranda can be found at:

http://www.dot.state.mn.us/stateaid/sa_tech_memos.html

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