# **Memorandum 2007**

# **Date:** Monday, June 11, 2007

**To:** Alexander/Carlson

**From:** Region 3 Materials

**Subject:** Materials Information

**STA 092A-018, Austin to Hotchkiss Corridor S/A: 14934**

**The materials recommendations for the above named project are as follows**:

18kESAL: 1,200,000

Environmental: Moderate

Design: 20 Years

PSI Loss: 2

Reliability: 80

Evaluation: Component Analysis Date: Monday, June 11, 2007

Result: R Value = 5 SN: 4.42

HBP Acceptance by: Gradations-Asphalt Content-Density

Estimated AC Content (from gyration historical data, adjusted for design Air Voids minus 1%): 6.2%

**Preliminary: 6/11/2007**

MP 6.8 to 21.8, Minor Widening

**Project Description:**

The project will consist of a minor widening/ reconstruct with changes to the horizontal and vertical alignments starting at milepost 6.8 and proceeding east to milepost 21.8.

**Background:**

Construction on this corridor started in 1938 and continued through 1946 to construct the initial 26 foot wide roadway with 6 inches of compacted base course surfacing on 6 to 12 inches of select material. Due to a lack of project files the next project found was in 1970 which was a 1 1/2" HMA overlay. Then in 1981 a single application chipseal was placed. Finally in 1997 a 2-inch HMA overlay was placed on the road to provide the current driving surface.

**Geotechnical Database:**

A soil survey was performed on this project. Drilling data was obtained at half mile intervals and selected locations in alternating lanes for the entire length of the project. Drilling records indicate that the asphalt thickness ranged from 5 to 8-inches averaging 6.5", and base course thickness ranged from 6" to 8" averaging 6.5".

**Subgrade and Embankment Design:**

Testing on the existing subgrade material indicates low R-value silt and clay consistently throughout the corridor. The subgrade material consisted of sandy clay (A-6) and silty clay (A-7); therefore a minimum subgrade R-value of 5 was used in the component analysis in determining the structural thickness for the design. We should also require that all imported embankment material meet R-value = 40 to prevent the Contractor from importing clay (there would probably be little or no cost difference).

The design template should allow the base and subbase layers to extend continuous outside of the edge of oil to intersect the ground surface in the Z-slope. This will allow the groundwater water to drain freely away from the roadway template (please reference the CDOT 2005 Roadway Design Guide Figure 4-5 Typical Section). By extending the base and subbase material into the Z-slope will undoubtedly increase the quantities of aggregate base course material for subbase and base; however it will improve long-term performance of the roadway structure and more than offset the additional initial cost.

**Pavement Design:**

Considering the poor profile grade and condition of the pavement it is recommended to rubblize the existing pavement with an HMA reclaimer to a 1 inch maximum nominal size. This rubblized material shall act as the subbase (Class 1) material to provide structural stability to the roadway, therefore the rubblized material is to be processed and remain in place where the new alignment will allow. Additional shaping or repair of any soft spots may occur prior to placing the 6" of ABC Class 6 and 5" of HMA. In areas where the horizontal and vertical alignments change from the existing alignment due to changes in curve radius or sight distance, then the reconstruction section should be used. The reconstruction template will include 14" of ABC Class 1, 6" of ABC Class 6, and 5" of HMA. PG 64-28 shall be used for the top 2-inches and PG 58-28 for the remaining 3-inch bottom lift. The "-28" temperature range is required to reduce low temperature cracking. The "64" is required to prevent rutting in the summer.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Widening & | Over |  |
|  | SC | Reconstruction | Rubblized Pavement |  |
| Concrete |  |  |  |  |
| HMA Gr. SX | .44 | 5" | 5" |  |
| ABC Cl. 6 | .12 | 6" | 6" |  |
| ABC Cl. 1 | .11 | 14" |  |  |

Other Region Materials recommendations:

Class 2 Field Lab.

Moisture density control for this project shall be AASHTO T99 full depth of all embankments and 6 inches in bases of cuts and fills.

Sulfate resistant concrete for this project shall be: Class 2.

Smoothness for HMA pavement for this project shall be: HRI Category II.

cc: Resident Engineer Program Revision: 5-3-07, rrg

file

Note

The following revisions should be included in the plans for STA 092A-018, Austin to Hotchkiss Corridor. If the revisions marked with“#” are necessary, they should be modified as noted and included.

#Revision of Section 304 AGGREGATE BASE COURSE

Base Course: Class 6, R-value 78

Subbase: Class 1, R-value 70

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

REVISION OF SECTION 403

HOT MIX ASPHALT (GRADING SX) (75)

Section 403 of the Standard Specifications is hereby revised for this project as follows:

Subsection 403.02 shall include the following:

The design mix for hot mix asphalt shall conform to the following:

TABLE 403-1

VALUE FOR

PROPERTY TEST METHOD GRADING

SX (75)

Air Voids, percent at N (des) CPL 5115 3.5-4.5

Lab Compaction (Revolutions) N (des) CPL 5115 75

Stability, minimum CPL 5106 28

Aggregate retained on the No. 4 sieve with at least

2 Mechanically Induced fractured faces, % minimum CP 45 70

Accelerated Moisture Susceptibility Tensile

Strength Ratio (Lottman), minimum CPL 5109 80

Method B

Minimum Dry Split Tensile Strength, psi (kPa) CPL 5109 30 (205)

Method B

Grade of Asphalt Cement, Top Layer PG 64-28

Grade of Asphalt Cement, Layers Below Top PG 58-28

Voids in the Mineral Aggregate (VMA), % min CP 48 See TABLE 403-2

Voids Filled with Asphalt (VFA), % AI MS-2 65-80

Dust to Asphalt Ratio Fine Gradation CP-50 0.6 — 1.2

Coarse Gradation CP-50 0.8 — 1.6

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Note: AI MS-2 = Asphalt Institute Manual Series 2

Note: The current version of CPL 5115 is available from the Region Materials Engineer

Note: Mixes with gradations having less than 40% passing the No. 4 sieve shall be approached with caution because of constructability problems.

Note: Gradations for mixes with a nominal maximum aggregate size of one-inch or larger are considered a coarse gradation if they pass below the maximum density line at the #4 screen.

Gradations for mixes with a nominal maximum aggregate size of ¾ inch or smaller are considered a coarse gradation if they pass below the maximum density line at the #8 screen.

All mix designs shall be run with a gyratory compaction angle of 1.25 degrees and properties must satisfy Table 403-1. CDOT Form #43 will establish construction targets for Asphalt Cement and all mix properties at Air Voids up to 1.0% below the mix design optimum.

REVISION OF SECTION 403

HOT MIX ASPHALT (GRADING SX) (75)

-2-

TABLE 403-2

Minimum Voids in the Mineral Aggregate (VMA)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nominal Maximum  Size \*  Inches (mm) | | \*\*\*Design Air Voids \*\* | | |
| 3.5% | 4.0% | 4.5% |
| 1 1/2 | (37.5) | 11.6 | 11.7 | 11.8 |
| 1 | (25.0) | 12.6 | 12.7 | 12.8 |
| 3/4 | (19.0) | 13.6 | 13.7 | 13.8 |
| 1/2 | (12.5) | 14.6 | 14.7 | 14.8 |
| 3/8 | (9.5) | 15.6 | 15.7 | 15.8 |

\* The nominal size is defined as one sieve larger than the first sieve to retain more than 10%

\*\* Interpolate specified VMA values for design air voids between those listed.

\*\*\* Extrapolate specified VMA values for production air voids beyond those listed.

The Contractor shall prepare a quality control plan outlining the steps taken to minimize segregation of HMA. This plan shall be submitted to the Engineer and approved prior to beginning the paving operations. When the Engineer determines that segregation is unacceptable, the paving shall stop and the cause of segregation shall be corrected before paving operations will be allowed to resume.

A minimum of one percent hydrated lime by mass (weight) of the combined aggregate shall be added to the aggregate for all hot mix asphalt.

Acceptance samples shall be taken at the location specified in either Method B or C of CP 41, as determined by the Region Construction and Materials personnel.

The hot bituminous pavement shall not contain any reclaimed asphalt pavement.

In Subsection 403.05 delete the third paragraph and replace with the following:

Aggregate, asphalt recycling agent, additives, hydrated lime, and all other work necessary to complete each Hot Mix Asphalt item will not be paid for separately but shall be included in the unit price bid. Asphalt cement will be measured and paid for separately in accordance with Section 411 except that asphalt cement used in Hot Mix Asphalt (Patching) will not be measured and paid for separately, but shall be included in the work.