June 23, 2020

Mr. Harold Mullen  
Executive Vice President  
Texas Asphalt Pavement Association, TxAAPA  
P.O. Box 1468  
Buda, TX 78610

Dear Mr. Mullen:

The Texas Department of Transportation (TxDOT) Specification Committee appreciates TXAPA’s comments. In response to comments provided in your letter dated May 13, 2020, we offer the following:

Tex-244-F “Thermal Profile of Hot Mix Asphalt,” (Spec Committee No. Tex-244-F-20202-9)

**TXAPA Comment:** Figure 1: The location of the Paver looks like it’s on the wrong side of the figure. It appears that we should be taking thermal profiles before the paver hits the mat???

**TxDOT Response:** For safety reasons, we encourage that the pavement markings be applied ahead of the paver. This is the intent of the drawing proposed. This also allows the technician to know when to record the maximum baseline temperature and when to switch the camera to cold spot to observe the temperatures to see if any are below the minimum allowable temperature. We have modified Figure 1 to clarify the intent of this drawing.

**TXAPA Comment:** Can reference to wood be changed to wood or metal?

**TxDOT Response:** We propose to remove the 2-ft. offset from the thermal profile when using the thermal camera as shown in Figure 1. Because of this change, the wooden board would not be needed.

**TXAPA Comment:** Can string be listed as optional?

**TxDOT Response:** We propose to remove the 2-ft. offset from the thermal profile when using the thermal camera as shown in Figure 1. Because of this change, the string and wooden board would not be needed.

**TXAPA Comment:** Note 8 & Figure 5 are misleading. The example is displayed for what can be assumed to be a 12’ wide mat, wouldn’t this “top left corner” be misleading at the required pixel & distance settings for a mat that is not 12’ wide?

**TxDOT Response:** Since the 2-ft. offset is proposed to be removed, the entire pavement surface is now part of the analysis. The clearance as defined in Figure 5 (now Figure 3 in the modified procedure) is necessary because it creates the contrast needed to view thermally segregated areas. Since we observe the temperatures parallel to the placement of the pavement and determine the temperature differential, the effect of the pixel and distance settings should be the same.
TXAPA Comment: Recommend modifying, to taking images that remove 2’ from either edge of the mat to be used for determining temperatures.

**TxDOT Response:** We propose to remove the 2-ft. offset from the thermal profile.

TXAPA Comment: Article 3.6.13: recommend removing, is the string and angle reset necessary?

**TxDOT Response:** Because we propose to remove the 2-ft. offset from the thermal profile, this is no longer necessary because the string and wooden board would be removed from the procedure.

TXAPA Comment: Article 3.6.16: recommend adding an equation as opposed to detailing the calculation in the Verbiage.

**TxDOT Response:** Please provide us an example of the calculation being proposed.

TXAPA Comment: Articles 3.6.19 to 3.6.20 (and all notes): recommend to not base thermal segregation on color but based on the temperature readings. There could be ambiguity on the ranges that the camera will assign colors to (and in my particular case, would this preclude me from performing thermal profiles with color blindness?)

**TxDOT Response:** We added the verbiage to view temperatures in the top left corner of the screen.

TXAPA Comment: Article 3.6.19: recommend including equations for moderate & severe thermal segregation as opposed to describing calculation in the verbiage.

**TxDOT Response:** Please provide us an example of the calculation being proposed.

TXAPA Comment: Figure 8: top left-hand image – I don’t see blue in that image, why is it being identified as having thermal segregation if there’s no blue?

**TxDOT Response:** This is an example of moderate thermal segregation. Blue is typically associated with severe thermal segregation.

TXAPA Comment: Article 3.6.25.1 – 3.6.25.3: this is redundant with article 3.6.19 - 3.6.22, can we just reference instead of restating?

**TxDOT Response:** We agree and the change was made.

TXAPA Comment: Article 3.6.25.4: What does “ensure the screed heaters did not overheat the mat” mean? Does this mean ensure the screed heaters do not cause the mix to exceed the maximum production temperature requirements?

**TxDOT Response:** We have clarified to ensure the screed heaters did not overheat the mat by referencing the maximum production temperatures in the specification.

TXAPA Comment: Note 33: is this applicable to thermal cameras or just thermal imaging systems? If it’s applicable to thermal cameras how do, we determine the statistical 1% and 98.5% values when making baseline temperature measurements?

**TxDOT Response:** Only applies to the thermal imaging system as corrected in Note 33.

TXAPA Comment: Line 2.2.1 Specify the minimum temperature to be 0 Deg. F

**Comment:** Most camera are capable of 32 Def F and AASHTO PP 80 Specify 32 F to be minimum. (See table 1 on the attached AASHTO PP 80 – 18)

**TxDOT Response:** We agree and this change was made.
**TXAPA Comment:** Line 3.2 and 3.7.4.1 – Using a Base Line Temperature as the max temperature for each thermal profile to determine Segregation Categories, where the Base Line Temperature is determined in the first 20 Ft. for each profile.

Comment: This part of the specification falls under Analysis and would require a change to the Analysis Programming. Since no other State uses this method, it would require each Manufacturer to manage a software specifically for Texas. As we discuss in our previous meetings, PMTP Manufacturers are usually Equipment Manufacturers and their Business models are not designed to manage Analysis and Reports for individual entities. As such we rather Provide the Data measured by our Systems to the User and let the User determine what Analysis and Reports are required. In this case we provide the Data in a format that could be upload to a common Software (Veta) managed by Several States (Transportation Pooled Fund States). Each State uses the Veta Software to perform Analysis and Reports based on their Specification. (See attached AASHTO PP 80-18 Section 5.2.2.1 and Table X5.1).

Also, like Equipment Manufacturers, it would be less of a challenge of contractors to follow a National Standard and a common system of analysis for all of the Intelligent Construction Technologies such as IC, PMTP etc. where the Equipment used could be sourced from several Manufacturers.

The Veta Software used by all of the States that specifies the use of a PMTP system meet all of Tex-244-F specification from an analysis standpoint with the exception of using a Base Line Temperature (Max at the first 20') to determine Thermal Segregation Categories. Veta uses a Max Temperature that is determined based on measurements taken over the entire 150’ of a thermal profile to determine Thermal Segregation Categories.

The Handheld Camera method is old technology and will eventually evade and replace with PMTP, as such you should consider removing the Handheld Camera Specification from Tex-244-F.

On a personal note, based on my experience, most severe thermal segregation typical occur due to end of load or end of hopper Insert. This will be excluded if it occurs within the last 130’ of the profile, since the Max Temp (Base Line) used to determine Segregation Categories are taken only in the first 20 Ft.

**TxDOT Response:** We agree. We have updated Figure 8 and have removed the 2-ft. offset.

**TXAPA Comment:** Line 3.7.5 Report

Comment: Same as above we rather provide the Data to the User via Veta (Cloud Upload or via a Jump Drive) and let the user execute Report as specified. The Veta Software provides a report with all of the Data shown on your EXL Spread sheet but in a different format.

**TxDOT Response:** We have adjusted the language to allow third party software to analyze the data. We can also change the template to include the format when this test procedure becomes effective.

Please provide additional comments within 30 days from the receipt of this letter. If your comments are not received, we will proceed with the final processing of the proposed special specifications.

If you have any questions, please contact me at 512-506-5808.
Mr. Harold Mullen

Sincerely,

Jere A. Williams, P.E.
Interim Director, Materials and Tests Division

Attachments

cc: Ryan Barborak, P.E., TxDOT
    Chuck Fuller TXAPA
    Corey Schwarz, TXAPA