Alaska Test Method 422 - Calibration of PaveScan RDM Using Drilled Cores

A. Percent Compaction Calibration of PaveScan RDM using Drilled Cores

General:
Perform a separate calibration for each asphalt mix type specified for Compaction Acceptance using the PaveScan Rolling Density Meter (RDM) ground penetrating radar (GPR) system on a given project. Minimum acceptable correlation coefficient (R^2) shall be 0.90 for calibration of PaveScan RDM dielectric readings to percent compaction determined by dividing bulk specific gravity by maximum specific gravity (MSG) and multiplying that decimal fraction by 100. Determine drilled core bulk specific gravity values in accordance with Alaska Test Method 421 (ATM 421), Bulk Specific Gravity and Density of Compacted Asphalt Mixtures using Automatic Vacuum Sealing Method, (Based on AASHTO T 331 and ASTM D6752). Determine maximum asphalt specific gravity in accordance with ATM 409, Theoretical Maximum Specific Gravity of Hot Mix Asphalt, (Based on AASHTO T 209 and ASTM D2041). Obtain a representative sample of the loose paving mixture from within the calibration area for determination of MSG, in accordance with ATM 402, Sampling Bituminous Mixes, (Based on AASHTO T 168). PaveScan RDM software also allows calibration of dielectric readings compared to percent voids or density in either English or SI units.

Procedure:

1. Scan a lane length of 200-1200 feet (or about 60-400 m) of pavement, or more, to obtain a representative sample of dielectric readings.
   (*NOTE*: A single pass down the middle of a 12-feet-wide lane with antennas spaced at 2.75 feet (0.84 m) apart may be representative, but two passes of the PaveScan are typically used for full coverage of a 12 feet (3.7 m) wide lane with sensors space 2 feet (0.6 m) apart and providing 6 feet (1.85 m) of coverage width per pass. Wider lanes may be mapped with additional passes.)

2. After the lane segment has been mapped, go to the "**Main menu**" and select "**Playback.**" Enter project name in the Playback menu, then select "**Range Options**". The collected range of data will be displayed by start and end stations.

3. Enter the start and end stations of the desired calibration interval and select "**Playback.**"

4. Select "**Statistics**," then sort Max column from largest to smallest by touching "**Max**" in the column header. Record this value in the field book. Next, sort Min column from smallest to largest by touching "**Min**" in the column header. Record this value in the field book and subtract to obtain the data spread.
   (*NOTE:* If the difference between Max and Min dielectric values for the segment is less than approximately 0.8, then the segment length may be too short and more lane length

may need to be scanned to get adequate variation for a valid calibration. If the difference between Max and Min dielectric values for the segment is greater than approximately 0.8 then the segment length is adequate for a valid calibration.)

5. Select core locations, using the pulldown menu. (Core locations may be selected in multiples of 3 up to 21.)

6. Select **21** for the number of cores. Seven (7) High, seven (7) Low, and seven (7) Mid dielectric locations will be selected from that file with each located by station and offset as well as GPS coordinates.

7. Sort the core locations in station order using the "**Sort**" feature. Record the station location and dielectric data for each of these 21 locations in your field book in station order from your current position. Subtract adjacent station locations and record the distance from your starting point to the first core location and then to each subsequent location.

8. Using the "**Collect Distance**" mode, measure the exact distance back to the first coring location and place a mark on the pavement at this point. Then use the active dielectric measurement to precisely find a location with a dielectric value within ±0.10 of the target value generated by the Core Location algorithm. If no consistent (for 2-4 ft or 0.6-1.2 m) dielectric reading is found within 6' (2 m) of the location then return to the mark placed on the pavement and again use "**Collect Distance**" mode to measure the distance to the next core location. When a dielectric match has been located in this manner, mark the core location in the center of the matching region with a 6"(15 cm) diameter template using either a lumber crayon or spray paint. Number cores in sequential order.

9. Select "**Collect Data**" to go to the Collect menu. Enter the core number. With antenna centered on core location, select "**Collect Time**" and collect data for about 15-20 seconds, then select "**Stop**" and "**Save**" to record the data.

10. While still centered on the core location, select "**Collect Core**". Enter the core number and then select "**Add Mark**". This will activate a new feature that will use the Digital Measuring Instrument to "talk" you through the Collect Core Distance procedure.
    (*NOTE:* Collect Core feature is programmed to work off the digital measuring instrument that is connected to one of the cart wheels and shuts off automatically when travel across the core covers the programmed distance of 4 feet or about 1.2 m) After pressing "**Add Mark**" you will be prompted to back up 2 feet and the DMI will tell you, "**Stop!**" when you have gone that distance. After you stop, a "**Collect Distance**" button will appear. Select that button and walk directly across the core location until the "**Distance Completed**" prompt appears. The core distance file will be automatically saved for that core. Since the DMI knows where the center of the core is located, the PaveScan can find average dielectric for the center 6", 12", 24", or full 48" across the core, allowing the operator to parse the data and look for better correlation if needed. The default value will be the average or median of the full 4 feet.)

11. Allow contractor to take any non-destructive test (NDT) readings needed for calibration of contractor's quality control testing equipment at the same core location.

12. On completion of non-destructive data collection from the calibration section, obtain core samples using ATM 413 (AASHTO R 67). Take care to center core barrel inside marked circle that indicates test location. Record core number and mark number on the core clearly with a paint pen or other permanent marking system. Continue NDT data collection followed by obtaining cores in the remaining calibration section until all calibration cores are collected.

13. Determine bulk specific gravity of cores by ATM 421 (AASHTO T331), Bulk Specific Gravity by CoreLok Vacuum Sealing Method.

14. Calculate percent compaction for each calibration core by dividing Bulk SpG by Theoretical MSG and then multiplying by 100.

15. Enter the percent compaction data for each core in the data table under the "**Collect Core**" menu. Select "**Calculate Calibration**" after all percent Compaction data has been entered. PaveScan will calculate and display both the exponential and linear equations and R^2 Values.

B. Daily Calibration of Dielectric Reading Consistency among Antennas

Calibrate PaveScan RDM System per manufacturer's instructions at the start of each day or shift of paving to synchronize antenna readings.

C. Daily Antenna Verification Procedure

Verify consistency between PaveScan RDM System antennas with the 5 line antenna verification procedure, Alaska Test Method (ATM) 423 at the start and end of each day or to assure validity of data for that shift of paving.