

# TEX-244-F

Thermal Profile of Hot Mix Asphalt



## Why

Identify thermal segregation of the uncompacted mat.

***Thermal segregation is large temperature differences within the mat before roadway compaction. The mat will have cold spots with areas of low density/high air voids.***



## When

### Behind the Paver Before Roller Compaction

1. Engineer one per project.
2. Contractor one per subplot.



## How

### Equipment

1. Hand-held thermal camera
2. Distance measuring wheel
3. Piece of wood two feet in length and 2-4 inches in width with string attached to an end
4. Marking paint of bright and noticeable color

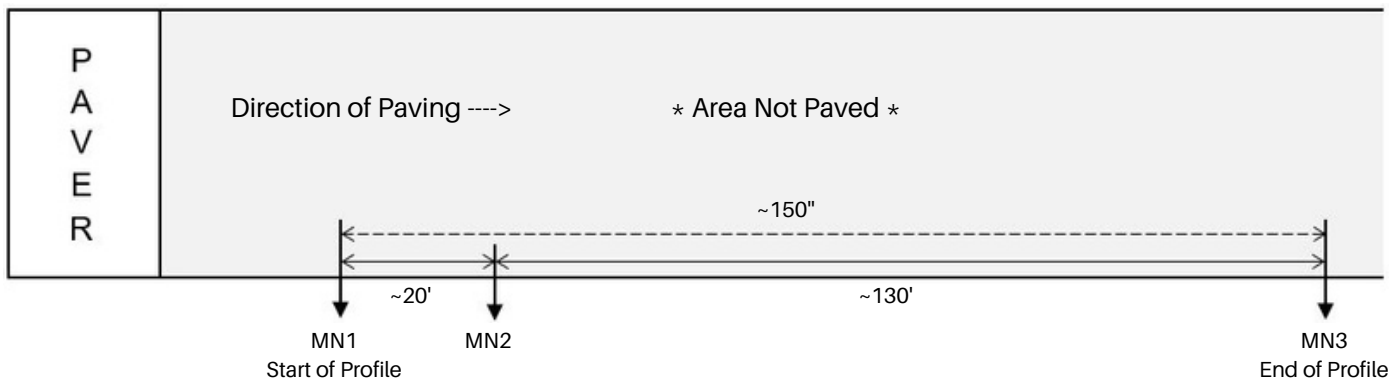


### Setting Up Thermal Profile

1. In front of the paver at a random location, mark outside of the pavement edge with marker numbers.
  - o MN1 - Start of the profile.
  - o MN2 - Approximately 20 feet from MN1.
  - o MN3 - Approximately 130 feet from MN2.
  - o Total profile length is approximately 150 feet.
2. Record the beginning and ending station numbers.

### Camera Settings

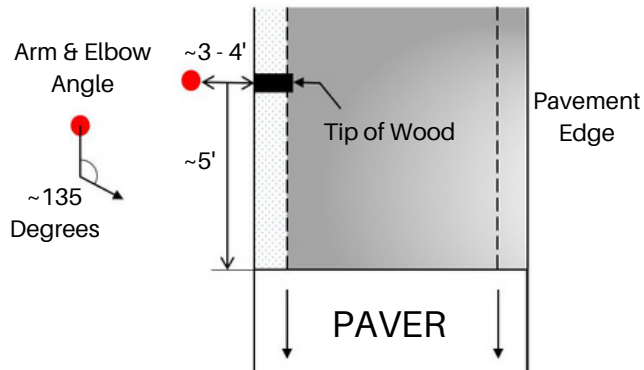
Emissivity = 1.00  
 Reflected Temperature = 68°F  
 Distance Unit = 10 feet  
 Temperature Unit = °F  
 Set Correct Date and Time  
 Color = Rainbow  
 Hot or Cold Spot



## QUICK FACTS: LEVEL 1B

### Camera Image & Setup

1. Turn camera on and check/adjust settings.
2. Profile area between MN1 and MN2 in hot spot.
3. After paver passes MN1, place the piece of wood with string attached near the pavement edge extending into the new mat.
4. Stand 3-4 feet from the new mat with arm bent at approximately 135 degrees in downward direction.
5. Establish view of measurement in the camera from tip of piece of wood to far pavement edge.
6. Exclude two feet from far pavement edge.

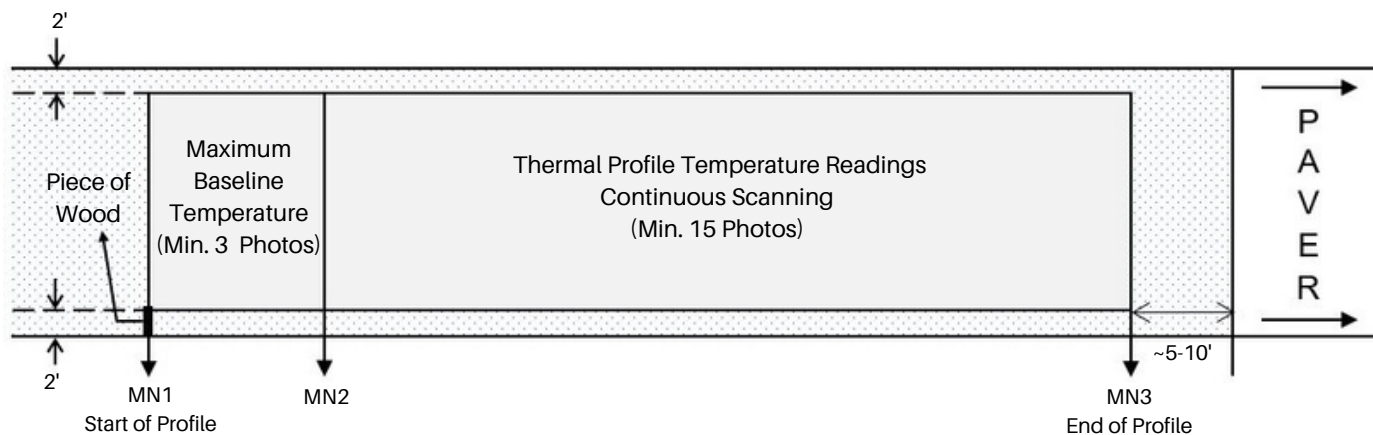


### Maximum Baseline Temperature

1. Establish the maximum baseline temperature from MN1 to MN2.
2. If the paver stops for more than 60 sec. between MN1 and MN2, reset and perform thermal profile again.
3. After the paver passes MN1 and there's approximately five feet of distance behind it, start walking.
4. Walk to MN2 at the speed of the paver while looking at the camera screen.
5. Maintain the same distance from the pavement edge and the same arm/elbow angle.
6. Walk 5-20 feet behind the paver.
7. Take a minimum of 3 photos while walking.
8. Record the maximum temperature from top left corner of screen.

### Profile Measurements

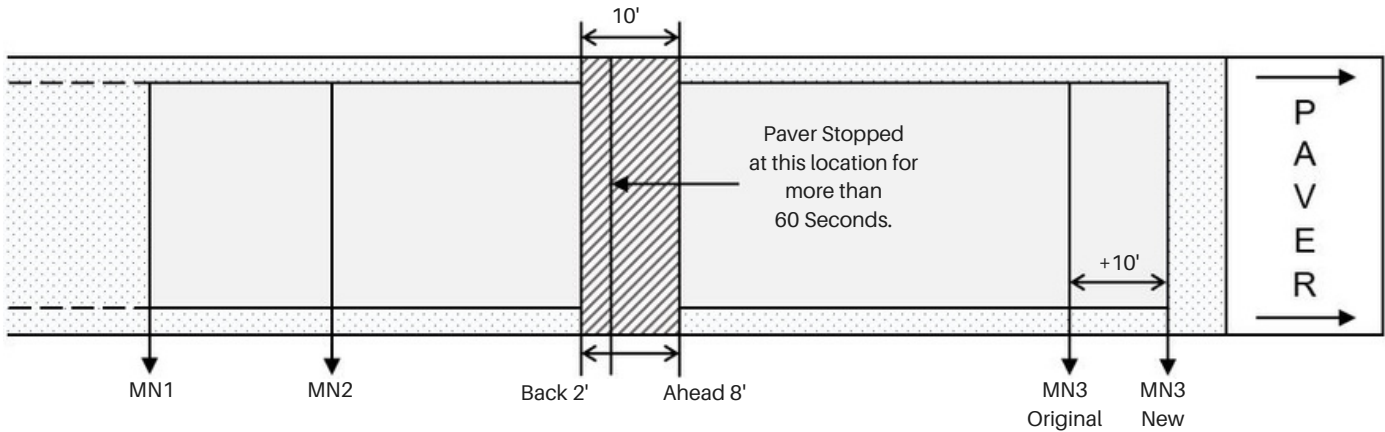
1. Measure profile temperatures from MN2 to MN3.
2. Before reaching MN2, change the camera to cold spot.
3. Subtract 25°F from maximum baseline temperature to determine the lowest allowable minimum temperature.
4. Walk to MN3 at the speed of the paver while looking at the camera screen.
5. Maintain the same distance from the pavement edge and the same arm/elbow angle.
6. Observe the minimum temperature in top left corner and look for any abrupt color changes.
7. When temperature is below the allowable minimum, mark the pavement edge.
8. Take a minimum of 15 photos while walking.



## QUICK FACTS: LEVEL 1B

### Paver Stops

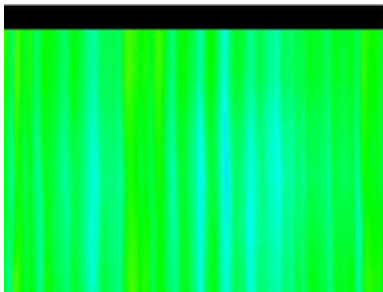
1. When the paver stops for more than 60 seconds, do not profile two feet behind and eight feet in front of the paver.
2. Exclude this ten foot area from the profile.
3. Add ten feet to the length of the overall profile.
4. The profile length will change from 150 feet to 160 feet.
5. Use thermal camera to ensure screed heaters do not overheat the mat after the paver continues to move.



### Action

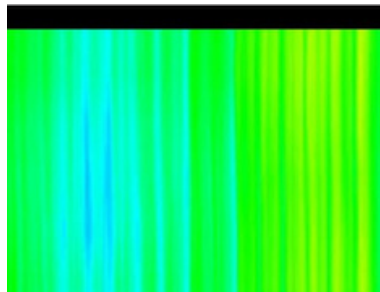
### Specifications

- **No thermal segregation** = Subtract the lowest profile temperature (MN2 to MN3) from the maximum baseline temperature (MN1 to MN2). *Temperature differential must be less than 25°F.*
- **Moderate thermal segregation** = Subtract the lowest profile temperature (MN2 to MN3) from the maximum baseline temperature (MN1 to MN2). *Temperature differential is between 25.1 to 50°F.*
- **Severe thermal segregation** = Subtract the lowest profile temperature (MN2 to MN3) from the maximum baseline temperature (MN1 to MN2). *Temperature differential is more than 50°F.*



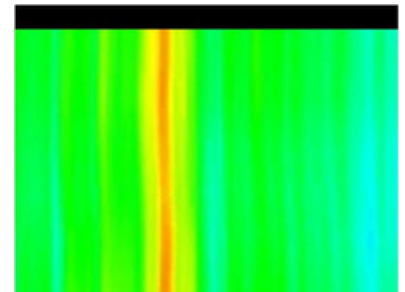
Temperature Difference  
0 - 25.0°F

**No Thermal Segregation**



Temperature Difference  
25.1 to 50.0°F

**Moderate Thermal Segregation**



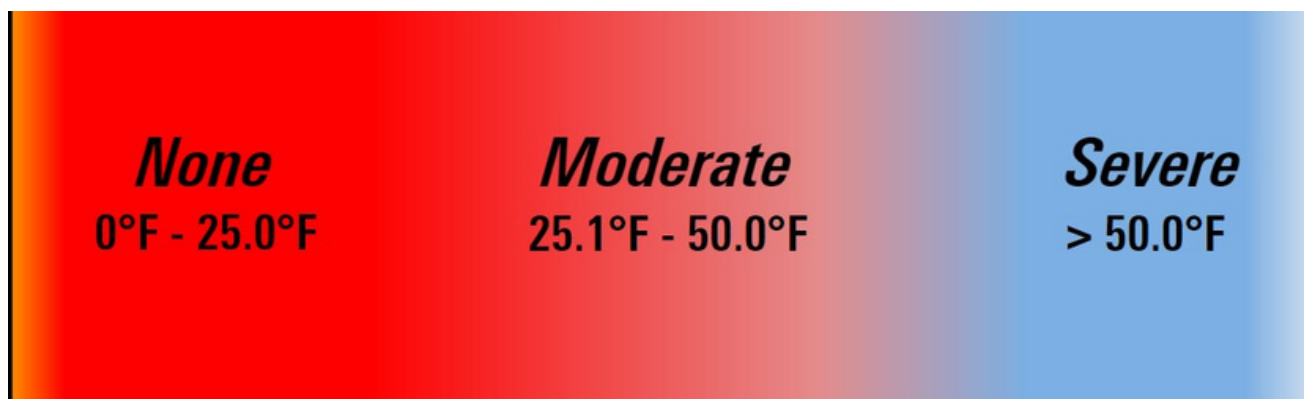
Temperature Difference  
>50.0°F

**Severe Thermal Segregation**

## QUICK FACTS: LEVEL 1B

### Requirements & Recommendations

- **No thermal segregation**
  - Report test results and continue with placement.
  - No further action required.
- **Moderate Thermal Segregation**
  - Take immediate corrective action.
  - Perform density profile Tex-207-F, Part V through the area with the moderate thermal segregation.
- **Severe Thermal Segregation**
  - Suspend operations.
  - Take immediate corrective action.
  - Perform density profile Tex-207-F, Part V through the area with severe thermal segregation.
  - Remove and replace material in any areas that have both severe thermal segregation and a failing density profile.



- **Immediate corrective action may include but not be limited to the following:**
  - Communicate the failing test results with the Contractor or Superintendent as soon as possible.
  - Ensure there is enough material in the hopper of the paver.
  - If using belly dump trucks, ensure the windrows are overlapped.
  - Do not dump the wings of the hopper during placement.
  - Slow the speed of the paver.