
Standard Method of Test for

Prediction of Asphalt-Bound Pavement Layer Temperatures

AASHTO Designation: T 317-04 (2022)¹

Technically Revised: 2004

Reviewed but Not Updated: 2022

Editorially Revised: 2021

Technical Subcommittee: 5a, Pavement Measurement



**American Association of State Highway and Transportation Officials
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1. SCOPE

- 1.1. This test method provides a standard for measuring pavement surface temperature and predicting temperatures within the asphalt-bound layer(s) of a flexible pavement section. This test method provides a means of estimating the temperature at depth from the pavement surface temperature, the time of day, the previous day's high and low air temperatures, and the desired depth at which the temperature is to be estimated.
- 1.2. Deflection testing commonly involves the measurement of the pavement surface temperatures. This standard is based on temperature relationships developed as part of the Federal Highway Administration (FHWA) Long-Term Pavement Performance (LTPP) Seasonal Monitoring Program.
- 1.3. This test method is applicable for temperature predictions on flexible asphalt concrete (AC) and composite asphalt over portland cement concrete (AC/PCC) pavements.
- 1.4. *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
- 1.5. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENTS

- 2.1. AASHTO Standard:
 - R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- 2.2. Federal Highway Administration:
 - Temperature Predictions and Adjustment Factors for Asphalt Pavements, FHWA-RD-98-085, 2000

3. TERMINOLOGY

- 3.1. *Description of Terms Specific to This Standard:*
- 3.1.1. *BELLS*—an acronym based on the initials of the four developers of the method: Baltzer, Ertman-Larsen, Lukanen, and Stubstad.
- 3.1.2. *depth*—the distance below the surface of the top layer of asphalt.
- 3.1.3. *one-day air temperature*—the average of the minimum and maximum air temperatures at the location of testing for the previous 24-h day, °C.

4. SUMMARY OF TEST METHOD

- 4.1. *Input Data Elements:*
- 4.1.1. *Infrared (IR) Temperature*—The exposed surface temperature of an asphalt pavement is measured, preferably with an infrared (IR) temperature-sensing device.
- 4.1.2. *Time of Day*—The time of day the temperature measurement takes place is recorded.
- 4.1.3. *One-Day Air Temperature*—The average of the minimum and maximum air temperatures at the location of testing for the previous 24-h day, °C.
- 4.1.4. *Pavement Depth*—The depth at which an estimate of the asphalt layer temperature that is required is specified.
- 4.2. The input data elements are entered into a regression formula that predicts the temperature within the asphalt pavement at depth.

5. SIGNIFICANCE AND USE

- 5.1. Analysis of deflection data from asphalt pavements almost always requires that the deflections or analysis results be adjusted for the effects of temperature. Measuring the temperature at depth requires that a hole be drilled into the pavement, partially filled with fluid, and the temperature measured with handheld devices. Alternatively, thermistors may be permanently installed at various locations. These processes are time consuming, resulting in a limited number of temperature measurements.
- 5.2. Current deflection testing equipment is often equipped with surface-temperature-sensing devices, for example, an infrared thermometer that measures the surface temperature at every test location. To adequately adjust the deflection or deflection results for the effects of temperature, the temperature at some depth must be known.
- 5.3. Utilization of this method results in a significant savings in time over the conventional practice of manually drilling holes into the pavement, and it results in a significant increase in the volume of temperature data (one pavement temperature for each test point).
- 5.4. The BELLS temperature prediction model was based on temperature measurements made with surface temperature measurements between 0 and 40°C during the unfrozen times of the year.