ALDOT-414-04

NETWORK-LEVEL PAVEMENT CONDITION DATA COLLECTION PROCEDURE

1. Scope

1.1. This method describes the collected data and the quality assurance process for network-level pavement condition data collection.

1.2. The values stated in English units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced documents


2.2. AASHTO PP 38-00 (2003), Standard Practice for Determining Maximum Rut Depth in Asphalt Pavements

2.3. AASHTO R-36(04), Standard Practice for Evaluating Faulting of Concrete Pavements

3. Description of distresses and other data items

3.1. Each distress or data item shall be collected for the entire length of each 0.01-mile (16.1 m) road segment, unless otherwise noted, and reported at 0.01-mile (16.1 m) increments. The CONSULTANT may suggest more cost-efficient data collection procedures for the DEPARTMENT’s consideration.

3.2. Information to be collected for all pavements:

3.2.1. Location information—route type, route, milepost, and direction.

3.2.2. Surface type—flexible or rigid.

3.2.3. Other segment information—Is the 0.01-mile (16.1 m) segment on a bridge (yes/no)? Is the 0.01-mile (16.1 m) segment in a construction zone (yes/no)?

3.2.4. Slope data—The following shall be recorded for a single point at the beginning of each 0.01-mile (16.1 m) segment:

- Cross slope of the pavement lane as a percentage.
- Longitudinal grade of the pavement shown as a percentage.

3.2.5. Global Positioning System (GPS) coordinates—Longitude and latitude shall be recorded for a single point at the beginning of each 0.01-mile (16.1 m) segment.
Elevation data shall be recorded at the same point. For each record, the vertical and horizontal dilution of precision (DOP) and date/time shall be included.

3.2.6. ROW/shoulder images—Color digital images shall be collected at the beginning and midpoint of each 0.01-mile (16.1 m) segment from one or more cameras that show left and right shoulder and ROW. The CONSULTANT will attach distinguishing information to each image specifically identifying highway number, direction, milepost, and date.

3.2.7. Events—The following events on the DEPARTMENT’s highway network shall be marked on the corresponding 0.01-mile (16.1 m) record:

- Every surface change—this event refers to noticeable changes in the age or type of the surface course
- Every railroad crossing
- Every transition from a multilane facility (at least two lanes in each direction) to a single lane facility, or vice versa
- Any time the test vehicle moves out of the specified lane

3.2.8. International Roughness Index (IRI)—Mean ride quality for each 0.01-mile (16.1 m) segment shall be reported separately for the two wheel paths in the survey lane in units of in./mile (m/km). The data shall be Highway Performance Monitoring System (HPMS) compliant as described in the Highway Performance Monitoring System Field Manual.

3.2.9. Transverse cracking—This type of cracking consists of cracks that occur at approximately right angles to the centerline. Transverse cracks shall be categorized as one of the following:

- Severity level 1: Cracks having widths > $\frac{1}{25}$ in. and $\leq \frac{1}{8}$ in. ($> 1$ mm and $\leq 3$ mm).
- Severity level 2: Cracks having widths > $\frac{1}{8}$ in. and $\leq \frac{1}{4}$ in. ($> 3$ mm and $\leq 6$ mm).
- Severity level 3: Cracks having widths > $\frac{1}{4}$ in. ($> 6$ mm).

Transverse cracks shall be rated prior to other cracking, and shall be reported as feet of cracking per 0.01-mile (16.1 m) segment. In order for a crack to be categorized as transverse, a single crack shall be greater than 6 ft (1.8 m) long and project within 30° of perpendicular to the pavement centerline.

3.3. Information to be collected for flexible pavements:

3.3.1. Load associated cracking—This type of cracking consists of any cracks longer than 1 in. found in the wheelpaths as defined in Figure 1 that were not previously identified as transverse cracks. Load associated cracking is categorized as follows:
• Severity level 1: Cracks having widths $>\frac{1}{25}$ in. and $\leq \frac{1}{8}$ in. ($> 1$ mm and $\leq 3$ mm).
• Severity level 2: Cracks having widths $>\frac{1}{8}$ in. and $\leq \frac{1}{4}$ in. ($> 3$ mm and $\leq 6$ mm).
• Severity level 3: Cracks having widths $>\frac{1}{4}$ in. ($> 6$ mm).

Load associated cracking shall be reported as the number of linear feet (linear meters) of road segment containing such cracking. In each 0.01-mile (16.1 m) segment, the maximum length of load associated cracking that shall be reported is 52.8 ft (16.1 m). If load associated cracking is present in both wheelpaths for the same length of road, the higher severity shall be reported.

**FIGURE 1. TYPICAL WHEELPATH DIMENSIONS**

3.3.2. Non-load associated cracking—Non-load associated cracks are those cracks longer than 1 in. in the areas within the lane width not identified as wheelpaths, as described in Figure 1, that were not previously identified as transverse cracks. These may include longitudinal cracks or and interconnected longitudinal and transverse cracks forming a series of polygons. Non-load associated cracking shall be categorized as one of the following:

• Severity level 1: Cracks having widths $>\frac{1}{25}$ in. and $\leq \frac{1}{8}$ in. ($> 1$ mm and $\leq 3$ mm).
• Severity level 2: Cracks having widths $>\frac{1}{8}$ in. and $\leq \frac{1}{4}$ in. ($> 3$ mm and $\leq 6$ mm).
• Severity level 3: Cracks having widths $>\frac{1}{4}$ in. ($> 6$ mm).

Non-load associated cracking shall be reported as the number of linear feet (linear meters) of road segment containing such cracking. In each 0.01-mile (16.1 m) segment, the maximum length of non-load associated cracking that shall be
reported is 52.8 ft (16.1 m). If non-load associated cracking is present in multiple locations for the same length of road, the highest severity shall be reported.

3.3.3. Rutting—Report mean and maximum values for outside wheel path and report mean and maximum values for inside wheel path for each 0.01-mile (16.1 m) segment. Rut depths shall be determined according to AASHTO PP 38-00 (2003). The maximum distance between measurements shall be 0.001 miles (1.61 m).

3.3.4. Raveling—Report instances in which the aggregate and/or binder has worn away and the surface texture is extremely rough and pitted, coded as follows:

- 0 – not present
- 1 – present

3.3.5. Patching—Report instances in which patching exists and is of a condition such that ride quality is affected, coded as follows:

- 0 – not present
- 1 – present

3.3.6. Macrotexture—The mean right wheelpath RMS amplitude of texture for wavelengths from 0.50 mm to 50 mm shall be collected for each 0.01-mile (16.1 m) segment.

3.4. Information to be collected for rigid pavements:

3.4.1. Transverse joint faulting—Report mean and maximum values for each 0.01-mile (16.1 m) segment according to AASHTO R-36(04).

4. Data Quality Requirements

4.1. Pavement condition data—The following table describes the required accuracy and resolution of the collected pavement condition data.

<table>
<thead>
<tr>
<th>DATA ELEMENT</th>
<th>REQUIRED ACCURACY</th>
<th>REQUIRED PRECISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ride quality (IRI)</td>
<td>± 5% compared to Rod &amp; Level, Dipstick, or Class I profiler</td>
<td>1 in./mile (.016 m/km)</td>
</tr>
<tr>
<td>2. Cross slope, superelevation, and grade data</td>
<td>± 0.20 %</td>
<td>0.1%</td>
</tr>
<tr>
<td>3. Load associated cracking</td>
<td>± 10%</td>
<td>0.1 linear ft (30 mm) per 0.01-mile (16.1 m) segment</td>
</tr>
<tr>
<td>4. Non-load associated cracking</td>
<td>± 10%</td>
<td>0.1 linear ft (30 mm) per 0.01-mile (16.1 m) segment</td>
</tr>
<tr>
<td>5. Transverse cracking</td>
<td>± 10%</td>
<td>0.1 linear ft (30 mm) per 0.01-mile (16.1 m) segment</td>
</tr>
<tr>
<td>DATA ELEMENT</td>
<td>REQUIRED ACCURACY</td>
<td>REQUIRED PRECISION</td>
</tr>
<tr>
<td>-------------------------</td>
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</tr>
<tr>
<td>6. Rut depth</td>
<td>± 0.1 in. (±2.5 mm)</td>
<td>0.1 in. (2.5 mm)</td>
</tr>
<tr>
<td>7. Raveling</td>
<td>Identical</td>
<td>present/not present</td>
</tr>
<tr>
<td>8. Patching</td>
<td>Identical</td>
<td>present/not present</td>
</tr>
<tr>
<td>9. Macrotexture</td>
<td>N/A</td>
<td>0.01 in. (0.25 mm)</td>
</tr>
<tr>
<td>10. Transverse joint faulting</td>
<td>± 0.1 in. (±2.5 mm)</td>
<td>0.1 in. (2.5 mm)</td>
</tr>
</tbody>
</table>

All data elements should be repeatable within 5% run-to-run for three repeat runs.

4.2. GPS and elevation data—Latitude and longitude shall be reported in degrees, minutes, and seconds, with seconds recorded to four units after the decimal; elevation data shall be reported in feet. Positional accuracy for latitude and longitude shall not exceed ±10 feet (±3 m).

4.3. ROW/Shoulder images—ROW images shall be taken at sufficient resolution to ensure 10 in. (250 mm) sign lettering is legible at a distance of 15 ft (4.5 m) from the edge of the travel lane while traveling at highway speeds. All exterior cameras shall be capable of collecting images during normally encountered fair weather conditions in Alabama. In addition, camera lens or enclosures shall be cleaned regularly to prevent build up of road debris and insects.

5. Quality Control/Quality Assurance Requirements

5.1. For the purposes of this section, sensor data refers to IRI, rutting, faulting, texture, and grade and cross-slope data. Condition data refers to cracking, raveling and patching.

5.2. Equipment correlation

5.2.1. Sensor correlation sites—The CONSULTANT shall run its test equipment over the DEPARTMENT’s sensor correlation sites prior to data collection. Five to ten sites will be chosen representing various surface textures with specific sites requiring test runs for speed. All sites shall be run a minimum of five times prior to data collection. The average of the results of these data collections shall meet the requirements outlined in Section 4 when compared with DEPARTMENT-collected data.

5.2.2. Condition data sites—The CONSULTANT shall run its test equipment over DEPARTMENT’s condition data test sites prior to data collection. Five to ten sites will be chosen to reflect different pavement variables such as pavement type, age, prevalent distress types, etc. DEPARTMENT personnel will have recently rated these sites for pavement distress. Any sites that do not correlate will be investigated. If differences exist, the DEPARTMENT and the CONSULTANT
will jointly investigate the causes of the differences and agree upon a solution before production testing begins.

5.3. Production

5.3.1. Weekly verification sites—Once per week after production-level data collection has begun, the CONSULTANT shall return to a pavement section that it surveyed the previous week and will re-survey that overlay section for sensor data. The DEPARTMENT and the CONSULTANT will then review the results of the re-survey; the results shall satisfy the accuracy requirements outlined in Section 4. At that time, the CONSULTANT shall supply to the DEPARTMENT the ROW/shoulder images taken in the previous week. The DEPARTMENT will review those images for such parameters as clarity and brightness within one week and inform the CONSULTANT whether the images are acceptable. If the images are not acceptable, the CONSULTANT shall re-acquire the images for the unacceptable pavement sections.

5.3.2. Monthly correlation sites—Once per month, the CONSULTANT shall return to one or more of the sensor correlation sites to confirm that its sensor equipment remains in calibration. The CONSULTANT shall provide the DEPARTMENT with a report of IRI and rutting in the left and right wheel paths in 0.01-mile (16.1 m) increments for each of three runs on each sensor correlation site required.

5.3.3. If the verification or correlation sites’ results are erratic and exceed DEPARTMENT’s quality assurance thresholds, all prior reported data from the previous week will be considered compromised. The DEPARTMENT may refuse to purchase compromised data; however, the DEPARTMENT will purchase re-collected data so as long as subsequent correlation site reports indicate the new data is within the DEPARTMENT’s thresholds.

5.4. Survey vans—If the CONSULTANT wishes to use multiple vans, each van shall be approved after collecting data on the sensor correlation and condition data sites. In addition, the vehicles shall be calibrated to produce sensor measurement differences of 5% or less between vehicles. This demonstration shall be reported in writing to the DEPARTMENT whenever the vehicle first enters the state or returns to the project after leaving the state.