User’s Guide for Pavement Condition Surveys

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USER'S GUIDE FOR PAVEMENT CONDITION SURVEYS

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I. PAVEMENT CONDITION SURVEY

Introduction
The pavement condition survey is a visual inspection of the travelway of a street/road system. The survey provides measures to assess the magnitudes of various types of pavement distress. The rater is not to make evaluations on the basis of known or suspected subsurface conditions. It is necessary the rater only report in an objective manner what is seen. The types of distress include the following:

For Asphaltic Concrete Pavements: Alligator Cracking, Block/Transverse Cracking, Reflective Cracking, Rutting, Raveling, Bleeding, Surface Irregularities (shoving, corrugations, potholes), and Patching/Utility Cuts.

For Portland Cement Concrete Pavements: Blowups, Spalling and Popouts, Map Cracking, Longitudinal Cracking, Transverse Cracking, Diagonal Cracking, Joint Deterioration ("D" cracking, compression failures at joints, etc.), and Faulting (joints and shoulders).

For Unpaved or Aggregate-Surfaced Roads: Rutting, Corrugations, Potholes, Aggregate Loss, Surface Erosion (deficient crown), and Dust Generation.

A computer program is used to analyze distress (condition) data to determine a pavement (road surface) condition rating (PCR). The PCR varies from 0 for total distress to 100 for no distress. Distress types and levels are further related to estimated maintenance strategies and the cost of maintenance and/or rehabilitation needed for each street or road section.

Advantages of a Pavement Condition Survey

There are many advantages of having a pavement or road surface condition survey. Some of these are listed below:

1. The responsible governmental agency will have a complete inventory of all paved streets/roads on the system. This inventory will include such information as length, width, and type of pavement surface; shoulder and curb and gutter information; and block numbers. Additional information such as sidewalks, drainage, last resurfacing, utility information, signs, etc. may be included.

2. The pavement condition survey provides an objective evaluation of the condition of the street/road system. Results of the analysis show the types and amount of each pavement distress, an overall condition rating number, the recommended maintenance or rehabilitation activity, and the estimated cost of repair for each street/road section. A computer printout will provide a listing of each section of street/road alphabetically and by priority from worst to best condition. This information can be used to plan and budget a maintenance and rehabilitation program in a cost-effective manner.
3. The results of a pavement condition survey indicate the overall condition of the street/road system and will give an estimate of the amount of funding needed to preserve that infrastructure. Over time, an updating of the pavement condition survey will indicate whether the street/road system is improving or deteriorating. This information will be useful in planning both short- and long-term budget requirements for pavement maintenance and rehabilitation.

4. The pavement condition survey will assist in prioritizing resurfacing and other maintenance or rehabilitation activities. Management will have a record of distress conditions upon which to base professional decisions.

5. An historical record for each street/road section will be developed, including the last resurfacing date and other maintenance activities performed on a section. This will allow the evaluation of maintenance practices to determine their cost-effectiveness.

6. Streets/roads in very poor structural condition are identified by the pavement condition survey. Generally, these sections would require an engineering study and/or testing to identify the problem and find a proper solution.

7. Computerizing this inventory and distress information allows more flexibility in using the data. The levels of service for maintenance can be varied to see what effect this has on the amount of maintenance needed, and costs are updated easily. Also, information can be reported quickly in many different ways using the computer.

II. TRAINING FOR THE PAVEMENT CONDITION SURVEY

The need for a complete training program for raters prior to conducting the survey cannot be overemphasized. Even though there are comprehensive definitions and guidelines for measuring the pavement distresses, a complete training program is absolutely necessary to obtain uniform results. If uniform results cannot be obtained, the information is of little use. The survey data must be uniform to compare one pavement section to another and to compare one condition survey with another conducted at a later time.

The training is conducted over a 3- to 4-day period for each generic pavement type. Approximately one-half day will be spent in a classroom for instruction on conducting the survey, filling out survey forms, and reviewing the pavement distress definitions and photographs.

Approximately three days will be spent in the field rating preselected sections of street/road. These sections will exhibit the various types of pavement distress. The trainees will rate the street sections until they are able to obtain uniform results. Field training is most important in obtaining uniformity.
III. CONDUCTING THE PAVEMENT CONDITION SURVEY

1. A rating team consists of a driver and a rater working together. The rater will be making a visual inspection of the pavement while riding over the section. The rater should take special care to rate the distresses according to the definitions included in this manual.

2. A street should be rated on a block-by-block basis. That is; each block will be a separate section in the pavement condition survey. There may be an occasion where there is need for more than one section within a single block. For rural roads, survey sections should be no greater than 0.2-mile segments. Each section of pavement should be as homogeneous as possible. A section of pavement should be separated because of a change in one or more of the following conditions:
   a. pavement width,
   b. pavement type,
   c. curb and gutter (or change in type of shoulder),
   d. overall pavement condition.

3. Each section will be rated according to the type and magnitude of pavement distresses:
   For Asphaltic Concrete Pavements: Alligator Cracking, Block/Transverse Cracking, Reflective Cracking, Rutting, Raveling, Bleeding, Surface Irregularities, and Patching/Utility Cuts.
   For Portland Cement Concrete Pavements: Blowups, Spalling, Map Cracking, Longitudinal Cracking, Transverse Cracking, Joint Deterioration, and Faulting.
   For Unpaved Roads: Rutting, Corrugations, Potholes, Aggregate Loss, Surface Erosion (deficient crown), and Dust Generation.

4. The rater is responsible for placing this information on the pavement condition survey form as explained in Section IV of this manual.

5. The rating will be done at a relatively slow speed of 5 to 15 miles per hour. In no case should the speed be greater than 15 miles per hour because slight distresses might not be seen at higher speeds.

6. This rating requires a high degree of concentration on the part of the rater and is a tedious activity. A maximum of six to seven hours of rating in one day would be appropriate. Generally, this would constitute a full 8-hour day, accounting for travel time and breaks.

7. The driver is responsible for maintaining a consistent speed while traveling over the section. Also, the driver is responsible for getting the street/road section length from the odometer. When using the digital odometer, it should be properly calibrated to assure that measurements are accurate. Intersection
lengths shall be included in the section length of the major street/road. Crossing-street/road section lengths shall begin and end at the nearest edge of the intersections. Generally, the major street would be measured through the intersection with the minor street section lengths being stopped at the beginning of the intersection. This prevents a double counting of intersection widths. When breaking a survey section at an intersection, determination of the length of the intersection shall be from center to center of intersections. The only exception to this criterion involves a situation where a resurfacing project begins or ends at some specific location within the intersection. For this situation, the break for length determinations shall be located where the pavement surface condition changes.

For urban sections, the length for cul-de-sac sections shall be determined by measuring the length of a street/road section and then adding 100 feet for each cul-de-sac in the section.

Turn-outs shall be treated as separate sections if separated from the main street/road by a median or island. Turn-outs not separated by a median or island shall be designated as wide-outs and the length of the wide-out section will be added to the length of the total street section.

The driver also should measure the street/road width, if this information is not available. Usually the width of the previous section can be measured as well as the next section at an intersection. This will reduce the number of times the driver must get out of the car. Pavement width is measured from curb face to curb face, curb face to edge of pavement (for sections where there are curbs on one side of the street only), or from pavement edge to pavement edge where there are no curbs.

8. The location of the sun with respect to the rater greatly affects the ability to see pavement distresses. The rater also may want to look out the rear window of the car to determine any differences in perspectives dependent upon direction of travel. If there is any doubt, it is recommended that the street/road be traveled in both directions to rate.

9. The wetness of the pavement also affects the ability to see cracking. If the pavement is covered with water it will be impossible to see many pavement distresses. However, any cracks in the pavement should be apparent after a light rain and the pavement surface is drying. Often the cracking may appear more severe under these conditions. Be sure to review the definitions and photographs if there is any uncertainty about the visible cracking.

10. Generally, one pass over a section will be sufficient to get an accurate rating. However, if a rater is uncertain about the distresses seen, additional passes may be required. The rater may want to get out of the vehicle and examine the pavement distresses more closely.
11. The driver should be very safety conscious while the survey is being conducted. The vehicle’s emergency flashers should be used. A yellow caution light on top of the vehicle is also recommended. The rating vehicle is traveling at a slow speed and will be approached by traffic that is traveling much faster. The yellow caution light will make it easier for other drivers to see the rating vehicle.

When stopping, the entire vehicle should be pulled out of the travel lane where possible. Again, care should be taken when pulling in and out of the travel lane. Often, other drivers will be looking to pass the rating vehicle, and the driver should always be sure to check his blind spot before pulling out.

Additionally, the driver should be cautious when getting out of the vehicle to measure street widths. A safety vest is recommended to provide high visibility.

IV. FILLING IN THE PAVEMENT CONDITION SURVEY FORM

The pavement condition survey form will be filled in by a trained rater as shown in Figure 1. Pavement sections shown on the example survey form are illustrated on the map in Figure 2. A complete printout of street sections is provided for each survey area.

The form should be filled in using a pencil, and great care should be taken to write information neatly. This is very important since this information will have to be entered in the computer.

The various items on the pavement condition survey form are numbered and circled on the example survey form in Figure 1. The form should be completed according to the following instructions that refer to each numbered item.

1. **MO** - Month of the year that survey is being conducted.
   
   01 - January, 02 - February . . . 12 - December.

2. **YR** - Year that survey is being conducted. This should be printed out as 86 for 1986.

3. **D** - Direction. This should be shown when a street has a designated direction as part of its street name; for example, East Main Street and West Main Street. Otherwise, this should be left blank. One of the following letters should be used to designate the directions:
   
   N - North    E - East
   S - South    W - West
# PRIORITY LIST OF THE PAVEMENT SURVEY DATA

(Ratings from 0 to 100)

| Date:   | 05/12/1987 |

| NO YR | STREET NAME | TP | BLOCK | CD | DES DESCRIPTION | LENGTH | END DESCRIPTION | P | MI | L | SW | C | CT | -CC- | AL | AN | AS | K | FT | V | E | R | T | PCR | SY | (4) | $/MILE ACTIVITY | UTILITY |
|-------|-------------|----|-------|----|-----------------|--------|-----------------|---|----|---|----|---|----|------|----|-----|---|----|----|----|------|-----|-------|
| 05 B7 | IDLEWOOD    | CR | 2800 A | 5 | SALEM DR       | 550 LILAC RD | P 40 2 0 2 B | 4 | 0 | 5 | 1 | MN | S | SSL | 0 | 49 | 25753 | 247232 | STREV | 1 | 2 |
| 05 B7 | IDLEWOOD    | CR | 2600 A | 5 | SALEM DRIVE    | 500 IDLEWOOD CT | P 40 2 0 2 B | 4 | 2 | 1 | 3 | NL | M | NLL | S | 22 | 14911 | 157456 | PMH | 1 | 2 |
| 05 B7 | IDLEWOOD    | CR | 2900 A | 5 | LILAC RD      | 500 PRINCETON AV | P 40 2 0 2 B | 5 | 5 | 0 | 0 | SN | M | NLL | 22 | 0 | 11576 | 122240 | PMH | 3 | 1 |
| 05 B7 | IDLEWOOD    | CR | 2801 A | 5 | SALEM DR      | 500 LILAC RD | P 45 2 0 2 B | 3 | 3 | 3 | IL | LN | NS | MNL | 40 | 44 | 8993 | 94962 | PMH | 1 | 2 |
| 05 B7 | IDLEWOOD    | CR | 3000 A | 5 | LILAC RD      | 550 PRINCETON AV | P 40 2 0 2 B | 0 | 10 | 0 | 0 | SN | M | NLL | 40 | 0 | 1966 | 18072 | JR | 1 | 2 |
| 05 B7 | IDLEWOOD    | CR | 3100 A | 5 | PRINCETON AV  | 500 YALE PL | P 40 2 0 2 B | 8 | 2 | 0 | 0 | SL | M | NLL | 43 | 0 | 10990 | 115000 | PMH | 3 | 1 |
| 05 B7 | IDLEWOOD    | CR | 2700 A | 5 | IDLEWOOD CT   | 550 SALEM DR | P 40 2 0 2 B | 5 | 2 | 0 | 3 | NL | M | NLL | 45 | 147 | 13902 | 133456 | PMH | 1 | 2 |
| 05 B7 | IDLEWOOD    | CR | 3300 A | 5 | MARLOWD TER   | 500 END | P 40 2 0 2 B | 4 | 3 | 2 | 1 | NL | L | MNN | 50 | 44 | 10511 | 110992 | PMH | 1 | 2 |
| 05 B7 | IDLEWOOD    | CR | 3200 A | 5 | YALE PL       | 500 MARLOWD TER | P 40 2 0 2 B | 9 | 1 | 0 | 0 | SL | M | NLL | 52 | 0 | 10890 | 115000 | PMH | 3 | 1 |
| 05 B7 | IDLEWOOD    | CR | 3200 A | 5 | YALE PL       | 500 MARLOWD TER | P 40 2 0 2 B | 8 | 0 | 2 | 0 | SL | M | NLL | 55 | 0 | 10155 | 107240 | PMH | 3 | 1 |

Total area of Full Depth Patching... 417 sq yds
Total cost of Repairs ............... $ 119547

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Figure 1. Example of a Pavement Condition Survey Form.
Figure 2. Line Map Showing Pavement Sections Listed on Pavement Condition Survey Form.
4. STREET/ROAD NAME - The name of the street should be shown with a maximum of 15 spaces for this field.

5. TP - Street/Road Type. This designates a section as a street, boulevard, avenue, etc. The following standard abbreviations should be used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Alley</td>
</tr>
<tr>
<td>AV</td>
<td>Avenue</td>
</tr>
<tr>
<td>BV</td>
<td>Boulevard</td>
</tr>
<tr>
<td>CR</td>
<td>Circle</td>
</tr>
<tr>
<td>CV</td>
<td>Cove</td>
</tr>
<tr>
<td>DR</td>
<td>Drive</td>
</tr>
<tr>
<td>EP</td>
<td>Expressway</td>
</tr>
<tr>
<td>EX</td>
<td>Extension</td>
</tr>
<tr>
<td>FR</td>
<td>Freeway</td>
</tr>
<tr>
<td>HY</td>
<td>Highway</td>
</tr>
<tr>
<td>LN</td>
<td>Lane</td>
</tr>
<tr>
<td>LP</td>
<td>Loop</td>
</tr>
<tr>
<td>PL</td>
<td>Place</td>
</tr>
<tr>
<td>PK</td>
<td>Parkway</td>
</tr>
<tr>
<td>RD</td>
<td>Road</td>
</tr>
<tr>
<td>RN</td>
<td>Run</td>
</tr>
<tr>
<td>RW</td>
<td>Row</td>
</tr>
<tr>
<td>ST</td>
<td>Street</td>
</tr>
<tr>
<td>TL</td>
<td>Trail</td>
</tr>
<tr>
<td>TR</td>
<td>Terrace</td>
</tr>
</tbody>
</table>

6. BLOCK - Block Number. The survey will be conducted on a block-by-block basis. Therefore, each street section should have a block number. These should be shown as 100, 200, 300, ..., 1000, 1100, 1200, etc. For rural sections, pavement condition (distress) data will be obtained on intervals of 0.2 mile or less. Block numbers may be used to identify each section.

This information should be filled in if not already included on the form.

Occasionally, it may be necessary to have more than one section on a single block. The block number should be broken proportionately as shown for Idlewood Cr in the example in Figure 1. The first section of the 3200 block is 3200, while the second section begins at 3240. Multiples of ten are to be used for this purpose.

Also, there may be some sections that include two or more indistinguishable blocks. In this case, the lowest block number should be shown for that section. An example of this is the 2900 and 3000 blocks of Idlewood Cr in Figure 1.

7. C - Class of Street/Road. Sections will be classified according to traffic usage. The classes will be

A - Low Fatigue - residential local streets/roads,
B - Medium Fatigue - residential collector streets/roads, and
C - High Fatigue - arterial streets/roads.

Class of street/road is to be designated by the agency responsible for the facility.
8. CD - Survey Area. The jurisdiction (municipality or county) may be divided into a number of survey areas. This designates the Survey Area in which the street/road section falls. The survey forms are printed by Survey Area.

9. BEGIN DESCRIPTION - This is the description of the beginning point of the street/road section. Most commonly, this will be an intersection with another street or road. A maximum of 15 spaces is to be used for this.

If the section begins at a point other than an intersection, the beginning point should be described using the descriptions shown below:

<table>
<thead>
<tr>
<th>Description</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead End</td>
<td>Chg Width</td>
<td>Begin Pvmnt</td>
</tr>
<tr>
<td>End Pvmnt</td>
<td>Chg Pvmnt Type</td>
<td>Begin Conc Pvmnt</td>
</tr>
<tr>
<td>End C&amp;G</td>
<td>Turnout</td>
<td>End Conc Pvmnt</td>
</tr>
<tr>
<td>Cul de Sac</td>
<td>Chg Condition</td>
<td>Bridge</td>
</tr>
<tr>
<td>City Limit</td>
<td>Begin Divided</td>
<td>Wide Out</td>
</tr>
<tr>
<td>End Maintenance</td>
<td>End Divided</td>
<td>Midblock</td>
</tr>
</tbody>
</table>

Other descriptions should be used as needed.

10. LGTH - Length. This is the length of the section measured in feet. This measurement should be taken using the digital odometer. It is important that the odometer be calibrated on a regular basis to maintain accuracy. Also, care should be taken so that intersection lengths are not double counted. Generally, the major street would be measured through the intersection with the minor street section lengths being stopped at the beginning of the intersection. This information should be right justified in the five available spaces.

11. END DESCRIPTION - This describes the location where the section ends. Again, this generally would be an intersection with another street. It should be completed as described under Item 9, BEGIN DESCRIPTION.

12. P - Pavement Surface Type. This describes the type of pavement surface that exists on the section:

- P - plant-mix asphaltic concrete surface (PM)
- B - bituminous surface treatment (BST)
- C - portland cement concrete pavement (PCC)
- U - unpaved
13. WI - Pavement Width. This is the width of the section measured in feet from edge of pavement to edge of pavement. For sections with curbs on both sides, the width shall be from curb face to curb face. For those sections with a curb on one side only, the width is measured from curb face to edge of paving material. For sections with no curbs, the width shall be measured from edge of surfacing (pavement) to edge of surfacing (pavement).

14. L - Number of Travel Lanes. This is the number of through travel lanes that exist on the section. This does not include parking or short turning lanes. Widening less than 150 feet in length at intersections for turn lanes should not be considered.

15. SH - Shoulder Width. This is the overall estimated average shoulder width (in feet) throughout the section. The shoulder width is measured from the edge of the pavement to the break point of the ditch. This width would include both paved and unpaved shoulder widths if they exist on the section. If curb and gutter is present on both sides, this space should be left blank.

16. C - Location of Curb and Gutter. This shows the amount of curb and gutter existing on each section:

- 0 - no curb and gutter
- 1 - continuous curb and gutter on one side
- 2 - continuous curb and gutter on both sides

Corrections in street/road section information listed above should be made by marking one line through the incorrect information and writing the correction directly above. This is shown for the 600 block of Hillside Av in Figure 1.

If needed, an entire section can be deleted by marking a single line through the entire section and writing DELETE above the street name. This is shown for Irby Dr in Figure 1.

Sections to be added should be filled in on one of the blank lines at the bottom of each page. Be sure to fill in all information completely.

17. /CC/ - Condition of Curb and Gutter. The condition of the curb and gutter is evaluated using the following codes:

- N - no deterioration
- L - slight deterioration (excellent to good condition; less than one-third scaling, spalling etc. distress)
M - moderate deterioration (fair condition; one-half to one-third scaling, spalling, etc. distress)
S - severe deterioration (poor condition; greater than one-half scaling, spalling etc. distress)

Bituminous Surfaced/Asphaltic Concrete Pavements (Items 18 through 25)

18. AN, AL, AM, AS - Alligator Cracking: None, Slight, Moderate, and Severe, respectively.

Alligator cracking is rated as a percentage of the section that falls under the categories of None, Slight, Moderate, and Severe. The section should be rated according to the definitions shown in this manual. Percentages should be indicated as 01 for 10%, 02 for 20%, 03 for 30%, up to 10 for 100%. The appropriate percentages should be placed under None, Slight, Moderate, and Severe. These percentages should always add to 100%. If they do not, the data cannot be entered into the computer. This should be double-checked before submitting survey data to be entered.

19. BLK - Block/Transverse Cracking. Block/transverse cracking should be rated as an overall condition according to the definitions provided in this manual. One letter should be used for the appropriate overall condition of the section as follows:
   (-) - none
   L - slight
   M - moderate
   S - severe

NOTE: A dash should be used as a substitute for N to speed the process of filling out the form. This also will make it easier to enter the data into the computer.

20. REF - Reflective Cracking. This should be completed in the same manner as Item 19.

21. RUT - Rutting. This should be completed in the same manner as Item 19.

22. RAV - Raveling. This should be completed in the same manner as Item 19.

23. BLE - Bleeding. This should be completed in the same manner as Item 19.

24. SIR - Surface Irregularities. This should be completed in the same manner as Item 19.

25. PAT - Patching/Utility Cuts. This should be completed in the same manner as Item 19.
Portland Cement Concrete Pavements (Items 26 through 33)

26. BU - Blowups. The pavement condition related to blowups is rated on the basis of number of occurrences within the survey section.

27. SP - Spalling and Popouts. This should be rated as an overall condition according to the definitions provided in this manual. One letter should be used for the appropriate overall condition of the section as follows:

(-) - none
L - slight
M - moderate
S - severe

NOTE: A dash should be used as a substitute for N to speed the process of filling out the form. This also will make it easier to enter the data into the computer.

28. MC - Map Cracking, Sealing, Crazing, and Reactive Aggregate. This should be completed in the same manner as Item 27.

29. LC - Longitudinal Cracking. This should be completed in the same manner as Item 27.

30. TC - Transverse Cracking. This should be completed in the same manner as Item 27.

31. DC - Diagonal Cracking. This should be completed in the same manner as Item 27.

32. JD - Joint Deterioration. This should be completed in the same manner as Item 26.

33. FAV - Faulting. This should be completed in the same manner as Item 26.

Unpaved Roads (Items 34 through 39)

35. COR - Corrugations. This should be rated on the basis of number of occurrences within the survey section.

36. POT - Potholes. This should be completed in the same manner as Item 35.

37. ALO - Aggregate Loss. This should be completed in the same manner as Item 34.
38. SE - Surface Erosion. This should be completed in the same manner as Item 34.

39. DG - Dust Generation. This should be rated on the basis of visibility determined as described in this manual.

40. UTL1, UTL2 - Utility features.

UTL1 - number of utilities of each of the following types within the survey section (e.g., 3M or 2V):

- M - manhole
- V - valve

UTL2 - number of utility cuts (utility cuts also will be counted as patching)

V. PAVEMENT/ROAD SURFACE DISTRESS DEFINITIONS AND PHOTOGRAPHS

Pavement distress conditions, Items 1 through 8 on the survey form, are defined on the following pages. Each page discusses one of the distress conditions. Photographs of the different severity conditions are included to clarify the distress definitions.

The rater shall study thoroughly each definition of distress with accompanying photographs until the rater completely understands all severity conditions under each distress. This is critical to the survey if a uniform rating is to be obtained.

One or more photographs are shown for each of the severity conditions for each distress. These photographs represent what might typically be seen in the field for a specific distress. The photographs do not show all conditions that might be found. They also are not meant to imply that a condition must look exactly like what is shown for it to be classified as Slight, Moderate, or Severe. The pictures are illustrations of what the rater may see under the various severities for each distress.

Definitions for each severity include one or more phrases that describe the condition. Certainly not all of the specific phrases must exist for a condition to be labeled as such. It may be that only one of several phrases is visible on a section. However, this is sufficient for the rater to mark down the condition as Slight, Moderate, or Severe.
All types of distresses indicated on the rating form shall be identified and quantified even though two or more distresses are observed within the same area.

All types of distress should be rated as "None" if the survey section does not meet the criteria to be rated as Slight, Moderate, or Severe. A section rated as None may indeed display some minor distress, but that distress is not sufficient to be rated as Slight.
A. BITUMINOUS SURFACED/ASPHALTIC CONCRETE PAVEMENTS

1. ALLIGATOR CRACKING (Asphaltic Concrete Pavement)

Slight: Longitudinal disconnected hairline cracks about 1/8 inch wide running parallel to each other; initially may be only a single crack in the wheel path but could also look like an alligator pattern; sealant is performing satisfactorily for sealed cracks.

Moderate: Longitudinal cracks in wheel path(s) forming an alligator pattern; cracks may be lightly spalled and are about 1/4 inch wide; sealant is performing unsatisfactorily for sealed cracks (cracks opening again).

Severe: Cracking has progressed so that pieces appear loose with severely spalled edges; cracks are probably 3/8 to 1/2 inch wide or greater; pumping of fines through the cracks may be visible on the pavement surface; potholes may be present.

**Description:**
Alligator cracking is a load-associated structural failure. The failure can be either in the surface, base, or subbase. Permanent deformation (rutting) does not have to be present.

Another often observed pavement distress for pavement sections in Lexington is slippage of the asphalt surface material. Slippage typically results during the rolling (compaction) phase of construction. This distress, while not load associated, must be repaired in a fashion similar to alligator cracking. Therefore, slippage of the asphalt surface will be treated as alligator cracking for purposes of pavement condition rating.

Cracking first begins in the wheel path, usually as longitudinal cracking. Further stress creates an alligator pattern. If the surface is very flexible, the longitudinal crack will become wider, and an alligator pattern may not develop until Severe distress is reached.

Each lane of a two-lane facility is to be evaluated as representing 50% of the section. For example, if there is continuous Moderate alligator cracking in either one or both wheel paths of one lane only, the rater should mark 50% under Moderate alligator cracking. If similar cracking had been present throughout the other lane, the rater would mark 100% under Moderate.

For multilane undivided facilities, the total number of lanes shall be divided into 100 to yield the percentage that each lane represents. For example, each lane of a five-lane facility would represent 20% of the section.
For divided sections, only the outside travel lane should be rated. The outside lane will constitute
100% of the section for alligator cracking. The assumption is that the greatest amount of structurally
related distress (alligator cracking) will occur in the outside lane, which typically carries the greater
proportion of the traffic.

Estimating the percentage of alligator cracking is often the most difficult item for a trainee to learn.
Repeated field training and experience are the best ways to overcome this difficulty.

One method of developing percentages is to estimate what portion of each lane has any kind of
alligator cracking. For example, half the length of lane (25%) and one-third of the other lane (15%) might
have alligator cracking. The total percentage of alligator cracking would be 40%, leaving 60% to be placed
under None. The 40% should be divided into Slight, Moderate, and Severe, as appropriate, based on
appearance.

Another method of determining percentages of alligator cracking is to look at the linear feet of
cracking. This is particularly effective on short sections of 1,000 feet or less. For example, in a 500-foot
section, there must be 50 linear feet of alligator cracking in both lanes to have 10% alligator cracking.
Once the overall percentage of alligator cracking has been determined, it must be classified according to
severity as Slight, Moderate, or Severe. In this case, the total amount of alligator cracking on the section
was determined first, then it was divided into severities. Another approach is to keep track of the actual
linear feet of Slight, Moderate, or Severe alligator cracking. Both methods are effective, depending on the
particular section. The rater should use the method with which he or she is most comfortable.
DISTRESS CONDITIONS FOR ALLIGATOR CRACKING
(with No or Slight Rutting)

Slight: Longitudinal disconnected hairline cracks about 1/8 inch wide running parallel to each other; initially may be only a single crack in the wheel path but could also look like an alligator pattern; sealant is satisfactory for sealed cracks.

Moderate: Longitudinal cracks in wheel path(s) forming an alligator pattern; cracks may be lightly spalled and are about 1/4 inch wide; sealant is unsatisfactory for sealed cracks (cracks opening back up).

Severe: Cracking has progressed so that pieces appear loose with severely spalled edges; cracks are probably 3/8 - 1/2 inch wide or greater; pumping of fines through the cracks may be visible on the surface; potholes may be present.
2. BLOCK/TRANSVERSE CRACKING (Overall Condition)(Asphaltic Concrete Pavement)

NOTE: The entire pavement surface area represents 100% of the section.

Slight: Cracks, usually only transverse, are about 1/8 inch wide and are not spalled; block pattern may not be visible yet; sealant is satisfactory if cracks have been poured; transverse cracks usually 10 to 20 feet apart.

Moderate: Block pattern may be visible with blocks 10 square feet or greater present; cracks are about 1/4 inch wide; cracks may or may not be spalled; sealant is unsatisfactory if cracks have been poured (cracks opening again); transverse cracks usually 5 to 20 feet apart.

Severe: Cracks may be severely spalled with smaller blocks 2 to 10 square feet present; cracks usually about 1/2 inch wide or greater; transverse cracks may be 1 to 2 feet apart throughout portions of the surface.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:

Block cracks divide the pavement into roughly rectangular pieces. Block cracking is not load-associated. Cracks generally are caused by shrinkage of the asphalt concrete due to daily temperature cycling. Wheel path loads can increase the severity of block cracking if water is allowed to penetrate into the cracks. It is therefore very important to seal these cracks to prevent water penetration into the base materials.
Block cracking normally indicates a pavement surface that has hardened significantly. It is particularly prevalent on low-volume plant-mix roads where the surface is not being sufficiently "worked" by traffic. Block cracking also occurs in thin plant-mix resurfacings over portland cement concrete pavements. However, this cracking is not to be confused with reflective cracking.

Block cracking may begin with a transverse crack opening partially or entirely across the width of the pavement. Transverse cracks by themselves should not be rated above Moderate severity, even if the width of crack qualifies as Severe. A block pattern must exist before Severe block cracking is indicated.

If the block cracks have been poured and the sealant is keeping out the water, this would constitute a Slight condition. A Moderate condition exists if 1) the sealant is gone and the cracks are reopening or 2) the cracks have never been sealed.
DISTRESS CONDITIONS FOR BLOCK/TRANSVERSE CRACKING

Slight: Cracks, usually only transverse, are about 1/8 inch wide and are not spalled; block pattern may not be visible yet; sealant is satisfactory if cracks have been poured; transverse cracks are usually 10 to 20 feet apart.

Moderate: Block pattern may be visible with blocks 10 square feet or greater present; cracks are about 1/4 inch wide; cracks may or may not be spalled; sealant is unsatisfactory if cracks have been poured (cracks opening back up); transverse cracks usually 5 to 20 feet apart.

Severe: Cracks may be severely spalled with smaller blocks 2 - 10 square feet present; cracks usually about 1/2 inch wide or greater; transverse cracks may be 1 - 2 feet apart throughout portions of the surface.
3. REFLECTIVE CRACKING (Overall Condition)(Asphaltic Concrete Pavement)

NOTE: This type of distress is found on a bituminous overlay over a portland cement concrete pavement (primarily joint cracking), or on a bituminous (asphaltic concrete) overlay over a cement-stabilized or pozzolanic-stabilized base.

Slight: Cracks usually 1/8 to 1/4 inch wide; sealant is in satisfactory condition if present; cracks have little or no spalling; joints usually are not bumped up.

Moderate: Cracks are about 3/8 to 1/2 inch wide; sealant is unsatisfactory for sealed cracks (cracks reopening); cracks can be moderately spalled; joints may be bumped up 1/2 to 1 inch high.

Severe: Cracks usually greater than 1/2 inch wide; cracks are severely spalled; joint may be bumped up greater than 1 inch high.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the section shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the section with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the section shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the section with some Severe distress.

Severe: When one-third or more of the section shows Severe distress.

Description:

A thin bituminous resurfacing over old jointed concrete pavement almost always will have reflective cracks. Typically, the reflective joints are bulged above the riding surface such that the vehicle is riding over small bumps, or if maintenance is neglected, small pieces along the crack may have been loosened or removed by traffic.
Primary causes of reflective cracking are movement of the portland cement concrete slab beneath the plant-mix resurfacing because of thermal and moisture changes and faulting at joints. The problem can be compounded if the joints were not properly cleaned and sealed prior to resurfacing. Trapped material is forced out of the joint and causes bumps to form in the surface.

Usually, Severe reflective cracking indicates concrete joints that need extensive repair. Lateral movement at the joints has often caused a blowup to occur. Adjacent slab areas also may be cracked underneath the overlay. The adjacent slab(s) and joint must be reconstructed to prevent further problems at these locations. Blowups do not have to be present for there to be Severe reflective cracking.
DISTRESS CONDITIONS FOR REFLECTIVE CRACKING

Slight: Cracks usually 1/8 - 1/4 inch wide; sealant is in satisfactory condition if present; cracks have little or no spalling; joints usually are not bumped up.

Moderate: Cracks are about 3/8 - 1/2 inch wide; sealant is unsatisfactory for sealed cracks (cracks are opening back up); cracks can be moderately spalled; joints may be bumped up 1/2 - 1 inch high.

Severe: Cracks usually greater than 1/2 inch wide; cracks are severely spalled; joints may be bumped up greater than 1 inch high.
4. RUTTING (Overall Condition) (Asphaltic Concrete Pavement)

Slight: Rutting 1/4 to less than 1/2 inch deep.

Moderate: Rutting 1/2 to less than 1 inch deep.

Severe: Rutting 1 inch deep or greater.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the section shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the section with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the section shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the section with some Severe distress.

Severe: When one-third or more of the section shows Severe distress.

Description:

A rut is a surface depression in the wheel path(s). Surface depressions at other locations on the pavement surface shall be treated as shoving (to be defined later). Rutting results from permanent deformation in any of the pavement layers or the subgrade, usually caused by densification or lateral movement of the materials due to traffic loads. Movement in the mix during hot weather, inadequate compaction during construction, or displacement of the subgrade from beneath the wheelpaths are major causes of rutting.

Rutting is often present at intersections where vehicles stop and go. However, the entire section should be considered using the above guidelines to rate the overall condition.

It is common for rutting to occur in conjunction with alligator cracking. Both are structural failures in one or more layers of the pavement. Even though both distresses may be present at one location, they should be rated individually.
DISTRESS CONDITIONS FOR RUTTING

Slight: Rutting 1/4 to less than 1/2 inch deep.

Moderate: Rutting 1/2 to less than 1 inch deep.

Severe: Rutting 1 inch deep or greater.
5. RAVELING (Overall Condition) (Asphaltic Concrete Pavement)

Slight: Aggregate loss within the pavement lanes is not great; small amounts of pitting may be detected; aggregate or binder has started to wear away.

Moderate: Some pitting or stripping evident; random stripping with small areas (less than 1 square foot) or strips of aggregate broken away.

Severe: Pitting and stripping very evident; aggregate accumulation may be a problem; large sections (greater than 1 square foot) of stripping with aggregate layer broken away.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:
Raveling (which, for purposes of rating, also includes weathering) is the wearing away of the pavement surface caused by the dislodging of aggregate particles or the loss of asphalt binder (weathering). Raveling is also the progressive disintegration from the surface downward or edges inward by the dislodgement of aggregate particles.

Raveling may be caused by hardening of the asphalt binder with age or improper application of binder when the surface was placed. In either case, the binder cannot hold the aggregate. Traffic causes the aggregate to be removed from the surface. Raveling also may be caused by lack of compaction during construction, construction during wet or cold weather, dirty or disintegrating aggregate, too little asphalt in the mix, or overheating of the asphalt mix.
DISTRESS CONDITIONS FOR RAVELING

Slight: Aggregate loss within the pavement lanes is not great; small amounts of pitting may be detected; aggregate or binder has started to wear away.

Moderate: Some pitting or stripping evident; random stripping with small areas (less than one square foot) or strips of aggregate broken away.

Severe: Pitting and stripping very evident; aggregate accumulation may be a problem; large sections (greater than one square foot) of stripping with aggregate layer broken away.
6. BLEEDING (Overall Condition) (Asphaltic Concrete Pavement)

NOTE: Each lane of a two-lane facility represents 50% of the section.

Slight: Condition is present on 10% to 25% of the section.

Moderate: 26% to 50% of the section shows this condition.

Severe: Greater than 50% of the section is showing this condition.

Description:
Bleeding is a film of bituminous material on the pavement surface, which creates a shiny reflecting surface. Bleeding is caused by excess asphaltic cement in the mix and/or low air-void contents. During hot weather, the asphalt fills the voids of the mix and then expands out onto the surface of the pavement. The process is not reversible during cold weather, thus asphalt will accumulate on the surface.

No attempt has been made to define various levels of severity. Bleeding should be recognized when it is extensive enough to create a uniform coating in the wheel path(s) or across the entire lane for continuous lengths, usually 100 feet as a minimum.

If bleeding is occurring only in the wheel paths, then each wheel path shall represent 25% of the section on a two-lane facility. Otherwise, the extent or degree of bleeding shall be based on the total area of the section.

Bleeding may result from water and stripping action caused by heavy tire loads increasing the pore pressures in the pavement. Asphalt and disintegrated aggregate particles may migrate to the surface, presenting a flushed effect. These conditions are more often observed for open-graded surfaces.
DISTRESS CONDITIONS FOR BLEEDING

Slight: Condition is present on 10 - 25 percent of the section.

Moderate: 26 - 50 percent of the section shows this condition.

Severe: Greater than 50 percent of the section shows this condition.
7. SURFACE IRREGULARITIES (Overall Condition) (Asphaltic Concrete Pavement)

Definitions:

**Potholes:** Bowl-shaped holes of various sizes and depths in surface of pavement; surface has been broken into small pieces, and material has been removed by traffic. Generally, a minimum 6-inch diameter and 2-inch deep hole would constitute a pothole. Each pothole represents an occurrence.

**Shoving:** Lateral displacement of pavement material due to action of traffic. Each localized area that is 2 to 10 square feet in size represents an occurrence. For areas greater than 10 square feet, the number of occurrences shall be estimated by the total area in square feet divided by 10 square feet per one occurrence.

**Corrugations:** Transverse undulations (ripples) of the pavement surface at regular intervals and typically consisting of alternating closely spaced valleys and crests. Each localized area that is continuous for 5 to 15 linear feet represents an occurrence. For lengths greater than 15 feet, the number of occurrences shall be determined by dividing the total length by 15 feet.

**Paving Joint Deterioration:** Dislodgement or raveling of aggregate particles, progressing downward at construction paving joints and creating an open area at the joint to permit infiltration of water into the pavement structure. Each localized area that is continuous for 25 feet represents an occurrence. For lengths greater than 25 feet, the number of occurrences shall be determined by dividing the total length by 25 feet.

In rating the overall condition of a survey section, the rater shall use the following guidelines along with the above definitions.

- **Slight:** 1 to 5 occurrences per 0.1 mile (generally a block length)
- **Moderate:** 6 to 9 occurrences per 0.1 mile (generally a block length)
- **Severe:** 10 or more occurrences per 0.1 mile (generally a block length)

**Description:**

Potholes are typically the results of progressive deterioration of other defects such as alligator cracking. Potholes are typically the results of combined weaknesses in the pavement structure resulting from too little asphalt, too thin an asphalt surface, too many fines, too few fines, poor drainage, and traffic.
As alligator cracking progresses, the cracked pieces of pavement loosen and are removed by traffic, forming a pothole. Materials below the pavement also may be removed by traffic.

Shoving is typically the result of a lack of stability in the asphalt layers, but also may result because of lack of stability in supporting layers. Traffic loads cause the displacement of pavement material, resulting in an uneven surface.

Corrugations are typically the result of a lack of stability in the asphalt layers. The starting and stopping actions of traffic at intersections commonly cause the corrugation of the surface of the pavement.

Paving Joint Deterioration typically is caused by lack of compaction or improper compaction efforts or procedures during construction, construction during wet or cold weather, dirt on the pavement joint or lack of tack material, dirty or disintegrating aggregate, too little asphalt in the mix, or any other factors affecting the bonding of material at the pavement joint, including allowing the pavement joint to become cold before placing adjacent material.
SURFACE IRREGULARITIES

Potholes: Bowl shaped holes of various sizes and depths in surface; surface has been broken into small pieces and material has been removed by traffic; generally a minimum of 6" diameter and 2" depth; each pothole represents an occurrence.

Shoving: Lateral displacement of pavement material due to action of traffic; each localized area 2-10 square feet in size represents an occurrence.

Corrugations: Transverse undulations (ripples) of the pavement surface at regular intervals and typically consisting of closely spaced valleys and crests; each localized area that is continuous for 5-15 linear feet represents an occurrence.
8. PATCHING (Overall Condition) (Asphaltic Concrete Pavement)

NOTE: The entire pavement surface area represents 100% of the section.

Slight: Condition is present on 6% to 15% of the surface area.

Moderate: 16% to 30% of the surface area is patched; two to three utility cuts per block
(approximately 500 feet)

Severe: Greater than 30% of the surface area is patched; four or more utility cuts per block
(approximately 500 feet)

Utility Cut: A transverse cut that extends across 50% or more of the section width.

Description:

Patching is defined as any surface area of the existing pavement that indicates some type of
maintenance repair has taken place. These patched areas may be plant-mix or bituminous surface treatment
skin patches, overlays, or full-depth patches. They may be in spot locations, along one or both edges, in the
wheel paths, across the entire surface for short distances, or a combination of any of these. In-kind
treatments, such as plant-mix edges on an existing plant-mix surface, shall be considered as patches. Crack
pouring shall not be considered as a type of patching.

The quality and condition of the patch is not to be considered in evaluating patching. It does not
matter if the patches are alligator cracked, rutted, or potholed. These conditions are measured in the other
distresses. Similarly, all the patches could be in excellent condition. Thus, patching is only an indication
of the amount of surface area that has received some type of maintenance repair that may or may not be
performing satisfactorily.

The amount of patching shall be measured as a percentage of the total surface area. As an example,
an 8-foot wide patch on a 24-foot wide pavement would constitute 33% of the surface area. This would be
rated as a severe overall condition.

Remember, however, that there is no need to determine the exact percentage of patching. The rater
must only choose which of the three percentage ranges (L, M, or S) represents the amount of patching
visible. Further, do not spend too much time trying to determine the amount of patching, thereby losing
accuracy in the measurement of the first seven distresses.
Utility cuts, where present, should be considered under patching. This is a condition that is a problem in many municipalities.

**CAUTION!** Be aware that a section must have at least 6% of the surface area patched to be marked as Slight. Do not assume that, because there is some patching, a Slight condition is present. If a section has 5% or less of the surface area patched, it shall be marked as None.
DISTRESS CONDITIONS FOR PATCHING

Slight: Condition is present on 6 to 15 percent of the section.

Moderate: 16 to 30 percent of the section is patched; 2 to 3 utility cuts per 0.1 mile.

Severe: Greater than 30 percent of the section is patched; 4 or more utility cuts per 0.1 mile.

UTILITY CUT = A transverse cut which extends across more than 50% of the section width.
B. PORTLAND CEMENT CONCRETE PAVEMENTS

1. BLOWUPS (Portland Cement Concrete Pavement)

Slight: One occurrence per 0.1 mile (generally a block length).

Moderate: Two occurrences per 0.1 mile (generally a block length).

Severe: Three or more occurrences per 0.1 mile (generally a block length).

Description:
Blowups occur in hot weather at transverse joints or cracks that will not permit expansion of the concrete slabs. Insufficient expansion width usually is caused by infiltration of incompressible materials into the joint space. When compressive expansion pressure cannot be relieved, a localized upward movement of the slab edges (buckling) or shattering occurs in the vicinity of the joint. Blowups occur at construction joints or at wide transverse cracks at which the steel has previously ruptured. Blowups also may occur at utility cut patches and drainage inlets. The potential for blowups is increased when there is a spalling away of the slab at the bottom, creating reduced joint contact area. The presence of "D" cracking also weakens the concrete near the joint, resulting in increased spalling and blowup potential. The result is a localized upward movement (buckling) of the slab at the edges of the crack or construction joint accompanied by shattering of the concrete in that area, or a crushing of the slab in that area.
2. SPALLING AND POPOUTS (Portland Cement Concrete Pavement)

Slight: A spall less than 2 feet long; if spall is broken into pieces and fragmented, it must not extend more than 3 inches from the joint or crack. A spall more than 2 feet long with spall held tightly in place; if spall is cracked, it cannot be broken into more than three pieces. The joint is lightly frayed with fray extending no more than 3 inches from the edge of the joint or crack. One popout per 10 square yards.

Moderate: A spall is broken into pieces or fragmented and spall extends more than 3 inches from joint or crack. Some pieces may be loose and/or missing, but the spalled area does not present a tire damage or safety hazard. The joint or crack is moderately frayed with fray extending more than 3 inches from the edge of the joint or crack. Temporary patching has been placed because of spalling. Two or three popouts per 10 square yards.

Severe: The joint is severely spalled or frayed to the extent that a tire damage or safety hazard exists. Four or more popouts per 10 square yards.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:

Spalling: Spalling of cracks and joints is the cracking, breaking, or chipping of slab edges within 2 feet of the joint. A joint spall usually does not extend vertically through the whole slab thickness, but
extends to intersect the joint at an angle. Spalling usually results from (1) excessive stresses at the joint or crack caused by infiltration of incompressible materials and subsequent expansion or traffic loading, (2) disintegration of the concrete, (3) weak concrete at the joint (caused by overworking) combined with traffic loads, (4) poorly designed or constructed load transfer devices, or (5) a keyed longitudinal joint failure.

Comer spalling is the ravelling or breakdown of the slab within approximately 2 feet of the corner. A corner spall differs from a corner break in that the spall usually angles downward at about 45° to intersect the joint, while a break extends vertically through the slab. Comer spalling may be caused by freeze-thaw, "D" cracking, and other factors.

**Popout:** A popout is a small piece of concrete that breaks loose from the pavement surface due to freeze-thaw action, expansive aggregates, or nondurable aggregates. The presence of extensive popouts may be indicative of unsound aggregates and "D" cracking. Popouts usually range from approximately 1 inch to 4 inches in diameter and from 1/2 inch to 2 inches deep.
Spalling: Spalling of cracks and joints is the cracking, breaking, or chipping of slab edges within 2 feet of the joint. A spall does not extend vertically through the whole slab thickness, but intersects the joint at an angle. Corner spalling is the ravelling or breakdown of the slab within approximately 2 feet of the corner. A corner spall differs from a corner break in that the spall usually angles downward at about 45° to intersect the joint, while a break extends vertically through the slab.

Popout: A popout is a small piece of concrete that breaks loose from the pavement surface due to freeze-thaw action, expansive aggregates, or nondurable aggregates. Popouts usually range from approximately 1 inch to 4 inches in diameter and from 1/2 inch to 2 inches deep.
3. MAP CRACKING, CRAZING, SCALING, AND REACTIVE AGGREGATE DISTRESS

(Portland Cement Concrete Pavement)

Slight: Crazing or map cracking exists over most of the slab area; the surface is in good condition with no scaling. (Note: the low severity level is an indicator that scaling may develop in the future). If alkali-aggregate cracking occurs anywhere in the slab, it is counted.

Moderate: Less than 10% of any slab exhibits scaling.

Severe: More than 10% of any slab exhibits scaling.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Definitions:

Map Cracking or Crazing: Map cracking or crazing refers to a network of shallow, fine, or hairline cracks that extend only through the upper near-surface of the concrete. The cracks tend to intersect at angles of 120°. Map cracking or crazing usually is caused by overfinishing the concrete, and may lead to scaling of the surface, which is the breakdown of the slab near-surface layer to a depth of approximately 1/4 to 1/2 inch.

Scaling: Scaling may be caused by deicing salts, traffic, improper construction, freeze-thaw cycles, and steel reinforcement too close to the surface.
Reactive Aggregate: Reactive aggregates either expand in alkaline environments or develop prominent siliceous reaction rims in concrete. It may be an alkali-silica reaction or an alkali-carbonate reaction. As expansion occurs, the cement matrix is disrupted and cracks. It appears as a map cracked area; however, the cracks may go deeper into the concrete than in normal map cracking. It may affect most of the slab or it may first appear at joints and cracks.
**Map Cracking or Crazing:** A network of shallow, fine, or hairline cracks that extend only through the upper near-surface of the concrete. The cracks tend to intersect at angles of 120°.

**Scaling:** The breakdown of the slab near-surface layer to a depth of approximately 1/4 to 1/2 inch.
4. LONGITUDINAL CRACKING (Portland Cement Concrete Pavement)

Slight: Hairline (tight) cracking with no spalling or faulting. A well sealed crack with no visible faulting or spalling.

Moderate: Working crack with moderate spalling and/or faulting less than 1/2 inch.

Severe: Crack greater than 1 inch wide, crack with severe spalling, or crack faulted 1/2 inch or more.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:

Longitudinal cracks occur generally parallel to the centerline of the pavement. They are often caused by improper construction of longitudinal joints, or by a combination of repeated heavy loads, loss of foundation support, and thermal and moisture gradient stresses.
Longitudinal Cracking: Longitudinal cracks occur generally parallel to the centerline of the pavement.
5. TRANSVERSE CRACKING (Portland Cement Concrete Pavement)

Plain and Jointed Reinforced Concrete:

**Slight:** Hairline (tight) crack with no spalling or faulting. A well sealed crack with no visible faulting or spalling.

**Moderate:** Working crack with moderate spalling and/or faulting less than 1/2 inch.

**Severe:** Crack greater than 1 inch wide, crack with severe spalling, or crack faulted 1/2 inch or more.

Continuously Reinforced Concrete:

**Slight:** Tight (hairline) cracks with no faulting, steel rupture, or spalling.

**Moderate:** Crack with no steel rupture, faulting less than or equal to 0.2 inch, and/or slight spalling.

**Severe:** Faulting greater than 0.2 inch, or steel rupture, or moderate to severe spalling.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

**Slight:** When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

**Moderate:** When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

**Severe:** When one-third or more of the surface area shows Severe distress.
Description:

Plain or Jointed Reinforced Concrete: These cracks are usually caused by a combination of repeated heavy loads, thermal and moisture gradient stresses, and drying shrinkage stresses. Moderate or severe cracks are working cracks and are considered major structural distresses. (Note: hairline cracks less than 6 feet long are not rated.)

Continuously Reinforced Concrete: Transverse cracking of continuously reinforced slabs is a normal occurrence and is not in itself considered to be a distress. As soon as the slab is placed and begins to harden, drying shrinkage of the concrete occurs. Reinforcement in the slab and subbase friction oppose the shrinkage and cracks soon form. After about 2 to 4 years, the crack spacing becomes constant. The purpose of the steel is to hold these randomly spaced transverse cracks tightly together so that load transfer across the crack will be obtained through aggregate interlock. If the steel ruptures or shears, load transfer across the crack is lost and the crack becomes a potential location for major distress. When deicing salts and water infiltrate through a wide crack, the reinforcing steel is subjected to corrosion, and the effective diameter of the steel begins to decrease. When stresses due to temperature changes and loading are greater than the strength of the steel, the reinforcing bar ruptures. Indicators of sheared or decreased-diameter reinforcing bars are faulted and/or widened spalled cracks. Some cracks may have widened substantially after steel rupture. (Note: sometimes the transverse cracks run diagonally across the pavement and intersect). Hairline cracks less than 3 feet long are not rated.
TRANSVERSE CRACKING

Moderate: Working crack with moderate spalling and/or faulting less than 1/2 inch.

Severe: Crack greater than 1 inch wide, crack with severe spalling, or crack faulted 1/2 inch or more.
6. DIAGONAL (CORNER) CRACKING (Portland Cement Concrete Pavement)

Slight: Crack is tight (hairline). Well sealed cracks will be considered tight. No faulting or breakup at broken corner exists. Crack is not spalled.

Moderate: Crack is working and spalled slightly or moderately. Breakup of broken corner has not occurred. Faulting of crack or joint must be less than 1/2 inch. Temporary patching has been placed because of corner break.

Severe: Crack is severely spalled or the corner piece has broken into two or more pieces. If faulting of crack or joint is more than 1/2 inch, it will be considered severe.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:

A diagonal (corner) break is a crack that intersects the joints at a distance less than 6 feet on either side measured from the corner of the slab. A diagonal (corner) break differs from a corner spall in that the crack extends vertically through the entire slab thickness while a corner spall intersects the joint at an angle. Load repetition combined with loss of support, poor load transfer across joint, and thermal curling and moisture warping stresses usually cause corner breaks.
DIAGONAL (CORNER) CRACKING

Moderate: Crack is working and spalled slightly or moderately. Breakup of broken corner has not occurred. Faulting of crack or joint must be less than 1/2 inch.
7. JOINT DETERIORATION (Portland Cement Concrete Pavement)

Slight: One to five occurrences per 0.1 mile (generally a block length).

Moderate: Six to nine occurrences per 0.1 mile (generally a block length).

Severe: Ten or more occurrences per 0.1 mile (generally a block length).

Description:

Construction Joint Deterioration (Continuously Reinforced Concrete): Construction joint distress is a breakdown of the concrete or steel at a CRCP construction joint. It often results in a series of closely spaced transverse cracks near the construction joint or a large number of interconnecting cracks. These excessive cracks can, in time, lead to spalling and breakup of the concrete. If an inadequate steel lap or a steel rupture occurs at a construction joint, the result is often spalling and disintegration of the surrounding concrete, and a possible pumpout. This also may provide ready accessibility for water. The primary causes of construction joint distress are poorly consolidated concrete and inadequate steel content or placement.

Number of Occurrences = (Lane Length Affected)/(25 feet)

Joint Seal Damage of Transverse Joints: Joint seal damage is any condition that enables incompressible materials to infiltrate into the joints from the surface or allows significant infiltration of water. Accumulation of incompressible materials within the joints restricts slab expansion and may result in buckling, shattering, or spalling. A pliable joint filler bonded to the edges of the slabs protects the joints from accumulation of incompressible materials, and also reduces the amount of water seeping into the pavement structure. Typical types of joint seal damage are (1) stripping of joint sealant, (2) extrusion of joint sealant, (3) weed growth, (4) hardening of the filler (oxidation), (5) loss of bond to the slab edges, and (6) lack or absence of sealant in the joint.

Each Joint = 1 Occurrence

Lane/Shoulder Joint Separation: Lane/shoulder joint separation is the widening of the joint between the traffic lane and the shoulder, generally due to movement in the shoulder. If the joint is tightly closed or well sealed so that water cannot easily infiltrate, then lane/shoulder joint separation is not considered a distress.

Number of Occurrences = (Affected Joint Length)/(25 feet)
**Pumping and Water Bleeding:** Pumping is the ejection of material by water through joints or cracks, caused by deflection of the slab under moving loads. As the water is ejected, it carries particles of gravel, sand, clay, or silt, resulting in a progressive loss of pavement support. Surface staining or accumulation of base or subgrade material on the pavement surface close to joints or cracks is evidence of pumping. Pumping may occur without such evidence, particularly when stabilized bases are used. The observation of water being ejected by heavy traffic loads after a rain storm also may be used to identify pumping. Water bleeding occurs when water seeps out of joints or cracks.

Each Joint = 1 Occurrence

**Swell:** Swell is characterized by an upward bulge in the pavement's surface. A swell may occur sharply over a small area or as a longer gradual wave. Either type of swell is usually accompanied by slab cracking. A swell is usually caused by frost action in the subgrade or by swelling soil.

Number of Occurrences = Length/(25 feet)

**Durability ("D") Cracking:** "D" cracking is a series of closely spaced crescent-shaped hairline cracks that appear on the slab surface adjacent and roughly parallel to transverse and longitudinal joints, transverse and longitudinal cracks, and the free edges of pavement slab. The fine surface cracks often curve around the intersection of longitudinal joints/cracks and transverse joints/cracks. These surface cracks often contain a calcium hydroxide residue, which causes a dark coloring of the crack and immediate surrounding area. This may eventually lead to disintegration of the concrete within 1 to 2 feet or more of the joint or crack, particularly in the wheelpaths. "D" cracking may be caused by freeze-thaw expansive pressures of certain types of coarse aggregates. Concrete durability problems caused by reactive aggregates are rated under "Reactive Aggregate Distress."

Number of Occurrences = Length/(25 feet)
Individual joints in various stages of deterioration.
Lane/Shoulder Joint Separation: Lane/shoulder joint separation is the widening of the joint between the traffic lane and the shoulder, generally due to movement in the shoulder.

Pumping and Water Bleeding: Pumping is the ejection of material by water through joints or cracks, caused by deflection of the slab under moving loads. As the water is ejected, it carries particles of gravel, sand, clay, or silt, resulting in a progressive loss of pavement support. Surface staining or accumulation of base or subgrade material on the pavement surface close to joints or cracks is evidence of pumping. Pumping may occur without such evidence, particularly when stabilized bases are used.
Durability ("D") Cracking: "D" cracking is a series of closely spaced crescent-shaped hairline cracks that appear on the slab surface adjacent and roughly parallel to transverse and longitudinal joints, transverse and longitudinal cracks, and the free edges of pavement slabs. The fine surface cracks often curve around the intersection of longitudinal joints/cracks and transverse joints/cracks. These surface cracks often contain a calcium hydroxide residue, which causes a dark coloring of the crack and immediate surrounding area. This may eventually lead to disintegration of the concrete within 1 to 2 feet or more of the joint or crack, particularly in the wheelpaths.
8. FAULTING (Portland Cement Concrete Pavement)

Slight: One to five occurrences per 0.1 mile (generally a block length).

Moderate: Six to nine occurrences per 0.1 mile (generally a block length).

Severe: Ten or more occurrences per 0.1 mile (generally a block length).

Description:

Faulting of Transverse Joints and Cracks: Faulting is the difference of elevation across a joint or crack. Faulting is caused in part by a buildup of loose materials under the approach slab near the joint or crack as well as depression of the leave slab. The buildup of eroded or infiltrated materials is caused by pumping (free moisture under pressure) due to heavy loadings. The warp and/or curl upward of the slab near the joint or crack due to moisture and/or temperature gradient contributes to the pumping condition. Lack of load transfer contributes greatly to faulting.

Each Joint = 1 Occurrence

Longitudinal Joint Faulting: Longitudinal joint faulting is a difference in elevation at the longitudinal joint between two traffic lanes.

Number of Occurrences = Length/(25 feet)

Lane/Shoulder Dropoff or Heave: Lane/shoulder dropoff or heave occurs wherever there is a difference in elevation between the traffic lane and shoulder. Typically the outside shoulder settles due to consolidation or a settlement of the underlying granular or subgrade material, or pumping of the underlying material. Heave of the shoulder may occur due to frost action or swelling soils. Dropoff of granular or soil shoulders generally is caused from blowing away of shoulder material by passing trucks.

Number of Occurrences = Length/(25 feet)

Deterioration Associated with Joint Load Transfer System (Second Stage Cracking): This distress develops as a transverse crack a short distance from a transverse joint, usually at the end of joint load transfer dowels. This usually occurs when the dowel system fails to function properly due to extensive corrosion or misalignment. It also may be caused by a combination of small diameter dowels and heavy traffic loadings.

Each Joint = 1 Occurrence
Faulting of Transverse Joints and Cracks: Faulting is the difference of elevation across a joint or crack.

Longitudinal Joint Faulting: Longitudinal joint faulting is a difference in elevation at the longitudinal joint between two traffic lanes.

Lane/Shoulder Dropoff or Heave: Lane/shoulder dropoff or heave is a difference in elevation between the traffic lane and shoulder. Typically the shoulder settles due to consolidation or a settlement of the underlying granular or subgrade material, or pumping of the underlying material.
C. UNPAVED ROADS

1. RUTTING (Overall Condition) (Unpaved Road)

   Slight: Rutting 1 to 2 inches deep.

   Moderate: Rutting 2 to 4 inches deep.

   Severe: Rutting greater than 4 inches deep.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

   Slight: When one-half or more of the surface area shows Slight distress
         OR
         A combination of distress conditions is present on one-third or more of the surface
         area with some Moderate distress and no Severe distress.

   Moderate: When one-half or more of the surface area shows Moderate distress
             OR
             A combination of distress conditions is present on one-third or more of the surface
             area with some Severe distress.

   Severe: When one-third or more of the surface area shows Severe distress.

Description:
Rutting may result from having a deficient crown, a high percentage of fines in the aggregate mix, inadequate surface drainage, or traffic has moved the aggregate to the side of the road or shoulder.
2. CORRUGATIONS (Unpaved Road)

NOTE: A corrugation shall be at least 1/2 inch in depth to be considered in the rating scheme.

Slight: Fewer than five occurrences per 0.1 mile.

Moderate: Five to ten occurrences per 0.1 mile.

Severe: More than ten occurrences per 0.1 mile.

Number of Occurrences = Length of Road Involved/(25 feet)

Description:
Corrugations are transverse ruts of relatively narrow width. Causes may result from one or more of the following:

a. Low percentage of fines,
b. Excessive superelevation in curves,
c. Insufficient cover aggregate,
d. Poor compaction of the wearing surface, or
e. Inadequate surface drainage.
Corrugations: Corrugations are transverse ruts of relatively narrow width.
3. Potholes (Unpaved Road)

NOTE: A pothole is a depression, caused by the loss of material at the pavement surface, in which water may be retained. Potholes may be very slight (just sufficient to trap water) or may extend to the top of the subgrade.

**Slight:** One to five occurrences per 0.1 mile.

**Moderate:** Five to ten occurrences per 0.1 mile and/or depth of hole is to the bottom of the base.

**Severe:** More than ten occurrences per 0.1 mile and/or depth of hole extends into the subgrade.

**Description:**

Potholes are typically the result of repeated wheel loadings and fatigue of an inadequate structure. Poor drainage will contribute by letting moisture remain in a location, making a soft spot so that traffic can displace the surface material easily. Each pothole is an occurrence.
A pothole is a depression, caused by the loss of material at the pavement surface, in which water may be retained. Potholes may be very slight (just sufficient to trap water) or may extend to the top of the subgrade.
4. AGGREGATE LOSS (Ravelling) (Unpaved Road)

Slight: Loss of fines exposing coarse aggregate.

Moderate: Loss of bond between fines and coarse aggregate. Whipping action of traffic removes some coarse aggregate.

Severe: Loss of coarse aggregate. Large amount of aggregate on shoulders or edge of travel lanes.

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:

Loss of aggregate may be the result of dust generation during dry weather, surface erosion occurring during wet weather, poor surface drainage, and traffic, all producing a low percentage of fines in the remaining pavement structure.
AGGREGATE LOSS (RAVELING)

Slight: Loss of fines exposing coarse aggregate.

Moderate: Loss of bond between fines and coarse aggregate. Whipping action of traffic removes some coarse aggregate.

Severe: Loss of coarse aggregate. Large amount of aggregate on shoulders or edge of travel lanes.
Surface Erosion: Surface erosion is the loss of fine and coarse aggregate due to a deficient crown. The loss of crown may be due to weather or to improper blading techniques or inadequate ditch outlets.

A washout is a channel cut by erosion that can extend in any direction. A secondary ditch is a washout in the roadway that is parallel to the constructed ditch.
5. SURFACE EROSION (Deficient Crown)

Slight: No secondary ditches at shoulder or washouts.

Moderate: Secondary ditches at shoulder but no washouts.

Severe: Secondary ditches or washouts at sag or vertical curves or on flat grades.

Number of Occurrences = Length of Road Involved/(25 feet).

In rating the overall condition of a survey section, the rater should recognize that various amounts of Slight, Moderate, and Severe distress may be present. Therefore, the rater shall use the following guidelines, along with the above definitions, in rating the overall condition of a section.

Slight: When one-half or more of the surface area shows Slight distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Moderate distress and no Severe distress.

Moderate: When one-half or more of the surface area shows Moderate distress

OR

A combination of distress conditions is present on one-third or more of the surface area with some Severe distress.

Severe: When one-third or more of the surface area shows Severe distress.

Description:

Surface erosion is the loss of fine and coarse aggregate due to a deficient crown. The loss of crown may be due to weather or to improper blading techniques or inadequate ditch outlets.

A washout is a channel cut by erosion that can extend in any direction. A secondary ditch is a washout in the roadway that is parallel to the constructed ditch.
6. DUST GENERATION (Unpaved Road)

The rating of this parameter shall take place at least 24 hours after a rain. The rating shall be made driving the road at 20 miles per hour. The driver shall use the rearview mirror to make the rating.

Slight: No dust can be seen.

Moderate: A haze is visible, but objects may still be seen and identified.

Severe: Nothing can be seen or identified.

Description:
Dust generation may be the result of a high percentage of fines, poor compaction, high traffic volumes, and/or weather conditions. The number of complaints from the public may be a good indicator of a potential problem.
DUST GENERATION

Slight: No dust can be seen.

Moderate: A haze is visible, but objects may still be seen and identified.

Severe: Nothing can be seen or identified.
VI. SPECIAL INSTRUCTIONS

1. A divided street has a barrier median between the two directions of traffic flow. Each side of the street shall be rated as a separate section of pavement. To distinguish between one side and the other, the BEGIN DESCRIPTION should be completed to designate the direction of movement on that section. The BEGIN and END DESCRIPTIONS will be reversed when coming from the opposite direction. Remember that an even block number will be for the direction that is the same as the increasing block number (e.g., 100, 200, ..., 1000). The opposite direction shall have an odd block number (e.g., 101, 201, ..., 1001). This is illustrated in Figure 2.

2. There often will be an unpaved or portland cement concrete section encountered during the rating of bituminous pavement sections. For those sections, a "U" for unpaved or a "C" for portland cement concrete pavements should be placed under the pavement type. All pavement inventory information should be obtained and included in the rating form. Distress information should not be entered for concrete and unpaved sections. The "C" and/or "U" code will be used to generate a distress rating form for only those sections involving the specific pavement road surface type. Similarly, if the primary pavement sections for the system involves concrete pavements, the initial distress rating forms would be developed for concrete pavements and a "P" or "U" used to denote asphaltic concrete and/or unpaved roads sections. Similarly, if the primary road surface is unpaved, a "P" and "C" should be used to denote asphaltic concrete and concrete sections as encountered.

3. Since more than one team will be doing the survey, each team should be assigned a particular area. Boundary streets, if rated, should be assigned to a team so there is no confusion and a street will not be rated twice or omitted.

4. Each team should use a map to mark the streets as the survey progresses. This is most important when trying to determine how much progress has been made and that all streets have been rated. Also, it is necessary for efficient routing while the survey is underway. Existing streets not shown on the map should be verified before rating them.

5. The survey form should be filled out neatly and in pencil. Remember that L, not S, is used for a Slight distress.

6. Every survey form should be thoroughly checked to be sure all data is completely filled out. Forms with incomplete information will be returned to the field teams for completion.
It is also important to check the percentage under alligator cracking. It should always add to 100%.

7. When a section has severe block cracking, there also may be some alligator cracking. It is important to distinguish alligator cracking from block cracking and report the extent (percentage) of each.

8. It would be proper for the rater to stop and get out of the car to closely inspect the pavement or make additional passes over a section if there is a question concerning any distress condition on the section. The rater should get out and take actual measurements of rutting periodically to keep his judgment consistent with the definitions.

9. Occasionally, a longitudinal utility cut will have settled. If this condition exists on enough of the section, it should be rated as shoving.

10. Parking lanes should not be counted under the number of lanes. However, the entire pavement width, including parking areas, will be considered when rating the section.

11. Data collection may be subdivided into two segments. Untrained personnel may be used to collect information relating to block lengths, pavement widths, and types and locations of curbs.

12. Turn-outs shall be evaluated as separate sections when separated by a median or barrier. Otherwise, the length of the turn-out shall be added to the length of the section.

13. If a block or section has to be broken into subsections because of variations in pavement condition, "STREET NAMES" for the BEGIN and END DESCRIPTIONS for the computerized data bank shall be coded as "MID BLOCK" (for streets) or "INTERVAL" (for rural sections).

14. Remarks relating to special features for the survey section shall be written on the survey form in an appropriate margin. For example, special features may include
   a. composite pavement -- asphaltic concrete/portland cement concrete and
   b. pozzolanic base.

15. Coding procedures for rural pavement sections must be modified for use with the specific data management software. Pavement condition information will be collected on a 0.2-mile interval in lieu of "block by block" as shown on the typical data form. Procedures for rural roads shall involve selection of pavement sections from one intersection to another subdivided into 0.2-mile intervals. The intermediate
termini points will be designated "interval" and will correspond to 0.2-mile increments. An example of this procedure is illustrated in Figure 3.

16. If questions arise during the survey, please feel free to contact

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College of Engineering
University of Kentucky
Lexington, Kentucky 40506-0043

Telephone: (606) 257-4524

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Transportation Research Building
533 South Limestone
Lexington, Kentucky
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Figure 3. Pavement Condition Survey Form Showing Method of Designating Section Termini in Rural Areas.