Louisiana DOTD
Distress Identification Protocols
For Jointed & Continuously Reinforced
Concrete Pavements

Introduction

This protocol defines the general guidelines and terminology used to evaluate and summarize the pavement distresses and data requirements for Jointed Concrete Pavements (JCP) & Continuously Reinforced Concrete Pavements (CRCP) to support the pavement management requirements of Transportation Asset Management. This includes both the LADOTD's Pavement Management System and the Federal 23 CFR Part 490 requirements.

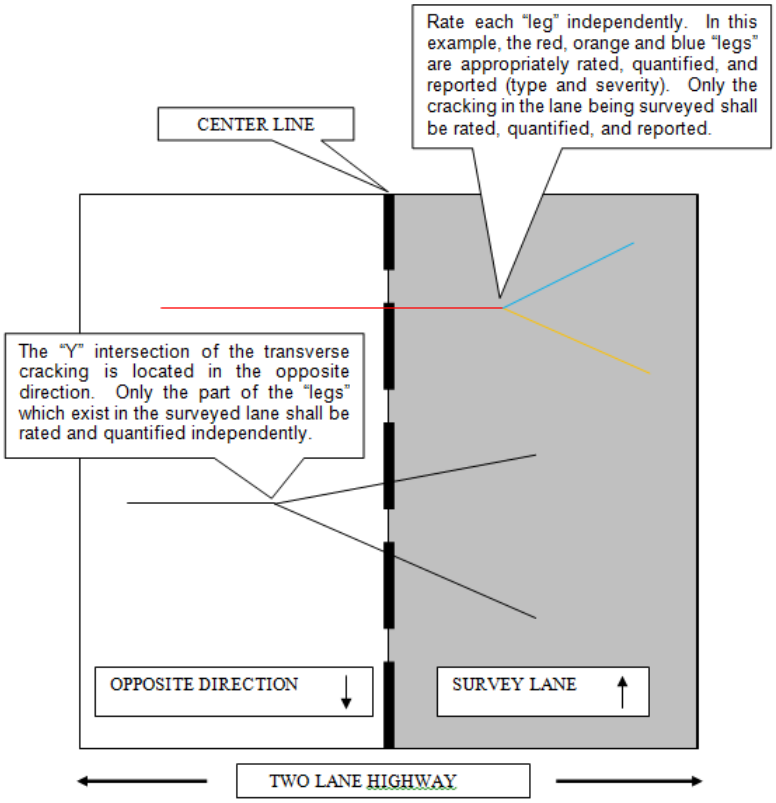
This protocol is one part of a three-part group of protocols. It shall be used in conjunction with "*Louisiana DOTD Distress Identification Protocols for Asphalt Pavements*" and "*Louisiana DOTD Distress Identification Protocols General Guidelines for All Pavements*".

Terminology

Cracking

1. **Crack** – A fissure or discontinuity of the pavement surface not necessarily extending through the entire thickness of the pavement. There is currently no minimum length for a crack.
2. **Sealed Crack** – A crack that has a sealing material applied at the pavement surface.
3. **Spalled Crack** - A crack is considered to be spalled if 10% or more of its length is spalled to a width of 1 inch or greater.
4. **PMS Index** – a PMS index is a unit-less measure used to allow the comparison of non-similar measures such as Rutting, Cracking, IRI, Patching, etc. The PMS indexes are based on a scale from 1 to 100, with 100 being perfect.
5. **Pavement Condition Index** – a unit-less measure resulting from the combination of other indexes into a single "pavement condition" index for each different pavement type.
6. **Longitudinal Crack** - Cracks in pavements that are predominantly parallel to the direction of traffic.
7. **Longitudinal Crack Index** - The unit-less cracking index for Longitudinal Cracking.

8. **Transverse Crack** - cracks in pavements that are predominantly perpendicular to the direction of traffic.
9. **Transverse Crack Index** - The unit-less cracking index for Transverse Cracking.
10. **Random Cracking** – cracks in pavements that include both perpendicular cracks and transverse cracks but has neither as the predominate type of crack.
11. **Corner Break** - a longitudinal crack that connects a longitudinal joint to an adjacent transverse joint. The corner break will intersect the transverse joint, at a point that is within one half of the analysis lane's width. The longitudinal crack with then extend to the adjacent, nearest longitudinal joint, and will typically not exceed a length of 12 feet.
12. **"Y" Cracks** – These are intersecting transverse cracks with each "leg" rated independently. In this image below, rate only the section in the survey lane.



Patching

1. **Patch** – An area of pavement surface that has been repaired with the addition of new material to correct an irregularity in the pavement surface, after the original construction.
2. **Patching Index** – The unit-less index for Patching.

3. **Patch Deterioration** – a patch that has begun to crack or show other measurable distresses. The patch should be rated, as per the type/severity of the distresses on the patch. The distresses on the patch should also be rated.

Punch Out

- A Punch out is the localized area of the slab that is punched down into the base material. It is generally broken into pieces, aggregate interlock has been lost and steel rupture has occurred. These can **only occur** on Continuously Reinforced Concrete (CRCP) Pavements.

Blow Up

- A localized upward movement of the pavement surface that usually occur at a transverse joint or crack, often accompanied by shattering of the concrete in that area. With respect to this protocol, in nearly every case, a patch has been used to repair the blowup. Although the blowup may have been repaired, cracks may still be evident. See EXHIBIT 29 for an example.

High/Low Shoulders

- The elevation difference between the right-side shoulder and pavement edge, regardless of the shoulder type.

Roughness

1. Roughness is defined by the current ASTM E867 as "The deviation of a surface from a true planar surface with characteristic dimensions," also known as the longitudinal profile, "that affect vehicle dynamics and ride quality" or its replacement.
2. **International Roughness Index (IRI)** - The standard measure, reported in units of inches/mile, which is used to determine the longitudinal profile of a pavement surfaces. Roughness data is currently acquired using a Class II laser type profiler calibrated using the Quarter Car Simulation approach.
3. **PMS Roughness Index** – The unit-less index for pavement Roughness.

Macrotexture

- Macrotexture is a measure the frictional properties of a pavement surface, using noncontact technologies. With respect to these protocols, DOTD only uses macrotexture for friction purposes.

Condition Ratings and Classifications

Sealed Cracks

1. The Sealed Crack flag, Sealed Crack, will be coded with a value of "1" for each tenth (0.100)

mile segment containing sealed cracks.

2. Cracks that have been sealed shall not be rated for the PMS, except where the sealant has failed.
3. Any crack that extends beyond the sealed area shall be treated as a crack and rated.
4. The lengths of visible Sealed Cracks will be measured and reported per Federal Part 490 requirements.
5. A sealed Transverse Crack on a jointed concrete pavement shall be considered a Transverse Crack for Federal Part 490 reporting requirements.
6. See Exhibit 1.

Longitudinal Cracking (JCP & CRCP)

1. Identify any visible Longitudinal crack on both JCP and CRCP pavements.
2. Any cracking that exist outside of the analysis lane width shall not be rated, quantified, or reported.
3. Any Longitudinal cracking that is found within a repaired patch shall be rated, quantified, and reported as Longitudinal cracking.
4. Estimate the mean crack width in inches and the length to the nearest foot.
5. For PMS purposes, Report Longitudinal Cracking, for both JCP and CRCP pavements, in linear feet, per severity level, for each tenth (0.100) mile.
6. For Federal Part 490 purposes, Report Longitudinal Cracking, for CRCP pavements only, in linear feet for each tenth (0.100) mile. Do not report "No Severity" cracking as identified below.
7. Classify Longitudinal Cracking as one of the severity levels listed below.
    a. **No Severity (Level 0):**
        i. Cracks that have no depth as determined by the new 3-D laser crack measuring technology.
        ii. Note these cracks are not included in the Federal Part 490 reporting requirement.
    b. **Low Severity (Level 1):**
        i. Cracks <0.25 inches in width with no spalling.
        ii. See EXHIBITs 11, 12 and 13.
    c. **Medium Severity (Level 2):**
        i. Cracks >0.25 inches in width with no spalling.
        ii. See EXHIBITs 14, 15 and 16.
    d. **High Severity (Level 3):**

i. Any longitudinal crack with spalling.

ii. See EXHIBITs 17, 18 and 19.

Longitudinal Cracking Index (JCP & CRCP)

1. The Longitudinal Cracking Index will be used for both JCP and CRCP pavements but only by the PMS.
2. The formula for the Longitudinal Cracking Index, and the Deduct tables are as follows:

   LONG = MIN (100, MAX (0, 100 – LNGCRK_L DEDUCT – LNGCRK_M DEDUCT – LNGCRK_H DEDUCT))

Update with new 3D extents

LONGITUDINAL CRACKING DEDUCTS (JCP & CRC)						
SEVERITY	EXTENT (Linear Feet)					
	0-11	11-31	31-131	131-261	261-1000	> 1000
LOW	0	1-13	13-23	23-31	31-35	35
MED	0	1-16	16-41	41-49	49-61	61
HIGH	0	1-20	20-46	46-63	63-70	70

Transverse Cracking (JCP & CRCP)

1. Identify any visible Transverse crack on both JCP and CRCP pavements.
   a. While Transverse Cracking and the Transverse Cracking Index will apply only to JCP pavements, this data capture method will provide the necessary data, in the most feasible manner, for DOTD to correct a pavement type identification error.
2. Any cracking that exist outside of the analysis lane width shall not be rated, quantified, or reported.
3. Rate each “Y” crack “leg” independently.
4. Any Transverse cracking that is found within a repaired patch shall be rated, quantified, and reported as Transverse cracking.
5. Estimate the mean crack width in inches and the length to the nearest foot.
6. For PMS purposes, report Transverse Cracking in linear feet, per severity level, for each tenth (0.100) mile.
7. For Federal Part 490 purposes, report for JCP pavements only, Transverse Cracking in

linear feet, for each tenth (0.100) mile. Also identify any JCP pavement slab with a Transverse Crack in that slab, including any sealed Transverse Cracks.

8 Classify Transverse Cracking as one of the severity levels listed below.

a. No Severity (Level 0):

i. Cracks that have no depth as determined by the new 3-D laser crack measuring technology.

ii. Note these cracks are not included in the Federal Part 490 reporting requirement.

b. Low Severity (Level 1):

i. Cracks <0.25 inches in width with no spalling.

ii. See EXHIBITs 2, 3 and 4.

c. Medium Severity (Level 2):

i. Cracks >0.25 inches in width with no spalling.

ii. See EXHIBITs 5, 6 and 7.

d. High Severity (Level 3):

i. Any transverse crack with spalling.

ii. See EXHIBITs 8, 9 and 10.

Transverse Cracking Index (JCP only)

1. The Transverse Cracking Index will be used only for JCP pavements and only by the PMS.
2. The formula for the Transverse Cracking Index, and the Deduct tables are as follows:

TRAN = MIN (100, MAX (0, 100 – TRNCRK_L DEDUCT – TRNCRK_M DEDUCT – TRNCRK_H DEDUCT))

Update with new 3D extents

TRANSVERSE CRACKING DEDUCTS (JCP)						
SEVERITY	EXTENT (Linear Feet)					
	0-13	13-49	49-241	241-469	469-2900	> 2900
LOW	0	1-13	13-23	23-31	31-35	35
MED	0	1-16	16-41	41-49	49-61	61
HIGH	0	1-20	20-46	46-63	63-77	77

PMS Random Cracking

1. Random Cracking will be reported for all cracking, longitudinal and transverse, found on JCP & CRCP pavements but only for the PMS.
   a. Random Cracking will be captured to provide the necessary data, in the most feasible manner, for DOTD to correct a pavement type identification error.
2. Any cracking that exist outside of the analysis lane width shall not be rated, quantified, or reported.
3. Any random cracking that is found within a repaired patch shall be rated, quantified, and reported as random cracking.
4. For each Severity Levels, random cracking quantities represent the sum of both longitudinal and transverse cracking.
5. Report Random Cracking in linear feet, per severity level, for each tenth (0.100) mile.
   a. **No Severity (Level 0):**
      i. Cracks that have no depth as determined by the new 3-D laser crack measuring technology.
   b. **Low Severity (Level 1):**
      i. All Longitudinal and/or Transverse cracks, less than 0.250 inches wide, with no interconnected cracks.
      ii. See EXHIBITs 21 and 22.
   c. **Medium Severity (Level 2):**

   Either of the following two cases:
      i. All Longitudinal and/or Transverse cracks that are greater than or equal to 0.25 inches wide but less than 0.50 inches wide, with no interconnecting cracks of the same width;
      ii. A network of polygons or blocks whose density is as shown in EXHIBITs 24, 25, 26 and 27.
   d. **High Severity (Level 3):**

   Either of the following two cases:
      i. All Longitudinal and/or Transverse cracks that are greater than 0.50 inches wide, with no interconnecting cracks;
      ii. A network of polygons or blocks whose density is as shown in EXHIBIT 28 and 29.

Punch Outs (CRCP Only)

1. A Punch Out occurs only on Continuously Reinforced Concrete (CRCP) Pavements and is the localized area of the slab that is broken into pieces. Aggregate interlock is lost, leading

to steel rupture, and allowing the pieces to be punched down into the base. Punch outs shall be rated, quantified, and reported, and classified into one of three severity levels (low, medium or high).

2. Report Punch Outs in square feet, per severity level, for each tenth (0.100) mile.
3. Report number, or total count of Punch Outs for each tenth (0.100) mile.
4. Classify Punch Outs as one of the severity levels listed below.
   a. **Low Severity (Level 1):**
      i. Longitudinal and transverse cracks are tight and may have spalling <3.00 inches or faulting <0.25 inches with no loss of material and no patching. This does not include "Y" cracks.
      ii. See EXHIBIT 30.
   b. **Medium Severity (Level 2):**
      i. Spalling >3.00 inches and <6.00 inches or faulting >0.25 inches and < .5 inches exists.
      ii. See EXHIBIT 31.
   c. **High Severity (Level 3):**
      i. Spalling >6.00 inches, or concrete within the punch out is punched down by >0.50 inches or is loose and moves under traffic or is broken into two or more pieces or contains patch material.
      ii. See EXHIBIT 32
5. For quantification purposes, add the total square footage of the Punch Outs to the square footage recorded for high severity patching.

Blow Ups

1. With respect to this protocol, a Blow Up repair could be temporary spot patching using a different material, or a semi-permanent full patch using different material.
2. When a semi-permanent full patch using a different material has occurred, the patching, not the repair itself, shall be rated, quantified, and reported according to the appropriate patching distress levels.
3. For quantification purposes, add the total square footage of the temporary spot patched Blow Ups to the square footage recorded for high severity patching.
4. In all cases, report Blow Ups in square feet for each tenth (0.100) mile.
5. In all cases, report number, or total count of Blow Ups for each tenth (0.100) mile.
6. See EXHIBIT 29 for an example of a temporary spot patch for a blowup.

Faulting (JCP Only)

1. The requirements of the current AASHTO R36-13 Evaluating Faulting of Jointed Concrete Pavements (JCP), or its replacement, shall be exceeded as defined below.
2. Faulting data shall be captured in the right wheel path only for 100% of the analysis lanes on all jointed concrete pavements.
   a. Real time fault data capture and reporting will Not be acceptable.
   b. Pavement images shall be synchronized with the faulting data.
   c. The actual location of all construction joints for the jointed concrete pavement via pavement images shall be clearly marked on the pavement images.
   d. Joint location will Not be solely established via algorithms, similar to ProVal, or via a pre-defined nominal joint spacing variable such as 20 foot spacing.
      i. Joint location can be initially programmatically determined, but the final actual joint locations must be manually validated, prior to determine faulting values.
3. Post process generated faulting values, using no minimum fault threshold, shall be provide at each actual joint location.
4. Faulting depth data will be captured and reported to the nearest 0.04 inch (1 mm), or to the lowest measure that can be practically or reasonably achieved with the DOTD approved technology.
   a. Where the "approach" slab is higher than the "departure" slab, faulting will be reported as a positive (+) fault.
   b. Where the "approach" slab is lower than the "departure" slab, faulting will be reported as a negative (-) fault.
5. The average faulting, for each tenth (0.100) mile increment (528 feet), will be calculated using the absolute value of all fault measures, including fault measures of (0.0 inch) values, and using the actual number of manually identified joints.
6. The location of each defined joint shall be provided to the nearest thousandth (0.001) of a mile (5.28 feet), control section logmile, LRS-ID logmile, and include the GPS coordinates.
7. The maximum positive fault, maximum negative fault, the computed average faulting and the number of identified joints for each tenth (0.100) mile increment (528 feet) shall be reported.
8. There is no Faulting Index. Faulting values are managed directly via treatment selection triggers in the Pavement Management System.

Patching

1. Patching that exist outside of the analysis lane zones shall not be rated.
2. A patch that has an area of at least one (1) square foot shall be rated, quantified, and reported.
3. When rating patching, the rating shall not overlap different areas to be rated, to prevent

patching quantities from being double counted.

4. When a Blow Up has been repaired, with a semi-permanent full patch using a different material, the patching, not the repair itself, shall be rated, quantified, and reported according to the appropriate patching severity distress levels.
5. Report Patching in square feet, per severity level, for each tenth (0.100) mile.
6. Report number, or total count of patches for each tenth (0.100) mile.
7. Classify Patching as one of the severity levels listed below.

a. No Severity (Level 0):

i. Existing patch show no distress of any type.

ii. Existing patch may have sealed cracking where the sealant has not failed.

iii. An existing patch that has been applied in a seamless manner.

iv. See Exhibit 20.

b. Low Severity (Level 1):

i. A patch, of the original pavement material, that does not exhibit distress of any type, shall not be rated or quantified.

ii. An existing patch, of the original pavement material, has low severity distress of any type.

iii. An existing patch, of the original pavement material, has had additional patching material added by removing some existing patch material and applying new material in a nearly seamless manner.

iv. See EXHIBITs 21 and 22.

c. Medium Severity (Level 2):

i. Patch has medium severity distress of any type.

ii. See EXHIBITs 23, 24 and 25.

d. High Severity (Level 3):

i. A patch that has high severity distress of any type.

ii. Any corner break, spalled area or any area that is in need of patching.

iii. An area that has been patched using material that is not consistent with the existing pavement surface, e.g., asphalt patch on a concrete pavement or gravel patch on a concrete pavement.

iv. Blow Up repairs using temporary spot patching with a different material from the original pavement are to be considered High Severity (Level 3) patching. Include the entire Blow Up area in square feet.

v. Punch Outs are to be considered High Severity (Level 3) patching. Include the entire

Punch Out area in square feet.

vi. See EXHIBITs 25, 26, 27 and 28.

Patching Index

- The formula for the Patching Index, and the Deduct table are as follows:

PTCH = MIN (100, MAX (0, 100 - PATCH_L DEDUCT – PATCH_M DEDUCT - PATCH_H DEDUCT))

Update with new 3D extents

PATCHING DEDUCTS (JCP & CRC)							
SEVERITY	EXTENT (Square Feet)						
	0-31	31-81	81-151	151-251	251-501	501-6336	> 6336
LOW	0	1-2	2-6	6-12	12-15	15-20	20
MED	0	1-4	4-11	11-31	31-40	40-45	45
HIGH	0	1-11	11-20	20-35	35-47	47-65	65

Roughness – (IRI) International Roughness Index

1. Conformance to the current ASTM E950-09 Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference, or its replacement, is expected.
2. Conformance to the current AASHTO R43-13 Standard Practice for Quantifying Roughness of Pavements, or its replacement, is expected.
3. The lowest allowable speed at which the Data Collection Vehicle (DCV) can accurately capture valid IRI measurements shall be provided.
4. The longitudinal profile of a pavement surface shall be captured in both wheel paths, for 100% of all Analysis Lane Miles. Roughness data shall be acquired using a Class II laser type profiler supplied and calibrated using the Quarter Car Simulation approach.
5. In LADOTD protocols, International Roughness Index (IRI) and Mean Roughness Index (MRI) are the same thing, and these terms are used interchangeably. The term IRI is predominately used.
6. International Roughness Index (IRI) shall be reported in units of inches/mile.

7. Longitudinal profile data should be provided for every one (1) inch of pavement, while the computed IRI values shall be summarized and retained for every four (4) inches of pavement in the left wheel path and the right wheel paths, along with the standard deviations of the left and right wheel paths.
8. IRI values will be summarized in section lengths of 0.004 miles (21.12 feet).
9. Computed IRI values shall be averaged and reported for each tenth (0.100) mile segment (528 feet) for both the left and right wheel paths. These reports shall include an average IRI for the tenth (0.100) mile segment.

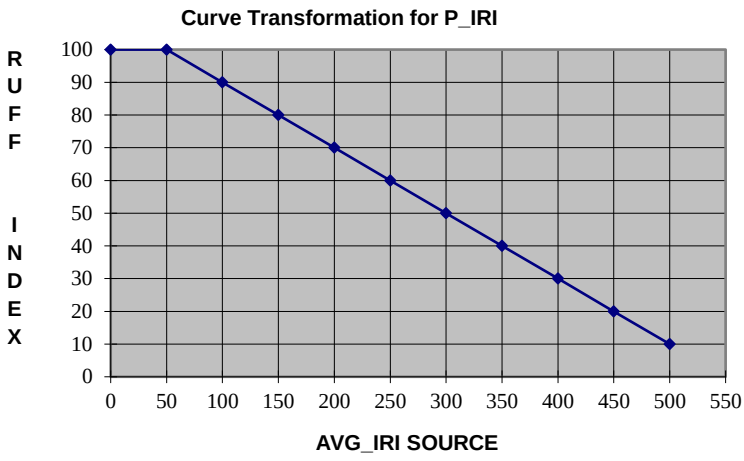
PMS Roughness Index

1. The formula for the PMS Roughness Index is as follows:

RUFF = MIN (100,100-((Avg_IRI *(1/5))-10))

2. The IRI to PMS Roughness Index cross reference is shown in a table format below, and graphically via the curve transformation.

ROUGHNESS INDEX	
AVG_IRI	RUFF Index
0	100
50	100
100	90
150	80
200	70
250	60
300	50
350	40
400	30
450	20
500	10



Pavement Condition Index

1. A Pavement Condition Index is calculated from the other indexes for each pavement type.
2. The formula for the JCP Pavement Condition Index is as follows:

JCP Pavement Condition Index = [MAX(MIN(LONG,TRAN,PTCH,RUFF)), (AVG(LONG,TRAN,PTCH,RUFF))] – 0.85 (STD(LONG,TRAN,PTCH,RUFF)))

3. The formula for the CRCP Pavement Condition Index is as follows:

CRCP Pavement Condition Index = [MAX(MIN(LONG,PTCH,RUFF)),

(AVG(LONG,PTCH,RUFF))] – 0.85 (STD(LONG,PTCH,RUFF)))

JCP Pavement Condition Index Example Calculation

Note: Must use the Standard Deviation, not the sample standard deviation

Longitudinal Cracking Index (LONG) = 90

Transverse Cracking Index (TRAN) = 80

Patching Index (PTCH) = 80

Roughness Index (RUFF) = 70

Number of Index Measures (N) = 4

Average (AVG) of (LONG, TRAN, PTCH, RUFF) = AVG (90, 80, 80, 70) = (90, 80, 80, 70) / 4 = 320/4 = **80**

	X	X-AVG	(X-AVG)^2
Longitudinal	90	10	100
Transverse	80	0	0
Patching	80	0	0
Roughness	70	-10	100
Σ	320		200

N = 4

Standard Deviation (STD) = SQRT {[∑ (X-AVG) ^2] / N**}** = SQRT {200/4} = SQRT {50} = **7.1**

JCP Pavement Condition Index formula = [MAX(MIN(LONG,TRAN,PTCH,RUFF)), (AVG(LONG,TRAN,PTCH,RUFF))] – 0.85 (STD(LONG,TRAN,PTCH,RUFF)))

JCP Pavement Condition Index = Max [min 70 or **avg 80**] - 0.85(7.1) = 80 – 6.0 = **74**

Miscellaneous

Bridges

- Concrete bridge surfaces will always be considered (JCP) Jointed Concrete Pavements and shall be rated per this protocol.

Tunnels

- Concrete Tunnel surfaces will always be considered (JCP) Jointed Concrete Pavements and shall be rated per this protocol.

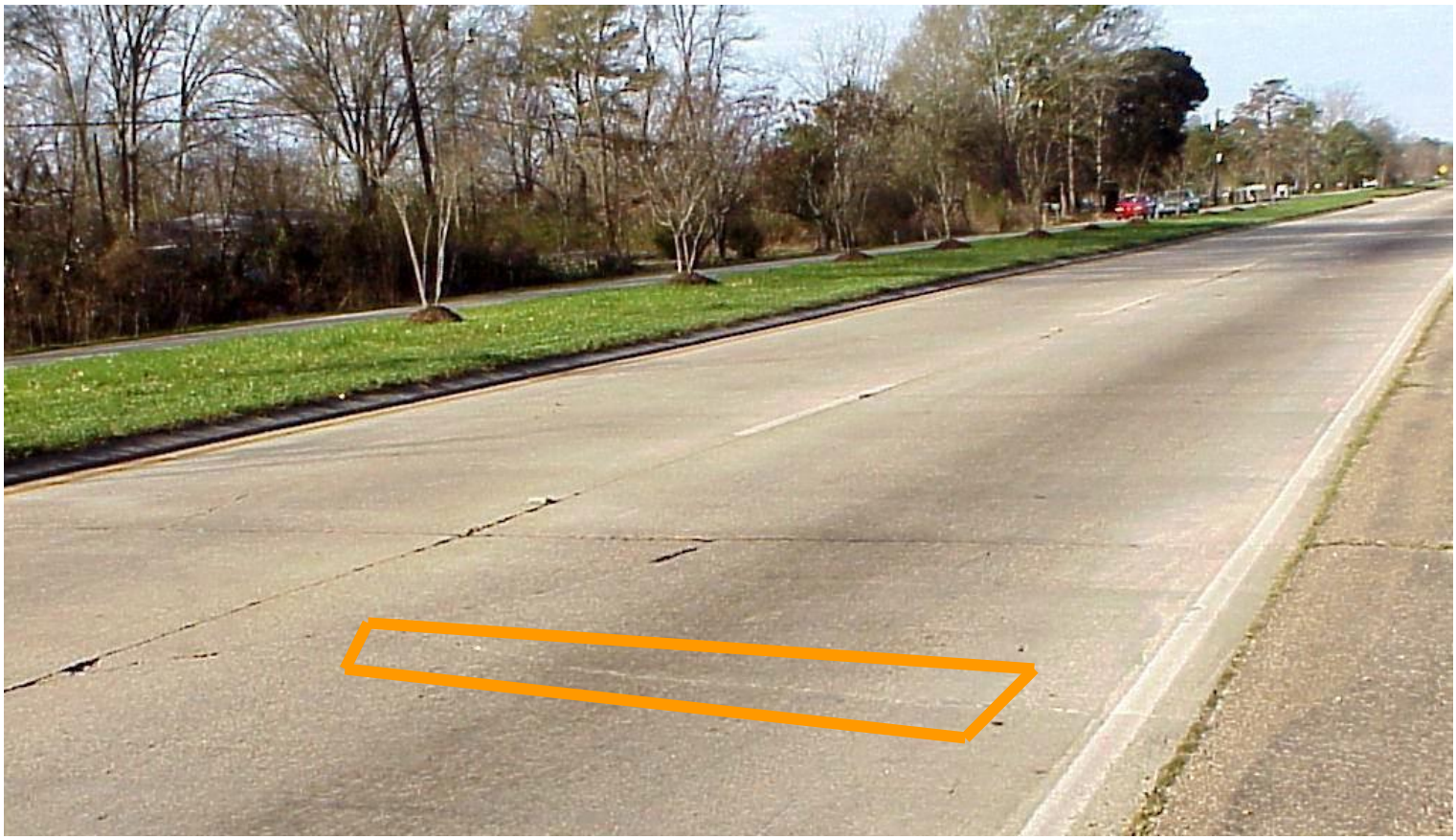
Exhibit 1 - SEALED CRACK

Within the orange box above is a sealed crack for Concrete Pavements.

A sealed crack should be measured for Federal Part 490 analysis, but not be rated for a PMS analysis.

Exhibit 2 - TRANSVERSE CRACK

LOW SEVERITY (Level 1)



Within the orange box above is low severity transverse cracking for Concrete Pavements.

Exhibit 3 - TRANSVERSE CRACK

LOW SEVERITY (Level 1)

Within the orange box above is low severity transverse cracking for Concrete Pavements.

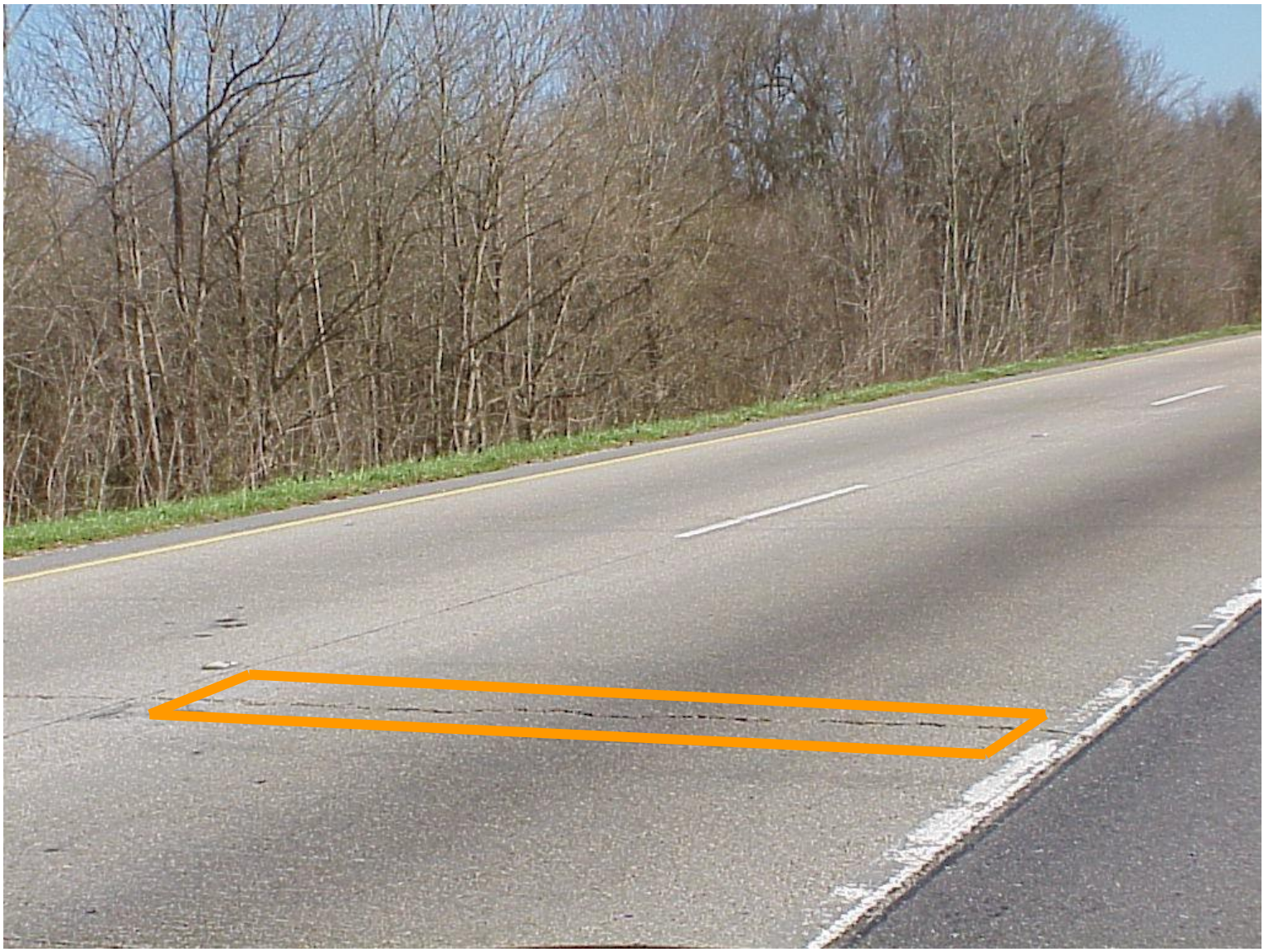
Exhibit 4 - TRANSVERSE CRACK

LOW SEVERITY (Level 1)

Within the orange box above is low severity transverse cracking for Concrete Pavements.

Exhibit 5 - TRANSVERSE CRACK

MEDIUM SEVERITY (Level 2)



Within the orange box above is medium severity transverse cracking for Concrete Pavements.

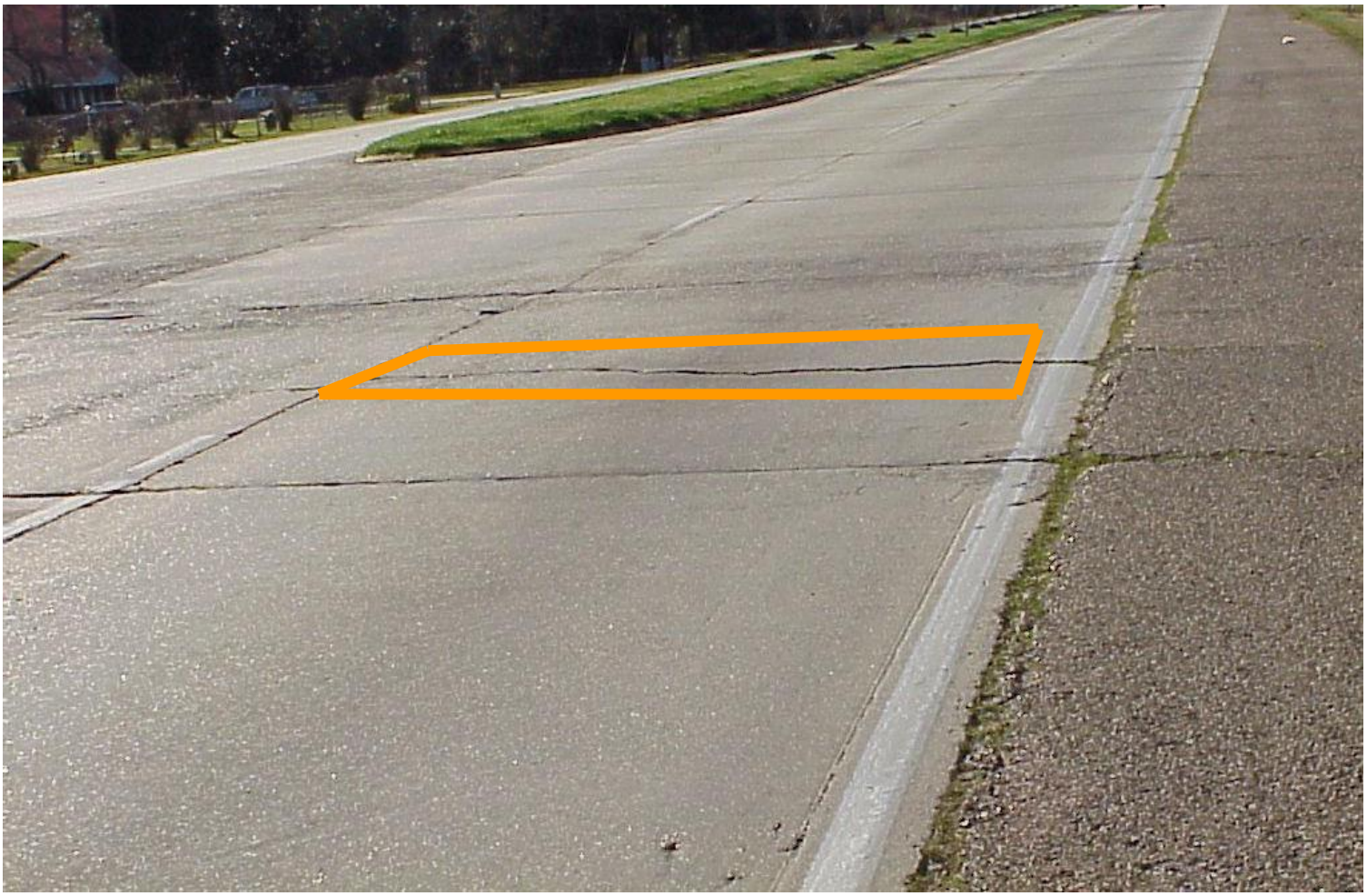
Exhibit 6 - TRANSVERSE CRACK

MEDIUM SEVERITY (Level 2)

Within the orange box above is medium severity transverse cracking for Concrete Pavements.

Exhibit 7 - TRANSVERSE CRACK

MEDIUM SEVERITY (Level 2)



Within the orange box above is medium severity transverse cracking for Concrete Pavements.

Exhibit 8 - TRANSVERSE CRACK

HIGH SEVERITY (Level 3)

Within the orange box above is high severity transverse cracking for Concrete Pavements.

Exhibit 9 - TRANSVERSE CRACK

HIGH SEVERITY (Level 3)

Within the orange box above is high severity transverse cracking for Concrete Pavements.

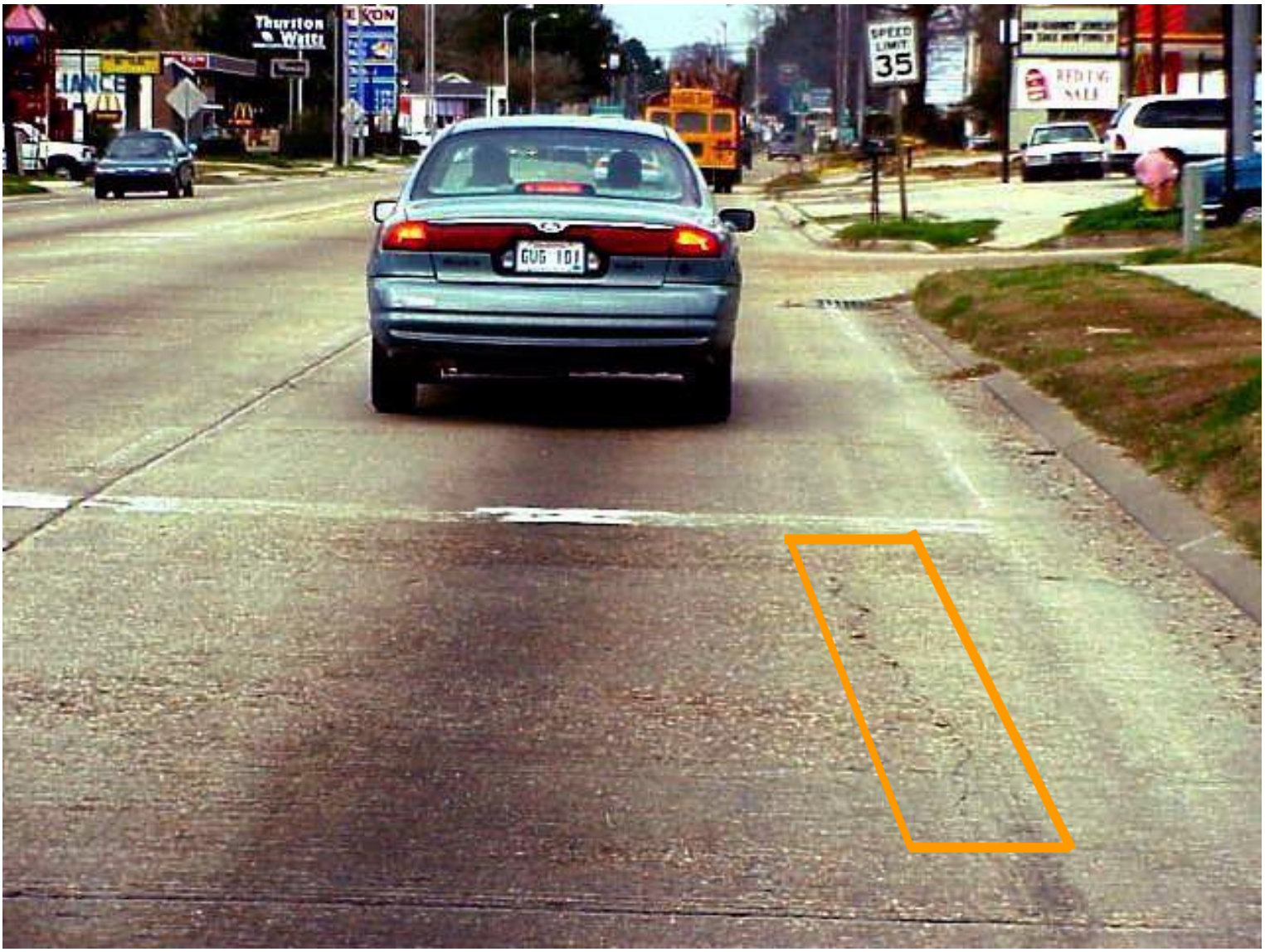
Exhibit 10 - TRANSVERSE CRACK

HIGH SEVERITY (Level 3)

Within the orange box above is high severity transverse cracking for Concrete Pavements.

Exhibit 11 - LONGITUDINAL CRACK

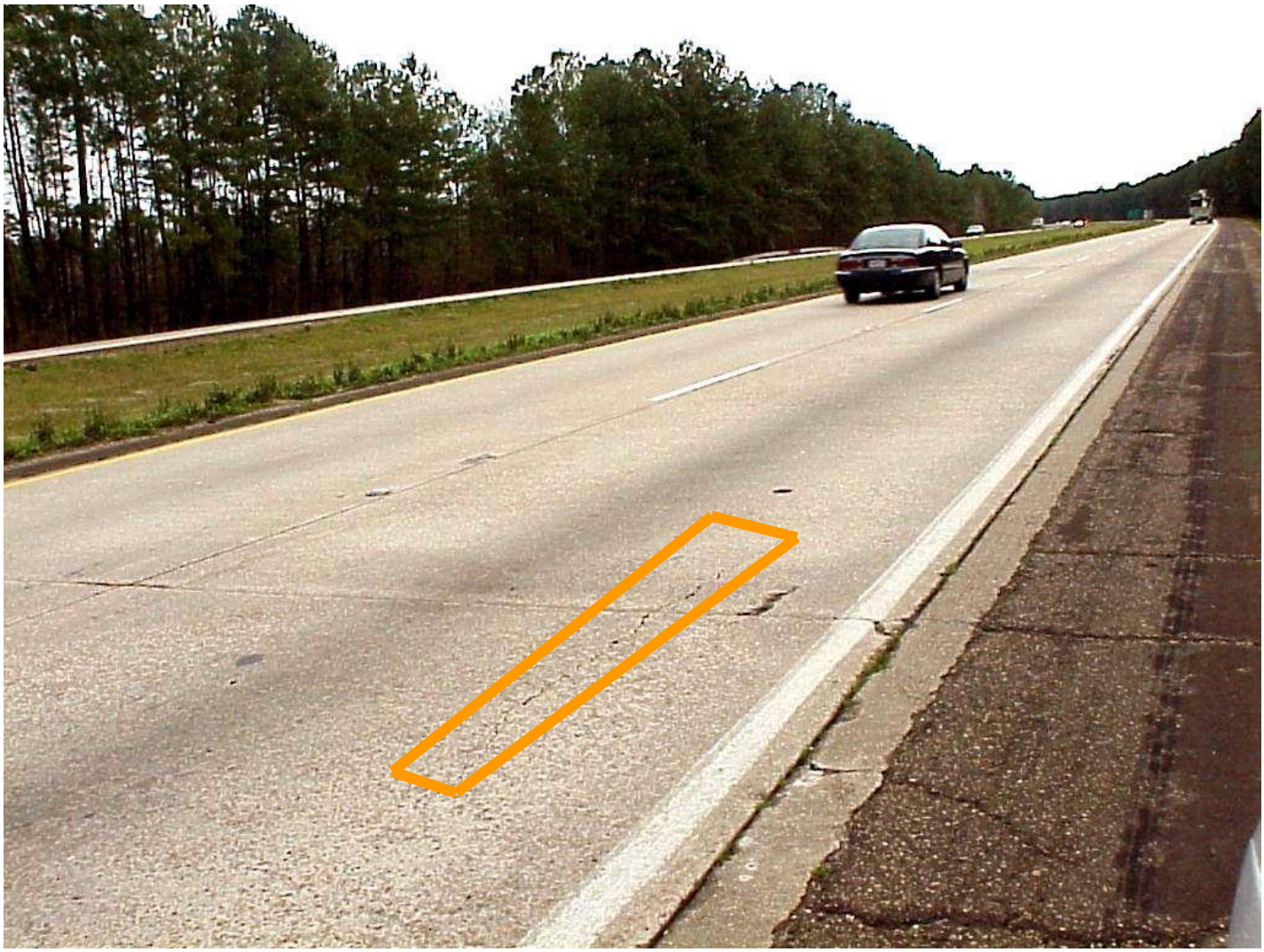
LOW SEVERITY (Level 1)



Within the orange box above is low severity longitudinal cracking for Concrete Pavements.

Exhibit 12 - LONGITUDINAL CRACK

LOW SEVERITY (Level 1)



Within the orange box above is low severity longitudinal cracking for Concrete Pavements.

Exhibit 13 - LONGITUDINAL CRACK

LOW SEVERITY (Level 1)

Within the orange box above is low severity longitudinal cracking for Concrete Pavements.

Exhibit 14 - LONGITUDINAL CRACK

MEDIUM SEVERITY (Level 2)

Within the orange box above is medium severity longitudinal cracking for Concrete Pavements.

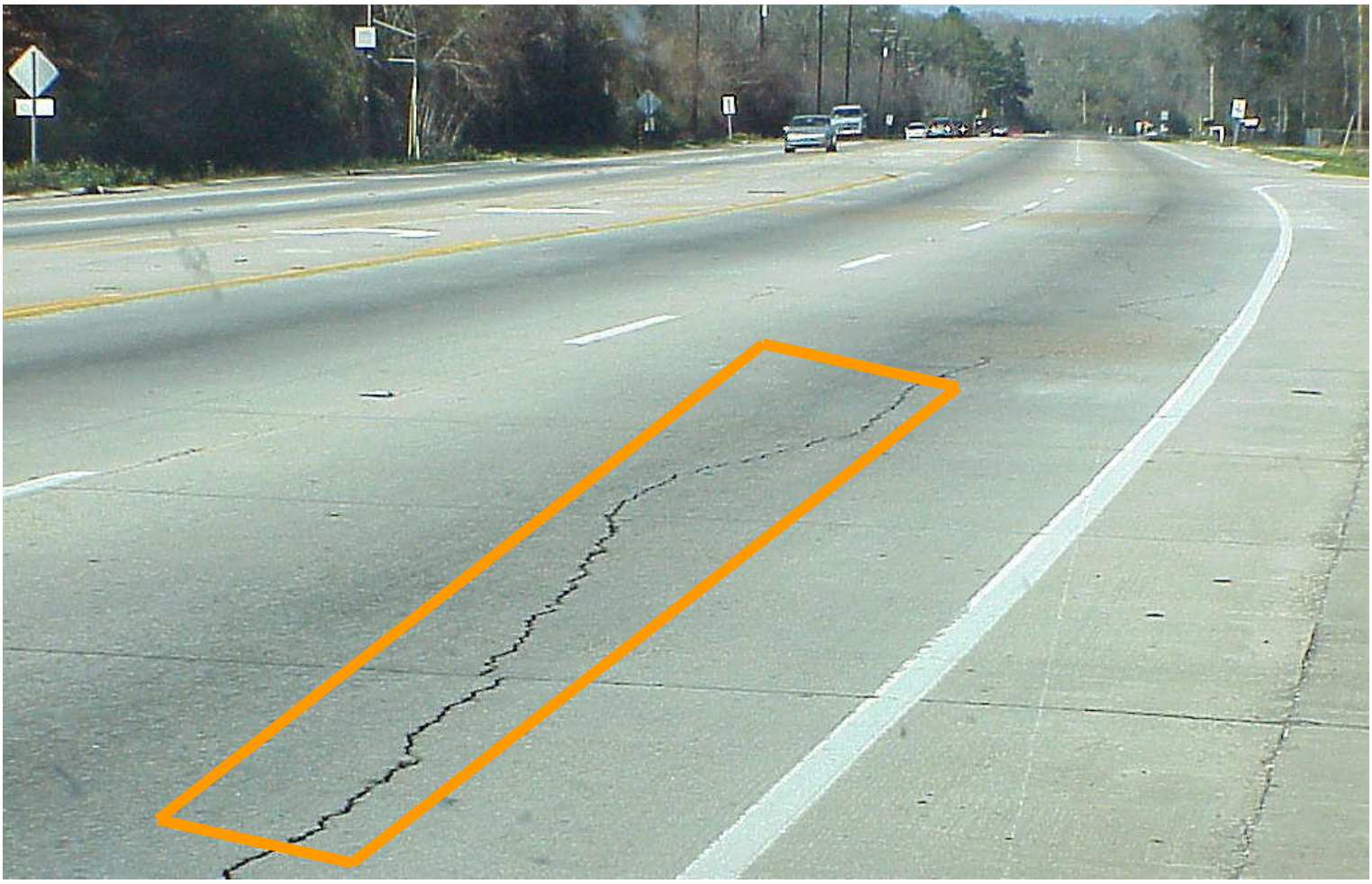
Exhibit 15 - LONGITUDINAL CRACK

MEDIUM SEVERITY (Level 2)

Within the orange box above is medium severity longitudinal cracking for Concrete Pavements.

Exhibit 16 - LONGITUDINAL CRACK

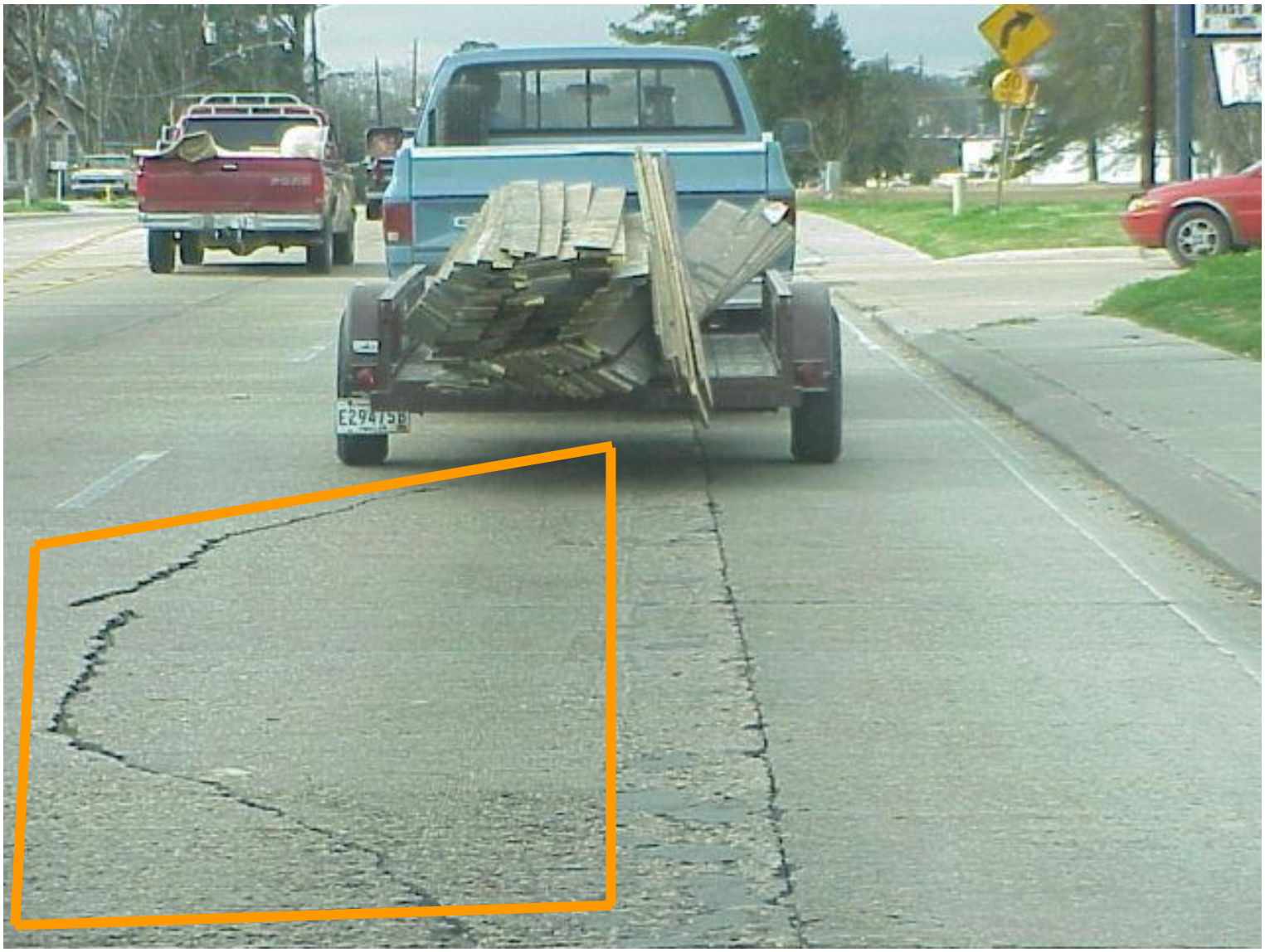
MEDIUM SEVERITY (Level 2)



Within the orange box above is medium severity longitudinal cracking for Concrete Pavements.

Exhibit 17 - LONGITUDINAL CRACK

HIGH SEVERITY (Level 3)



Within the orange box above is high severity longitudinal cracking for Concrete Pavements.

Exhibit 18 - LONGITUDINAL CRACK

HIGH SEVERITY (Level 3)

Within the orange box above is high severity longitudinal cracking for Concrete Pavements.

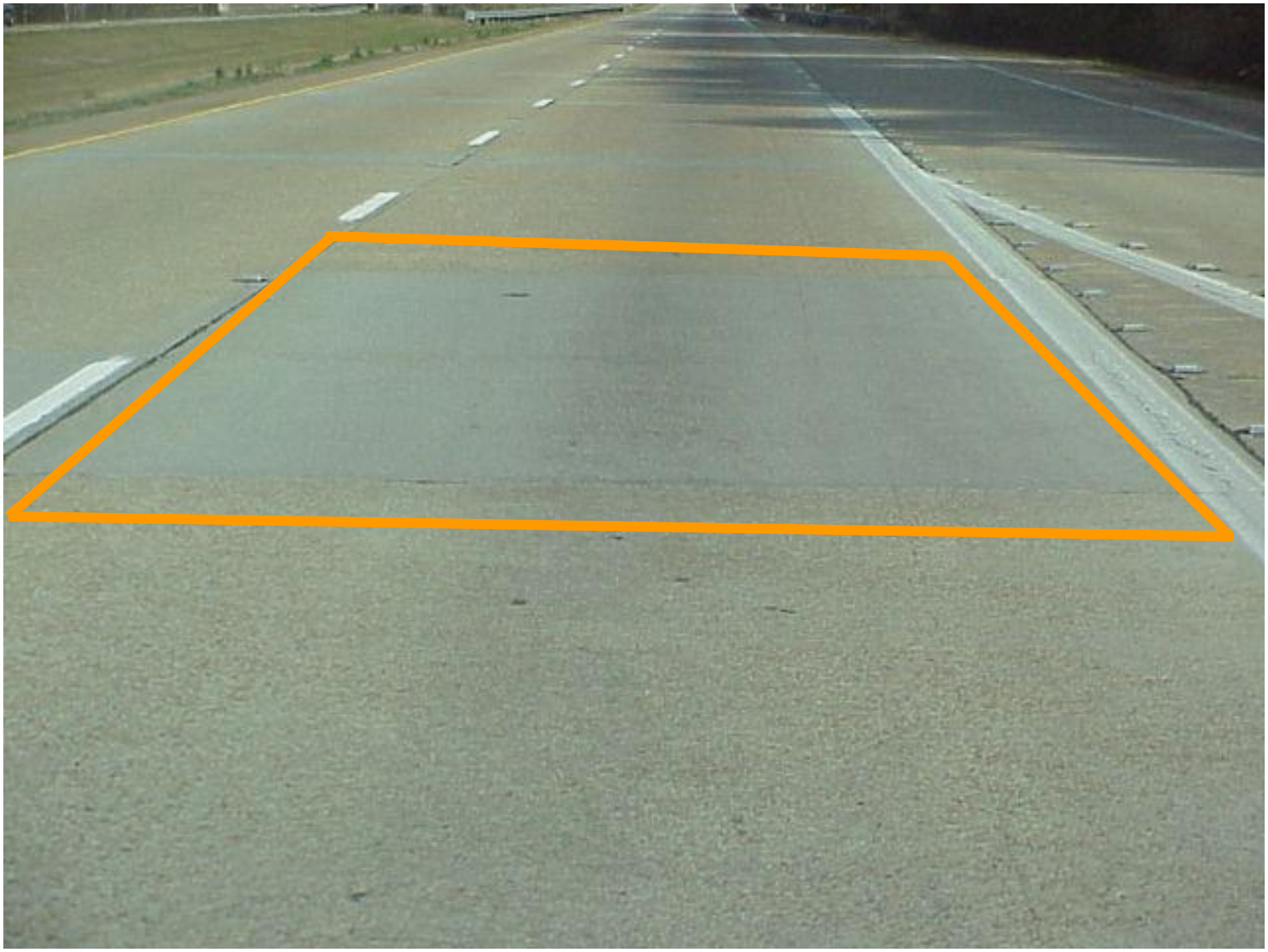
Exhibit 19 - LONGITUDINAL CRACK

HIGH SEVERITY (Level 3)

Within the orange box above is high severity longitudinal cracking for Concrete Pavements.

Exhibit 20 - PATCHING

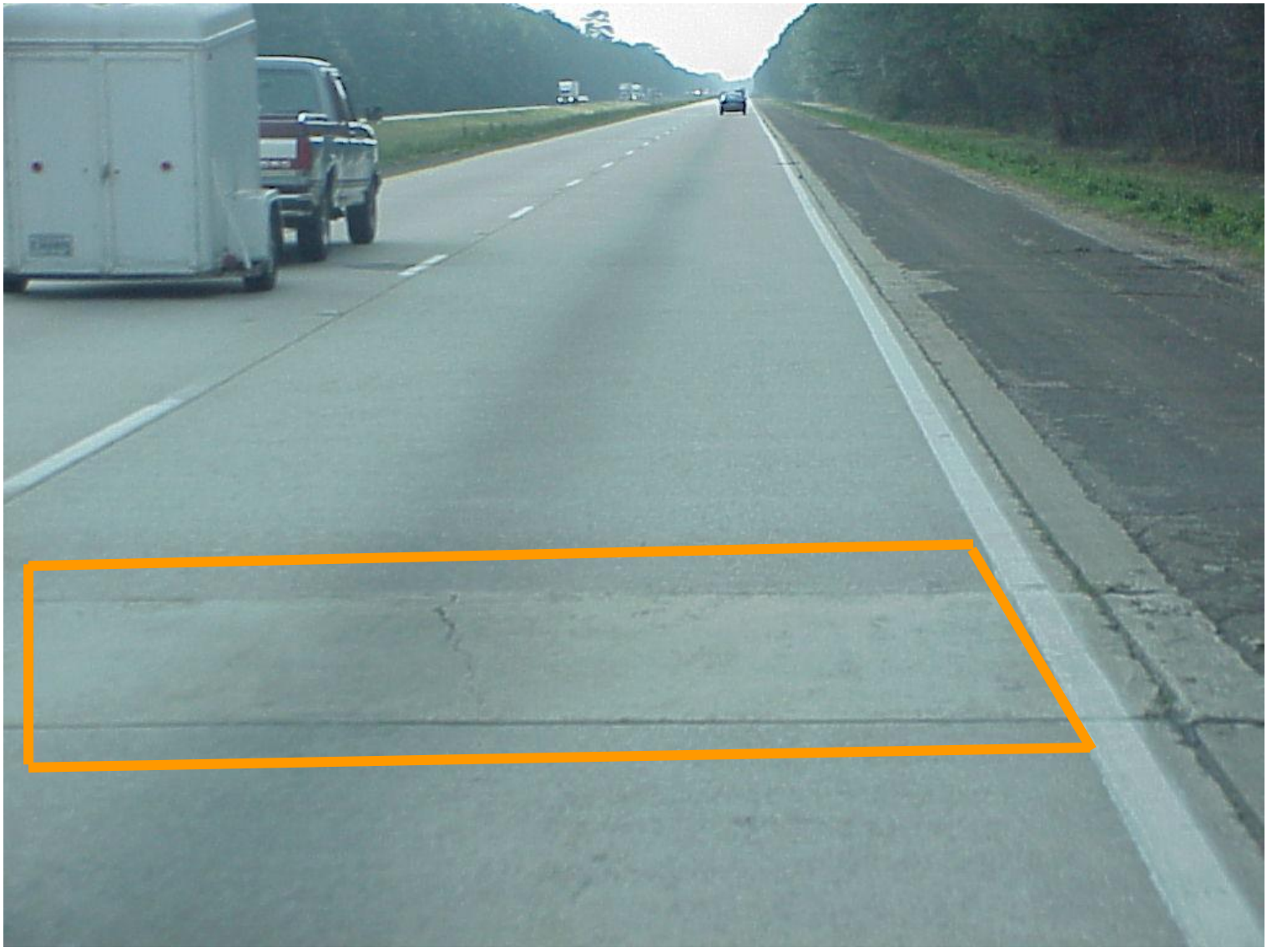
NO SEVERITY (Level 0)



Within the orange box above is no severity patching for Concrete Pavements. ***Note that there are no distresses of any type within this patch; therefore, it would not be rated/quantified.***

Exhibit 21 - PATCHING

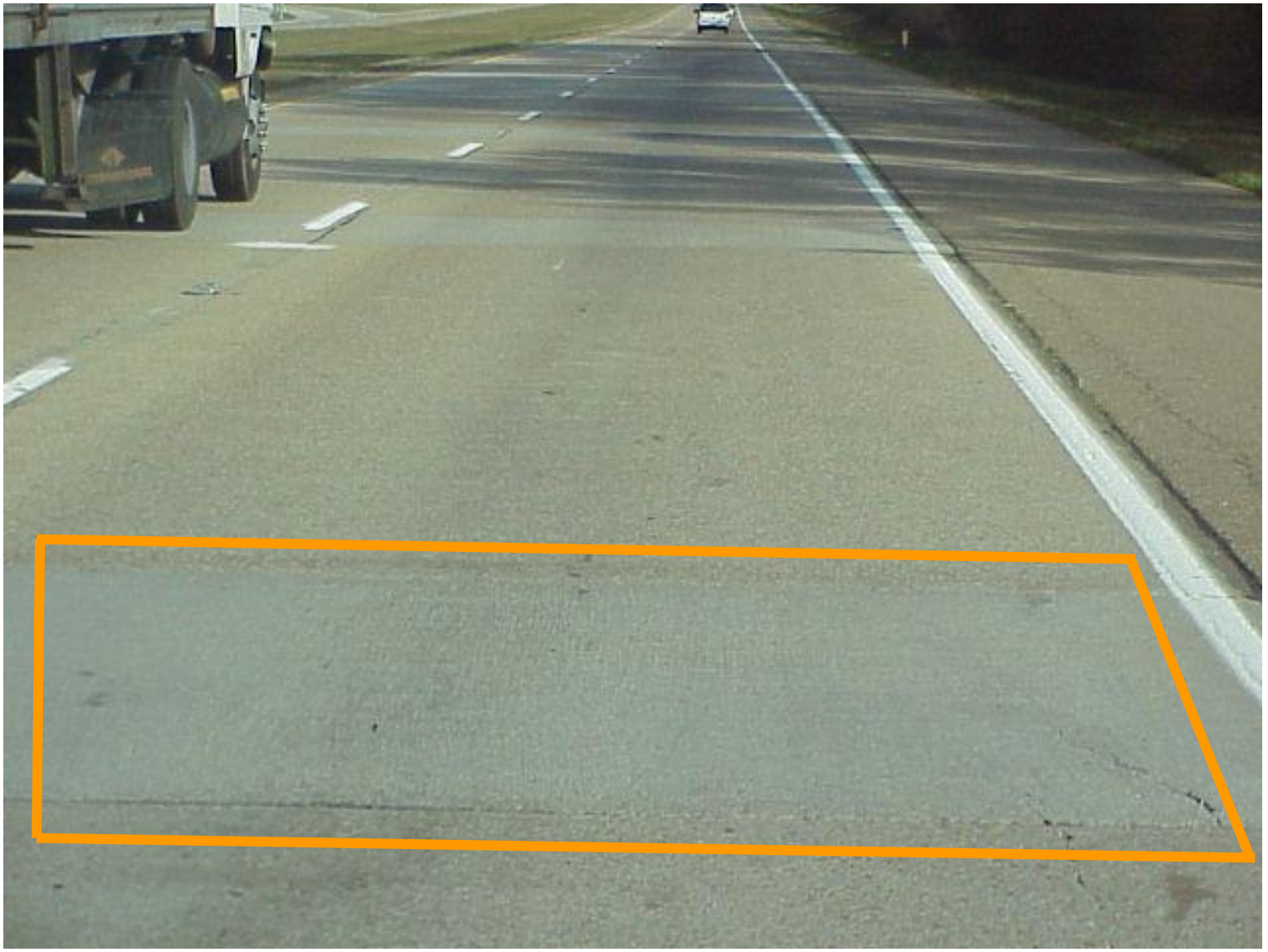
LOW SEVERITY (Level 1)



Within the orange box above is low severity patching for Concrete Pavements.

Exhibit 22 - PATCHING & RANDOM CRACK

LOW SEVERITY (Level 1)



Within the orange box above is low severity patching for Concrete Pavements.

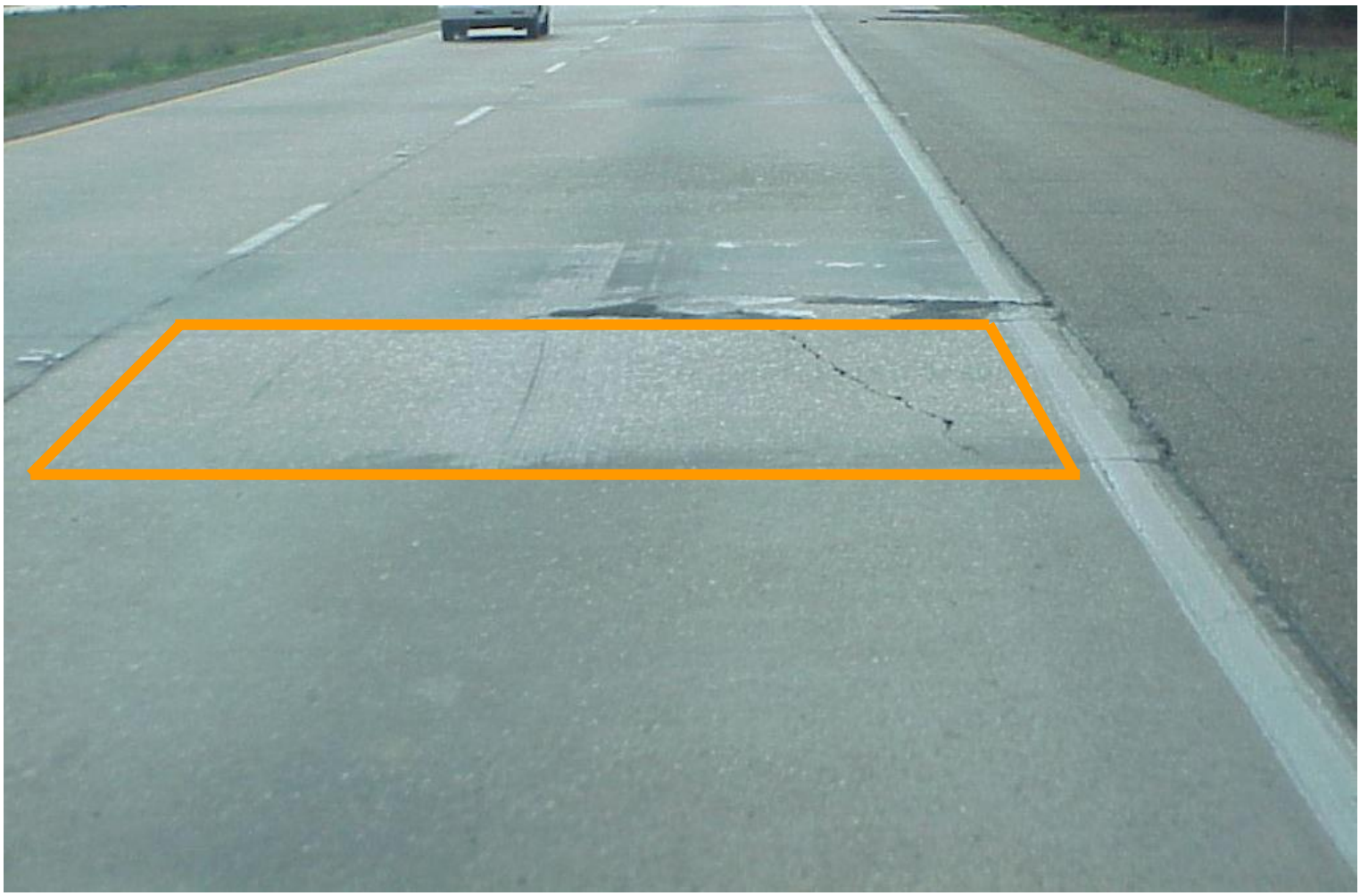
Exhibit 23 - PATCHING & RANDOM CRACK

MEDIUM SEVERITY (Level 2)

Within the orange box above is medium severity patching for Concrete Pavements.

Exhibit 24 - PATCHING & RANDOM CRACK

MEDIUM SEVERITY (Level 2)

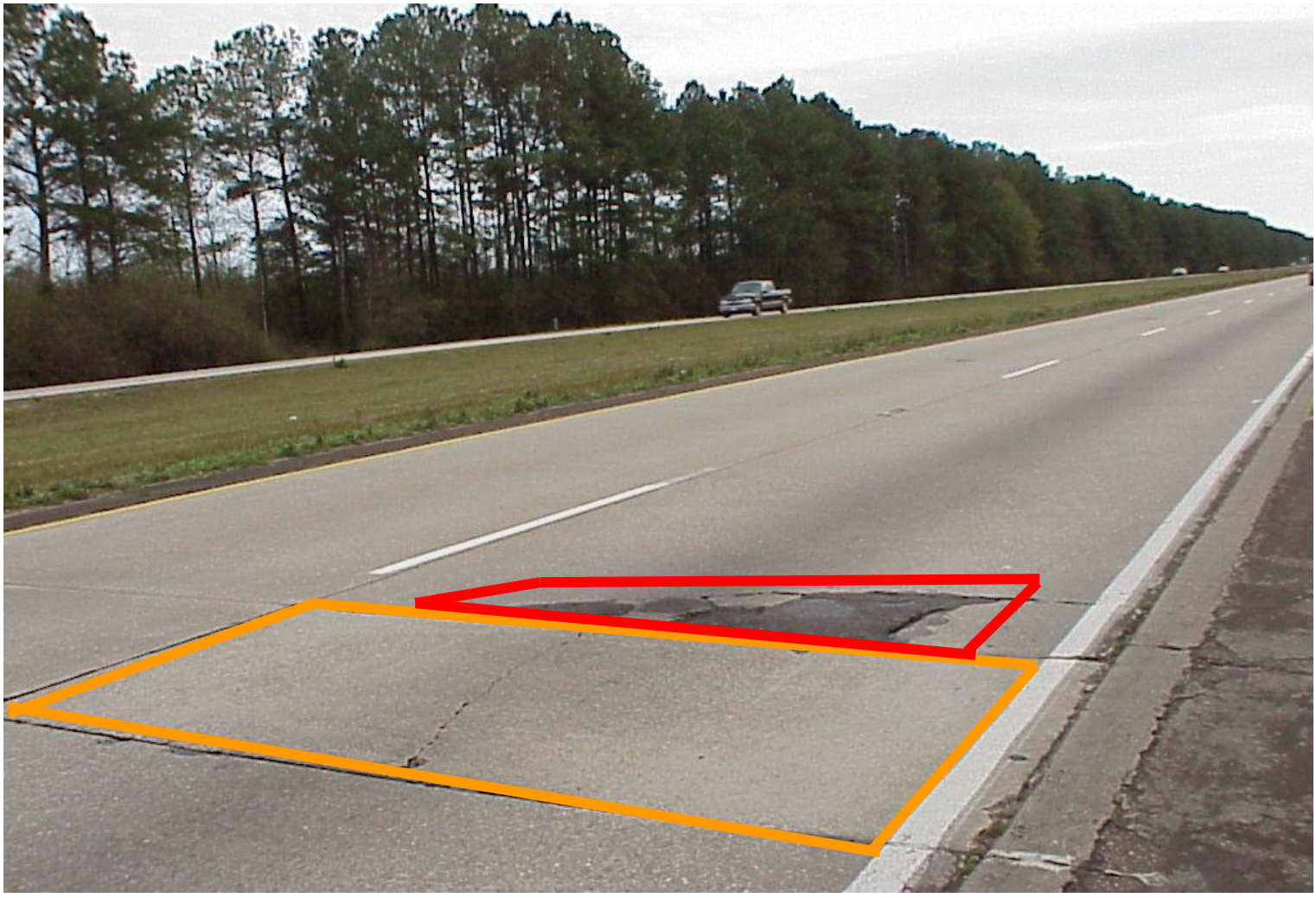


Within the orange box above is medium severity patching for Concrete Pavements.

Exhibit 25 - PATCHING & RANDOM CRACK

MEDIUM SEVERITY (Level 2)

& HIGH SEVERITY (Level 3)



NOTE: This picture has two different severity concrete patches.
The concrete patch, within the orange box, is a medium severity patch.
The asphalt patch, within the red box, is a high severity patch.

Exhibit 26 - PATCHING & RANDOM CRACK

HIGH SEVERITY (Level 3)

Within the orange box above is high severity patching for Concrete Pavements.

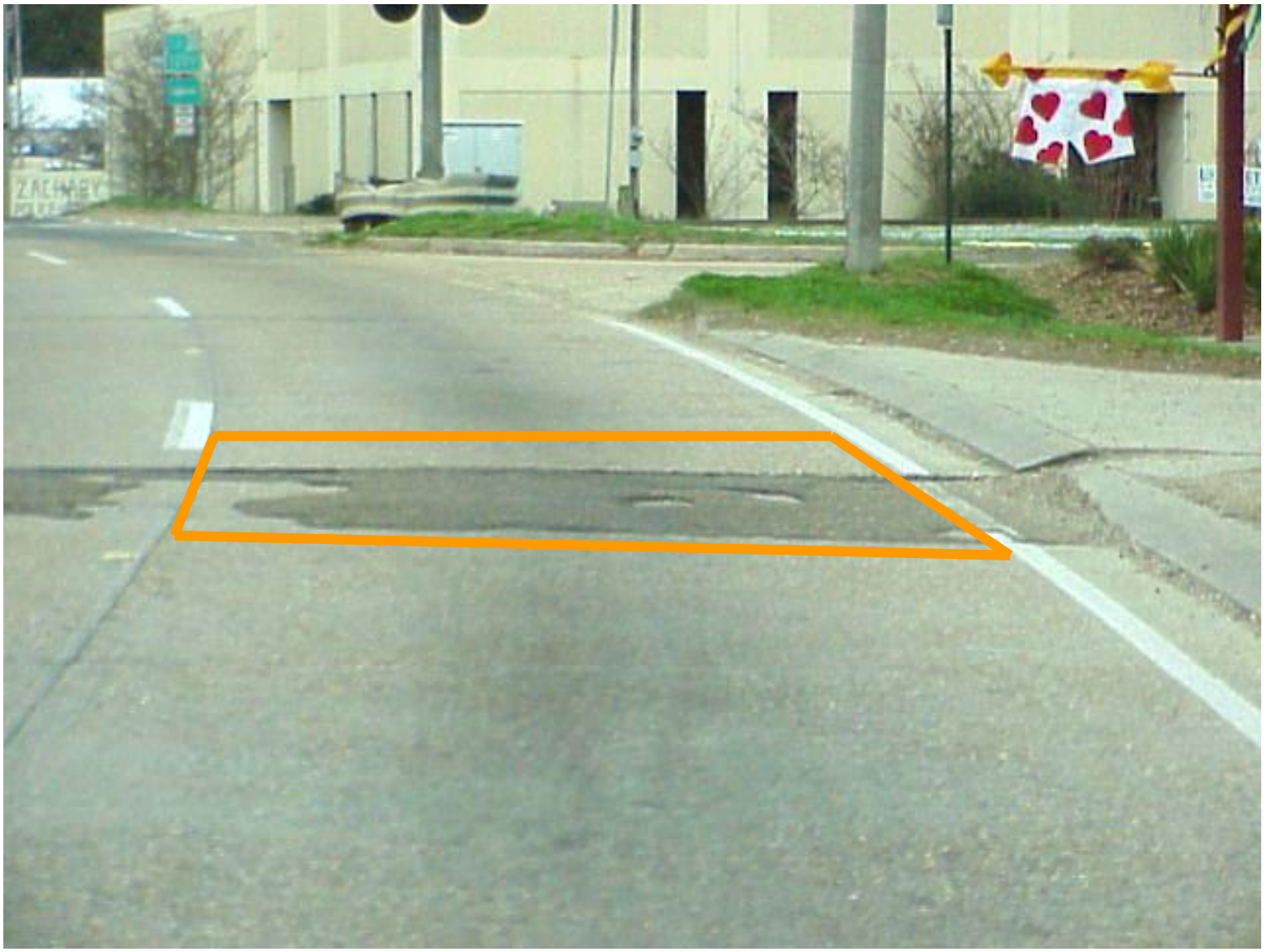
Exhibit 27 - PATCHING

HIGH SEVERITY (Level 3)

Within the orange box above is high severity patching for Concrete Pavements.

Exhibit 28 - PATCHING

HIGH SEVERITY (Level 3)



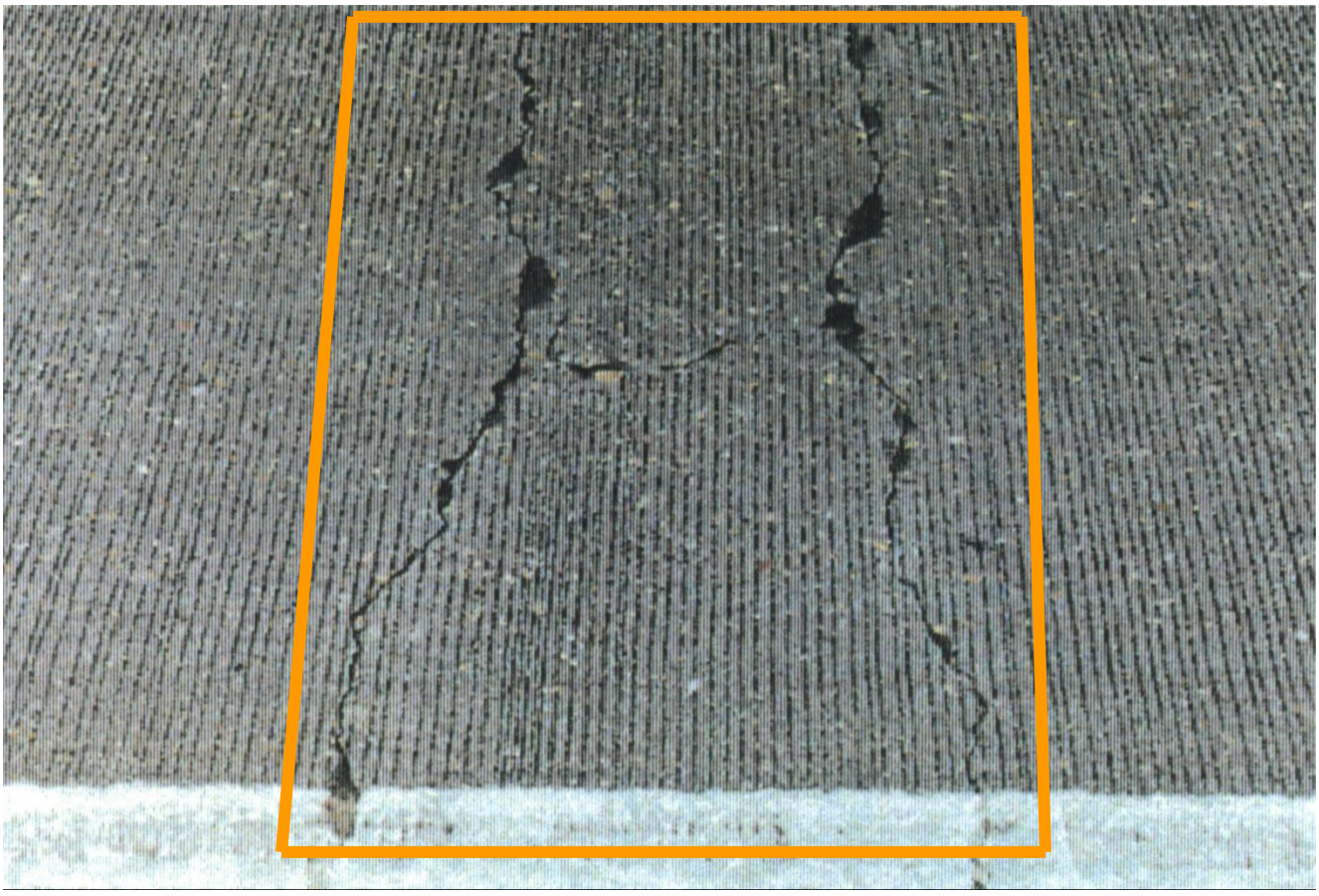
Within the orange box above is high severity patching for Concrete Pavements.

Exhibit 29 - Blowup

Within the orange box above is a blowup for Concrete Pavements.

Exhibit 30 - Punchout

LOW SEVERITY (Level 1)



Within the orange box above is a low severity punch out for Concrete Pavements.

Note: A punch out can only occur on Continuously Reinforced Concrete (CRCP) Pavements.

Exhibit 31 - Punchout

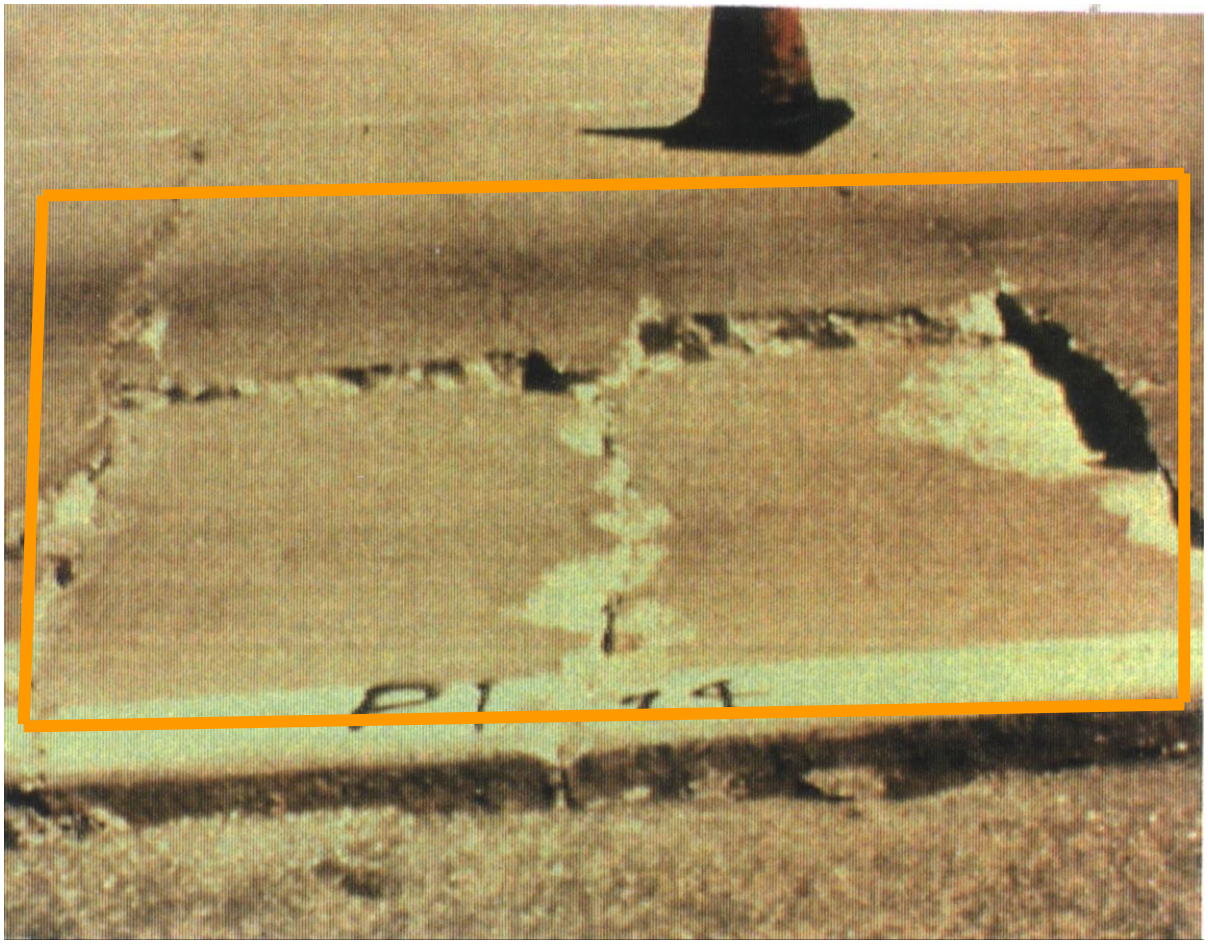
MEDIUM SEVERITY (Level 2)

Within the orange box above is a medium severity punch out for Concrete Pavements.

Note: A punch out can only occur on Continuously Reinforced Concrete (CRCP) Pavements.

Exhibit 32 - Punchout

HIGH SEVERITY (Level 3)



Within the orange box above is a high severity punch out for Concrete Pavements.

Note: A punch out can only occur on Continuously Reinforced Concrete (CRCP) Pavements.