An Roinn Iompair
Turasóireachta agus Spóirt

Department of Transport,
Tourism and Sport

Volume 2 of 3

Urban Flexible Roads Manual

Pavement Surface Condition Index

**Department of Transport,
Tourism and Sport**

October 2013

DOCUMENT CONTROL SHEET

Client	Department of Transport, Tourism and Sport.					
Author	PMS Pavement Management Services Ltd.					
Document Title	Urban Flexible Roads Manual					
Document No.	Issue 1, Rev. 0, November 2013					
This Document Comprises	DCS	TOC	Pages	Tables	Figures	Appendices
	1	1	57	2	0	0

Rev.	Status	Author(s)	Reviewed By	Office of Origin	Issue Date
Rev. 0	Final Issue	B. Mulry	K. Feighan	Galway	04 Nov 13

Acknowledgements

This Manual was written by Dr. Kieran Feighan and Mr. Brian Mulry of PMS Pavement Management Services Ltd. in collaboration with a Steering Group of the Department of Transport, Tourism and Sport. The members of the Steering Group were as follows:

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The authors would like to acknowledge the very significant contribution from the Steering Group both in terms of input to the manual content and in participation in a number of field trials to assess the application of the manual and related software at local authority level. Additional participation and contribution from other members of the above organisations was also made throughout the testing and trialling process of the manual and technologies.

Table of Contents

Section 1: Introduction

A major function of an urban authority is to use public funds to provide a comfortable, safe and economical road surface. This requires balancing priorities and making difficult decisions in order to manage pavements. Many urban pavement networks are often managed informally, based solely on the staff's judgment and experience. While this process is both important and functional, using a slightly more formalised technique can make it easier to manage pavements effectively.

Experience has shown that there are three especially useful steps in managing urban roads:

1. Inventory all urban roads.

2. Periodically evaluate the condition of all pavements.

3. Use the condition evaluations to set priorities for projects and select appropriate treatments.

A comprehensive pavement management system involves collecting data and assessing several road characteristics: roughness (ride), surface distress (condition), surface skid resistance and structure (pavement strength and deflection). Managers can combine this condition data with economic analysis to develop short-range and long-range plans for a variety of budget levels. However, many urban agencies lack the resources for such a full-scale system.

Since surface condition is the most vital element in any pavement management system, urban agencies can use the simplified Pavement Surface Condition Index (PSCI) rating system presented in this Urban Flexible Roads Manual to evaluate their roads. The Urban Flexible Roads ratings combined with other inventory data (width, length, shoulder, pavement type, construction history, etc.) can be very helpful in planning future budgets and priorities.

The PSCI condition rating system in this manual has been designed with a number of objectives in mind. It should be simple to understand and implement by a wide range of survey personnel. No prior experience in pavement rating should be necessary to carry out the rating procedure. The PSCI rating system in Table 1 and Section 3 of this manual should be based only on visual pavement distresses. The impact of surface-related distresses, structural-related distresses and other defects on the overall rating system should be identified. The results of the rating system should be relatable to the maintenance treatment categories specified for use on urban flexible roads by the Department of Transport, Tourism and Sport (DTTAS). Table 2 in Section 5: Conclusions and Next Steps of this manual summarises the overall relationships between these factors.

This Manual is designed to improve the data collection and quality of visual surveying of urban flexible roads within the urban authorities of the Republic of Ireland. Substantial use was made of the template provided by the Pavement Surface Evaluation and Rating (PASER) manuals produced by the Transportation Information Center at the University of Wisconsin-Madison.

Section 2: Pavement Distress – Flexible Pavements

This manual uses visual inspection to evaluate pavement surface conditions. The key to a useful evaluation is identifying different types of pavement distress and linking them to a cause. Understanding the cause for current conditions is extremely important in selecting an appropriate maintenance or rehabilitation technique.

Deterioration has three general modes. These are

- Environmental deterioration due to weathering and aging
- Structural deterioration caused by repeated traffic loading
- Deterioration due to unsuitable materials (e.g. consolidation of subgrade, subsidence).

Pavement deterioration will result from contributions by one or more of the modes. It is important to try to determine the relative contributions in order to select the most effective rehabilitation techniques. The rate at which pavement deteriorates depends on its environment, traffic loading conditions, original construction quality and interim maintenance procedures. Poor quality materials or poor construction procedures can significantly reduce the life of a pavement. As a result, two pavements constructed at the same time may have significantly different lives, or certain portions of a pavement may deteriorate more rapidly than others. On the other hand, timely and effective maintenance can extend a pavement's life. Crack sealing and surface dressing can reduce the effect of moisture on weakening of flexible road pavements.

With all of these variables it is easy to see why pavements deteriorate at various rates and why we find them in various stages of disrepair. Recognising defects and understanding their causes helps us rate pavement condition and select cost-effective repairs. The pavement defects shown on the following pages provide a background for this process. Some defects are localised while others indicate that problems may develop throughout the pavement. It is important to distinguish between local and widespread defects. Assessing the conditions of actual roadways also involves looking for combinations of these individual defects.

There are four major categories of common road surface defects on urban flexible roads:

Surface Defects
Ravelling
Bleeding

Pavement Deformation
Rutting
Surface Distortion (shoving, settlement/heave, depressions, bumps, sags, etc)

Cracks
Alligator Cracking
Edge Breakup and Cracking
Other Cracking (longitudinal, transverse, reflection, meander, slippage, etc.)

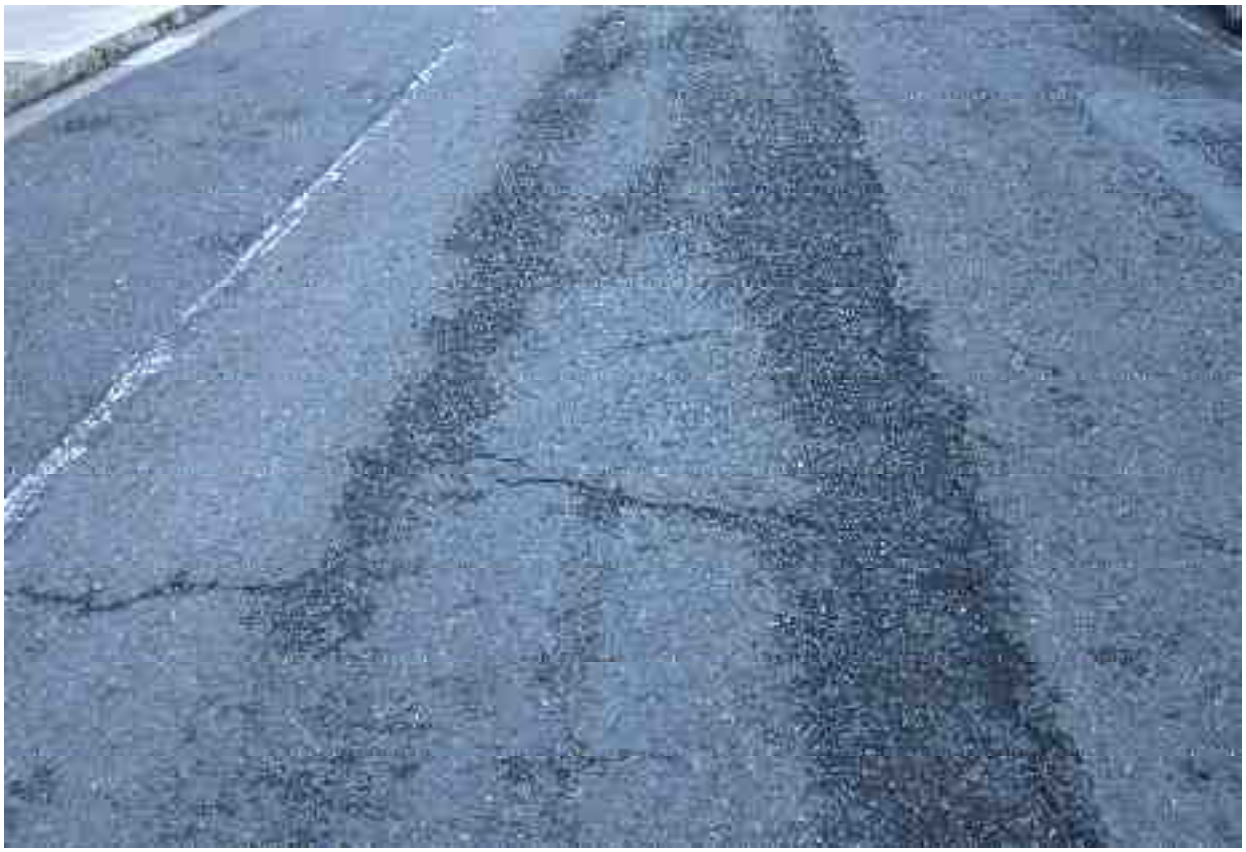
Surface Openings
Patching and Utility Repairs
Potholes
Manhole/Ironworks defects

Periodic inspection is necessary to provide current and useful evaluation data. It is recommended that Urban Flexible Road ratings be updated every two years, and an annual update is even better.

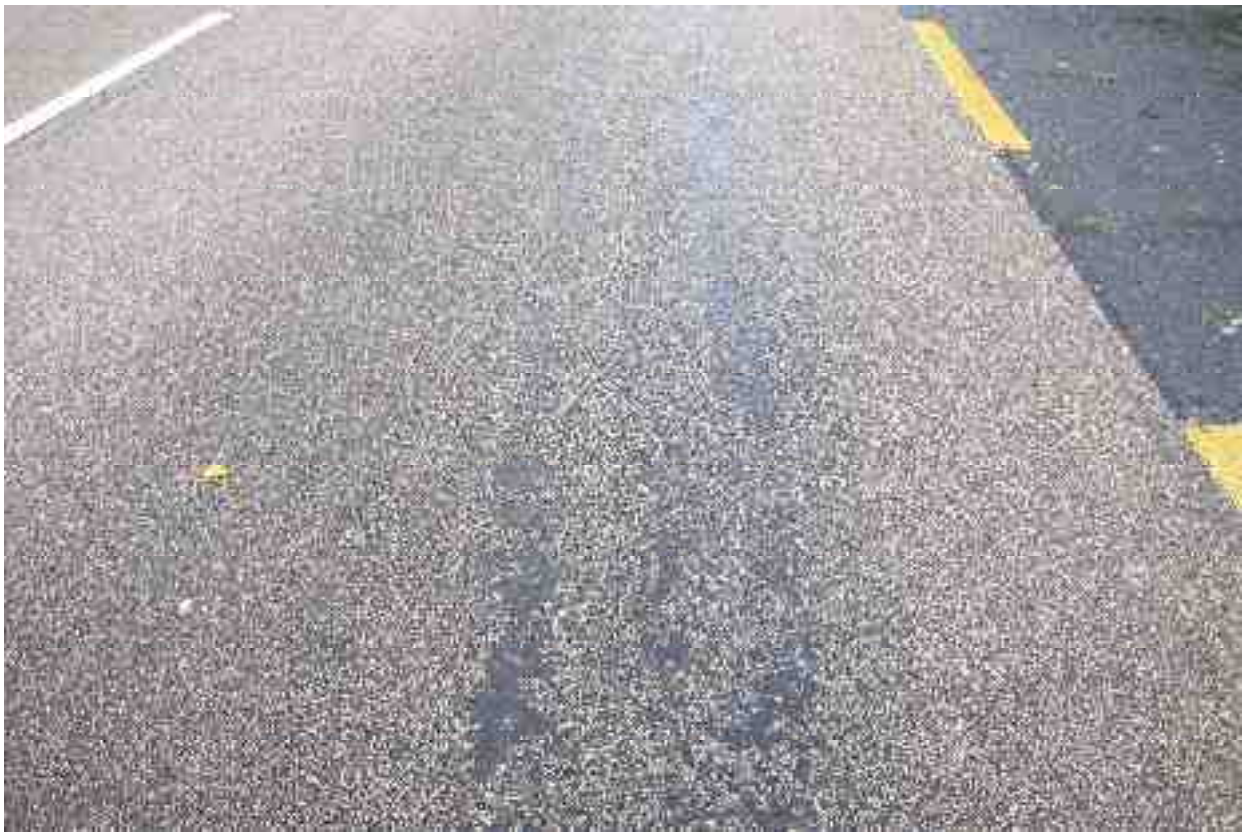
SURFACE DEFECTS

Ravelling

Ravelling is progressive loss of binder and aggregate chippings from the pavement surface. Ravelling can be caused by stripping of the bituminous film from the aggregate, binder hardening due to aging, poor compaction especially in cold weather construction, insufficient binder content or poor quality aggregate. In addition, ravelling can be caused by the action of tracked vehicles or oil spillage. Ravelling can occur on any part of the carriageway lane including areas with high friction surface and cycle tracks if they form part of the kerb to kerb carriageway surface.



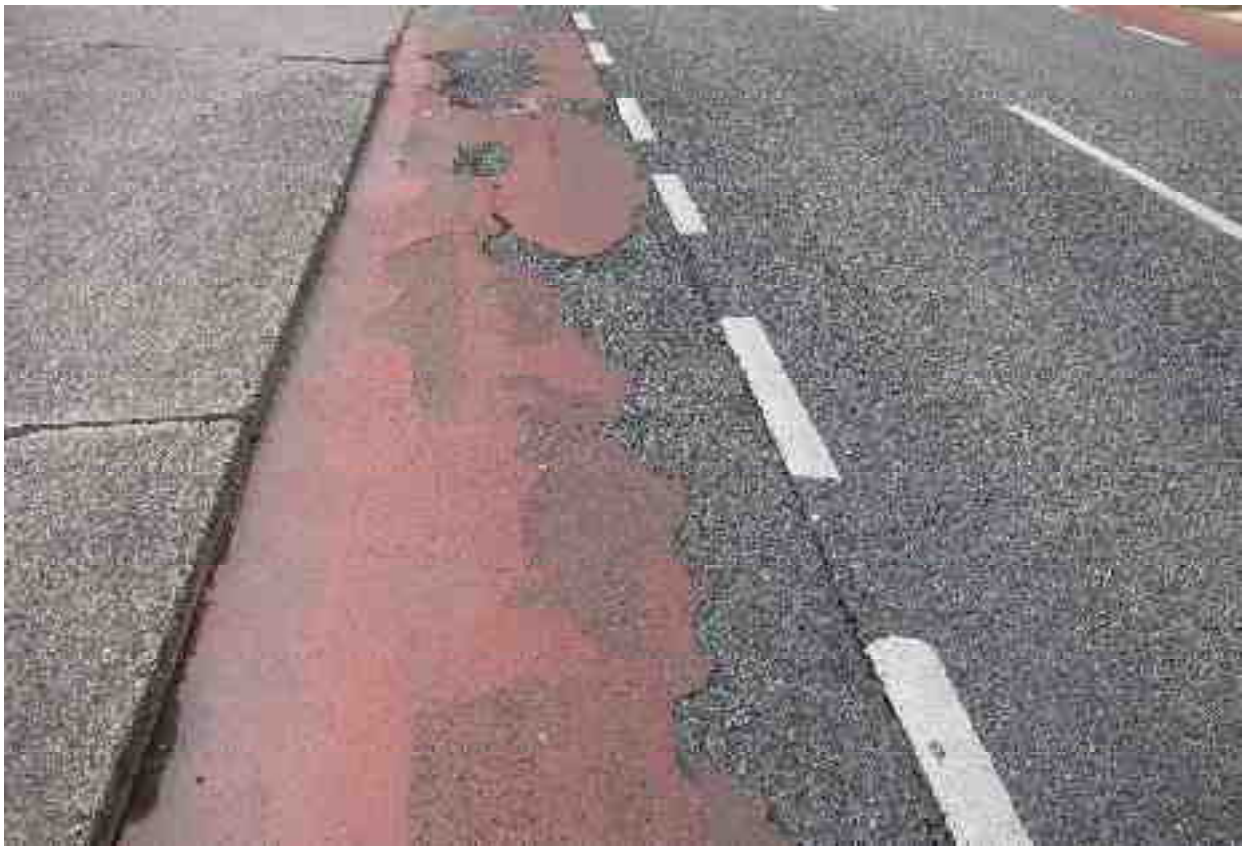
Moderate Ravelling in vicinity of linear cracks



Ravelling along wheelpath on High Friction Surface

SURFACE DEFECTS

Ravelling



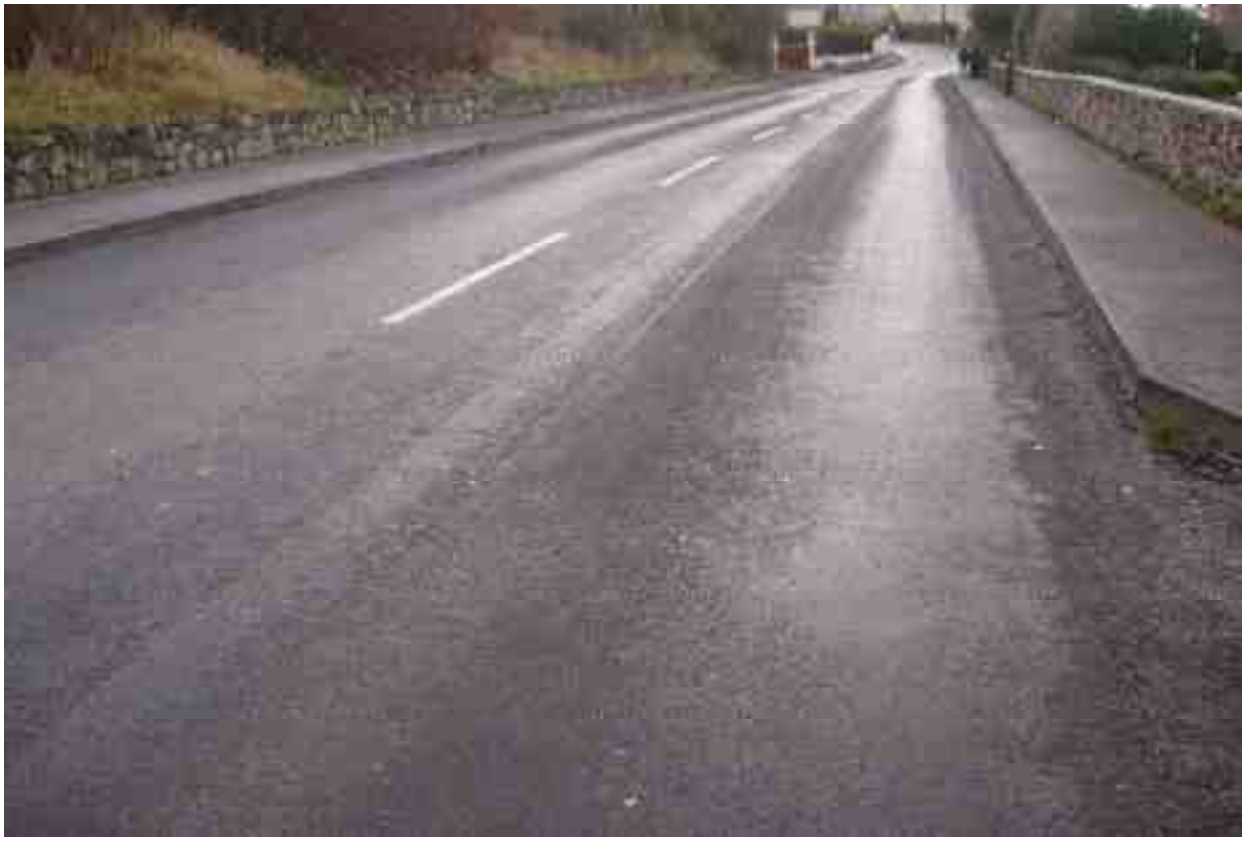
Ravelling along cycle track on carriageway lane

SURFACE DEFECTS

Bleeding

Bleeding or fatting up is a film of excess bituminous material on the pavement surface which creates a shiny reflective surface that usually becomes sticky in hot weather. In surface dressings, it is usually caused by excessive embedment of the chippings or too high a rate of spread of the binder. Repair by the application of a properly designed surface treatment to restore adequate skid resistance or thin overlay if additional strength is required.

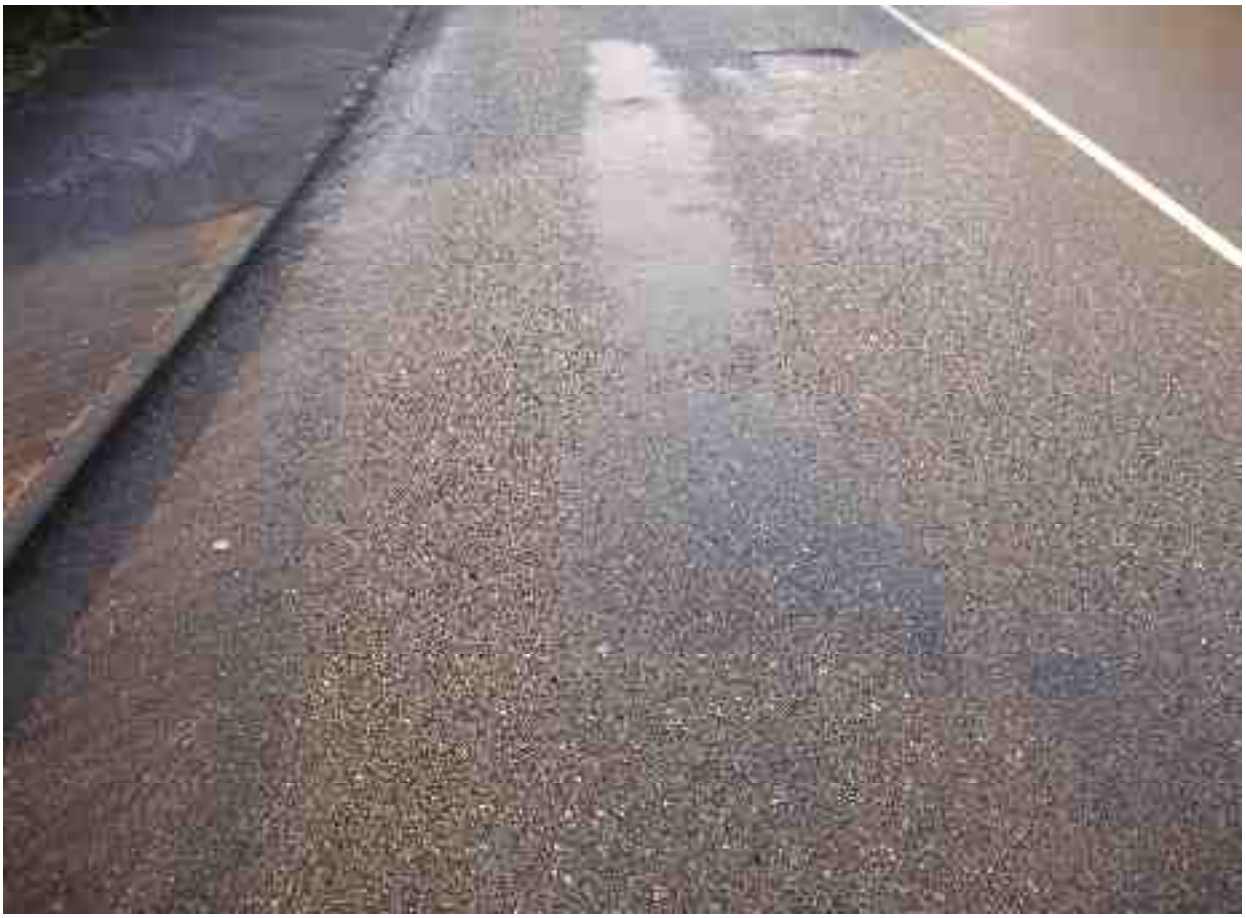
Bleeding/Fatting-up of binder



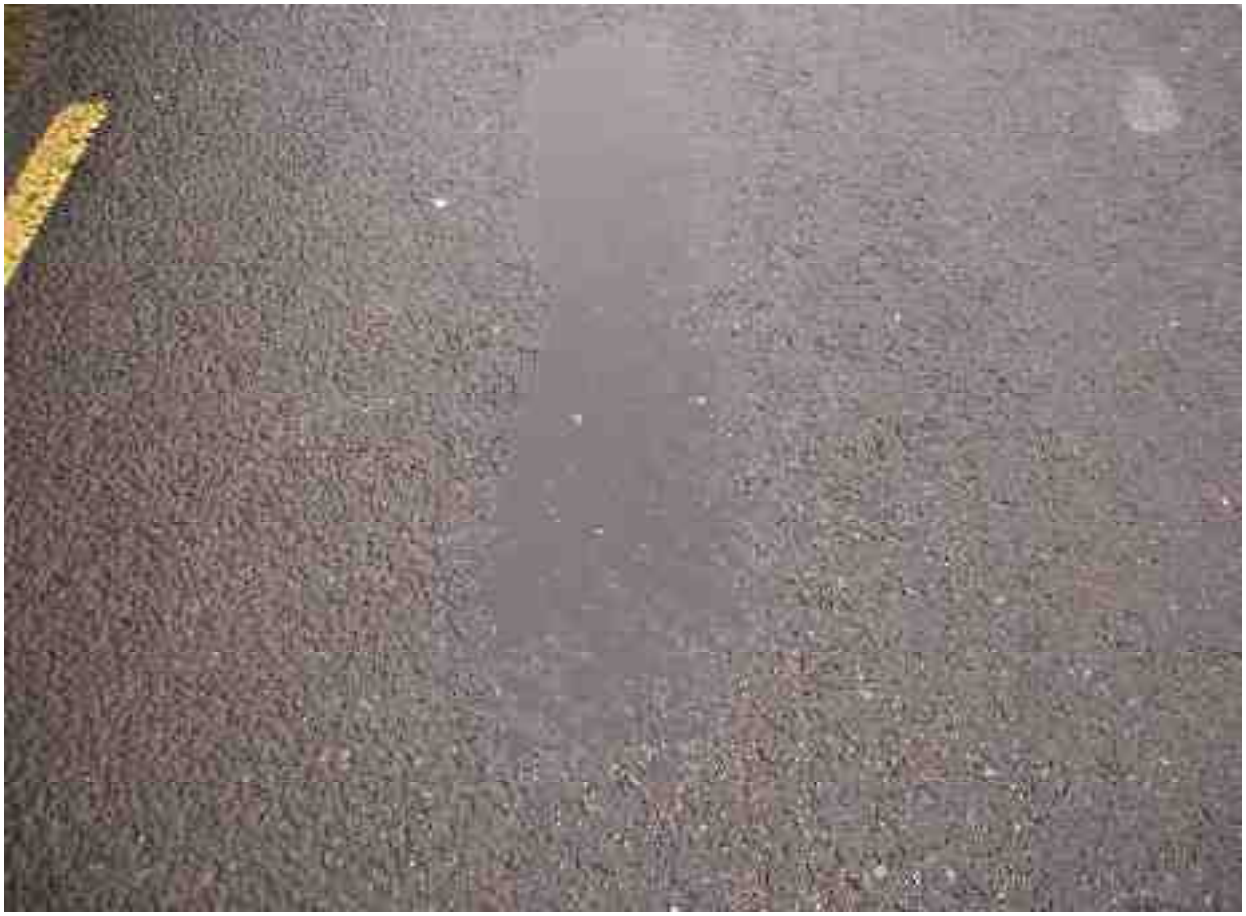
Bleeding: Darker, Shiny areas extending along the wheelpaths

SURFACE DEFECTS

Bleeding



Bleeding: Dark, shiny areas show where binder has worked to the surface along the wheelpath

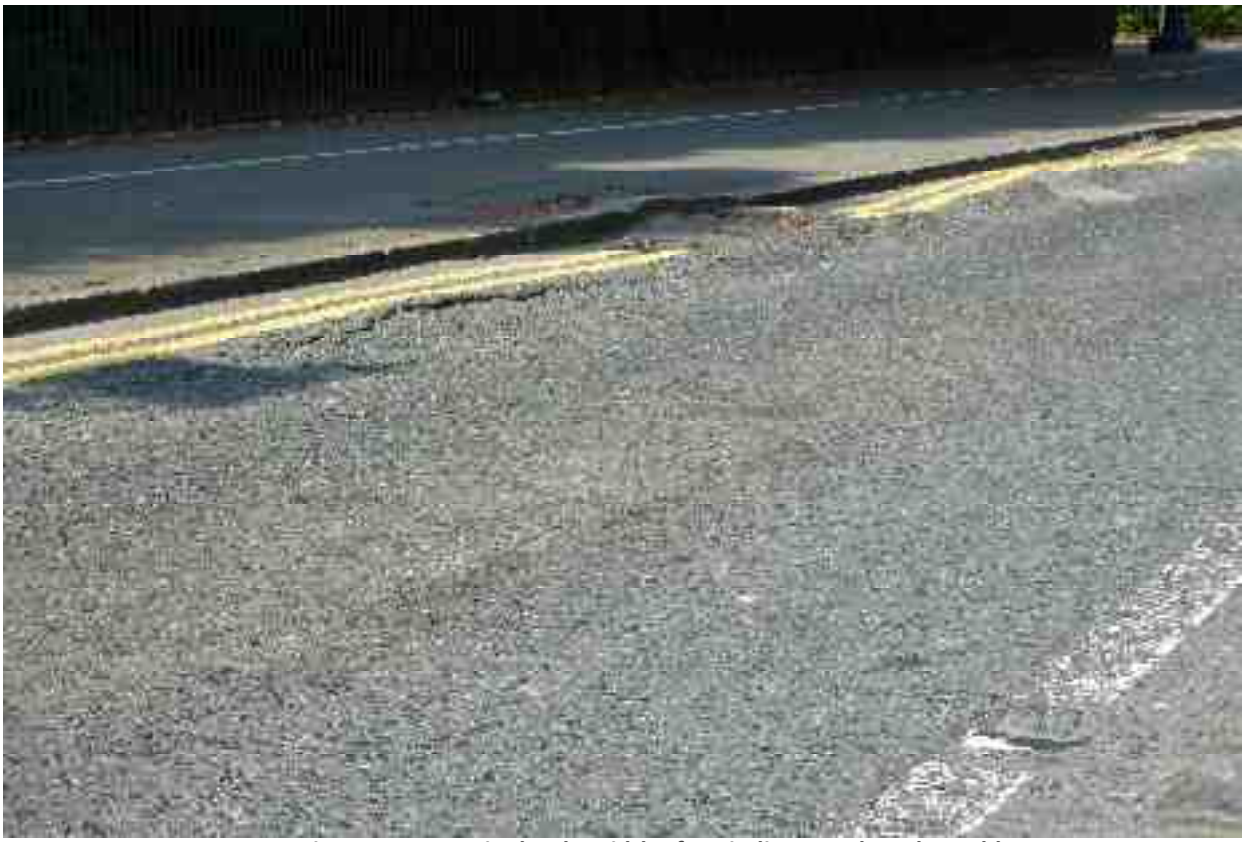


Fatting up of binder along the wheelpath on Clause 942 surface

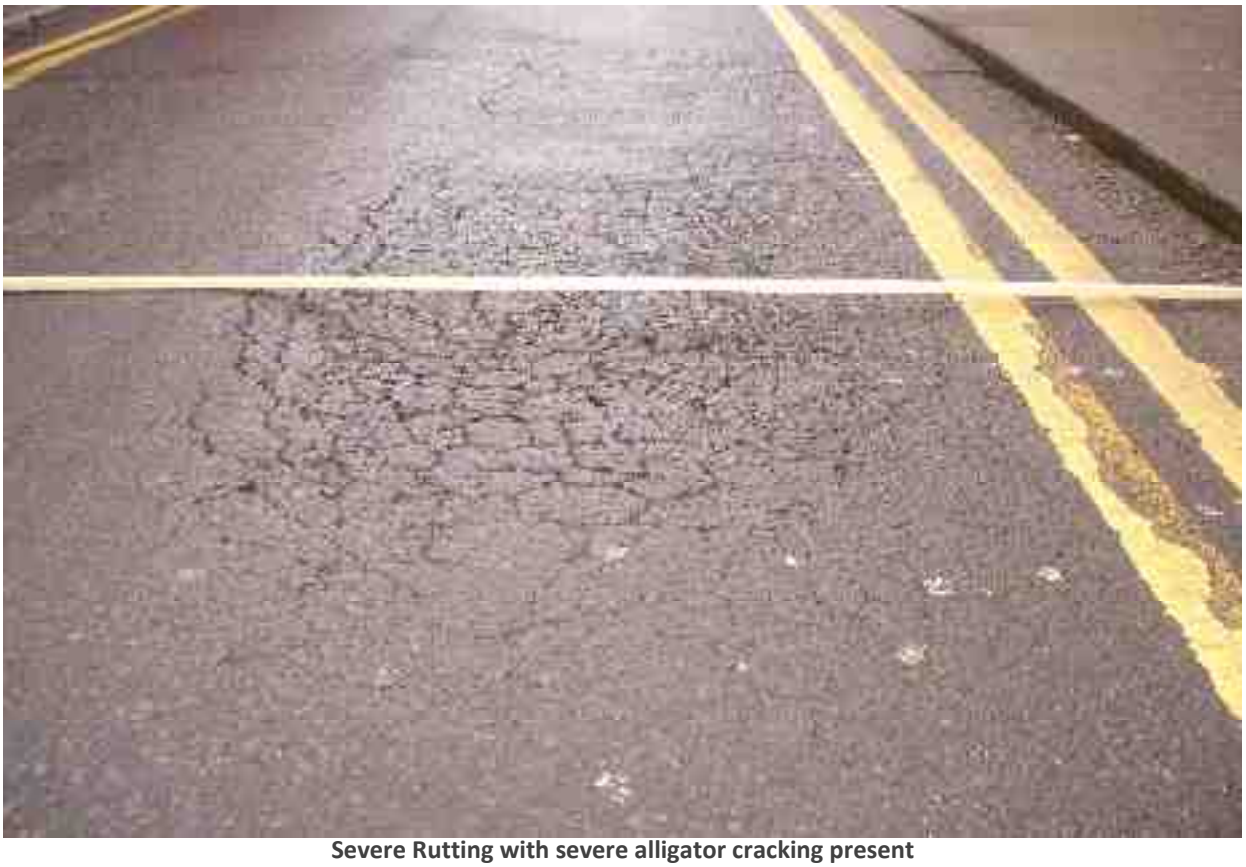
PAVEMENT DEFORMATION

Rutting

Rutting is a permanent longitudinal deformation in the wheel paths caused by traffic loading. It occurs due to the displacement of material, creating channels in the wheel paths. Some uplift may also occur along the sides of the rut. It is caused by traffic compaction or sideways movement of unstable material. Severe rutting (over 50mm) may be caused by base or subgrade consolidation. It is a form of structural failure caused by repeated traffic loading.



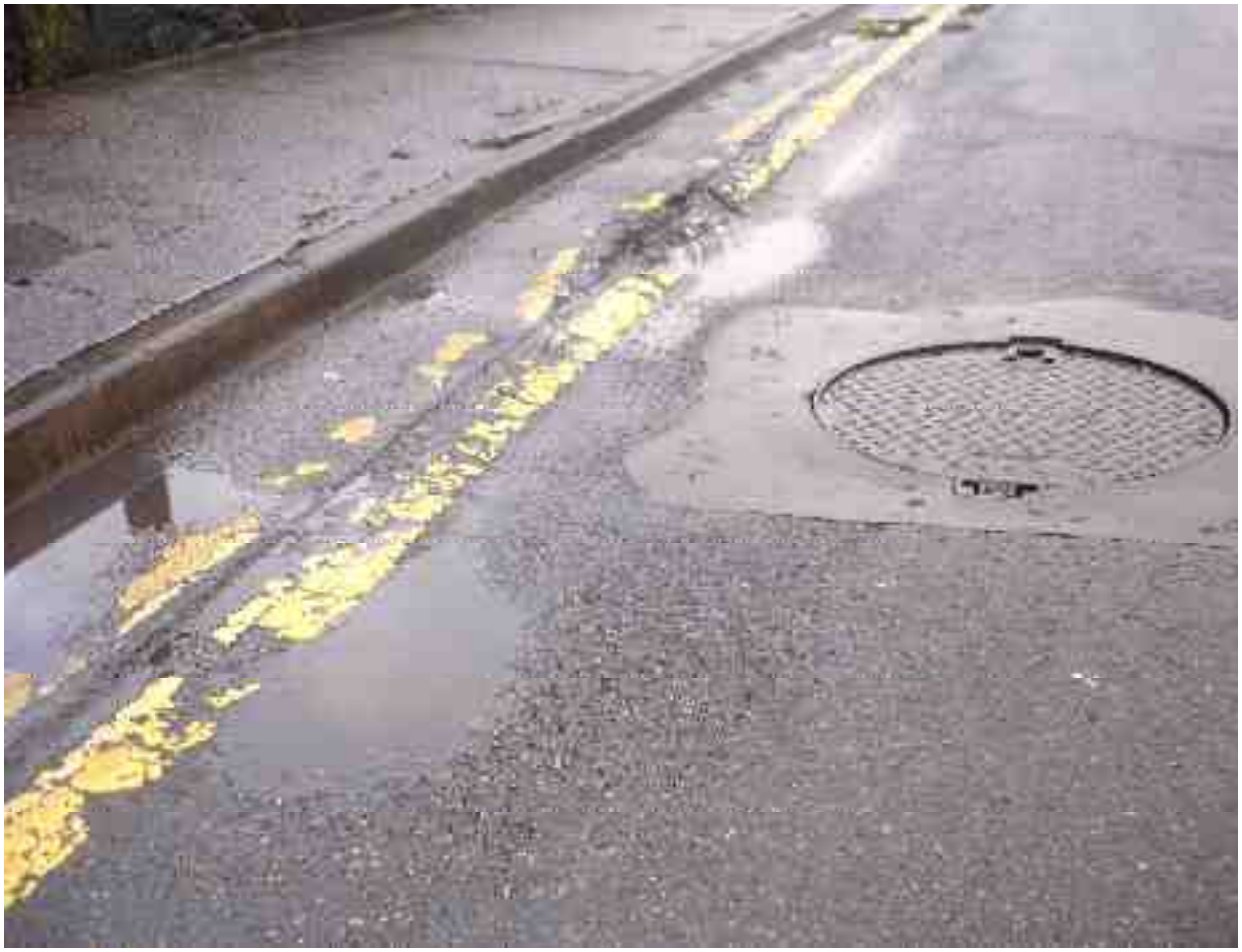
Severe Rutting over 50mm in depth, width of rut indicates subgrade problems



Severe Rutting with severe alligator cracking present

PAVEMENT DEFORMATION

Rutting



Severe Rutting with uplift of sides in the wheelpath

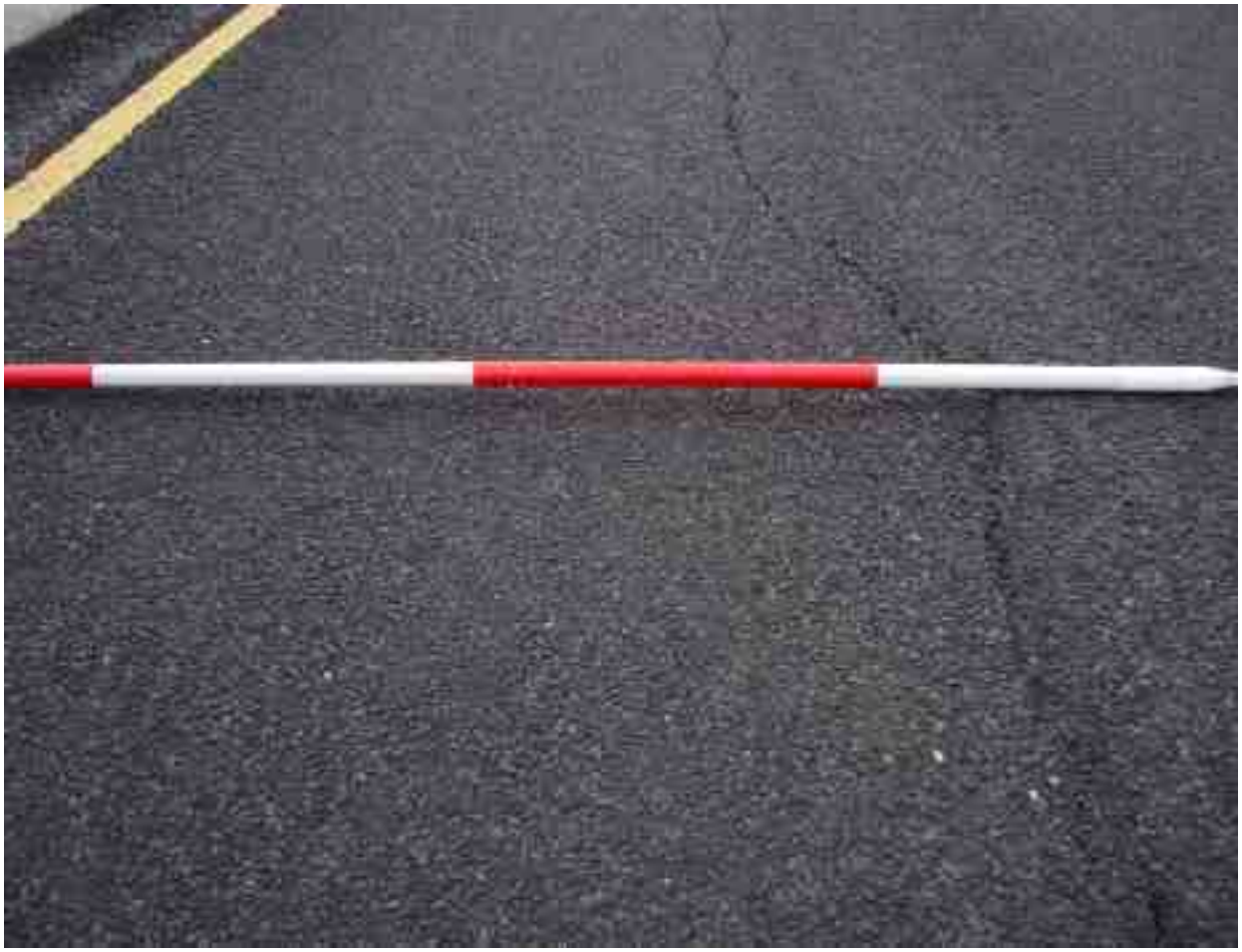
PAVEMENT DEFORMATION

Surface Distortion

All permanent surface deformation, with the exception of rutting, is identified as surface distortion. Rutting is a permanent longitudinal deformation in the wheel paths caused by traffic loading.

Surface distortion can be caused by poor construction, improper mix design or settlement of the subgrade. Distortion includes depressions or sags which are defined as small abrupt downward displacements of the pavement producing flat irregular shaped basins. Other pavement distortions include shoving, bumps, settlement, frost heave etc. with longer wavelengths. Shoving is a displacement of a localised area of pavement caused by traffic pushing against the pavement with unstable asphalt mixture. Bumps are small abrupt upward displacements of the pavement surface.

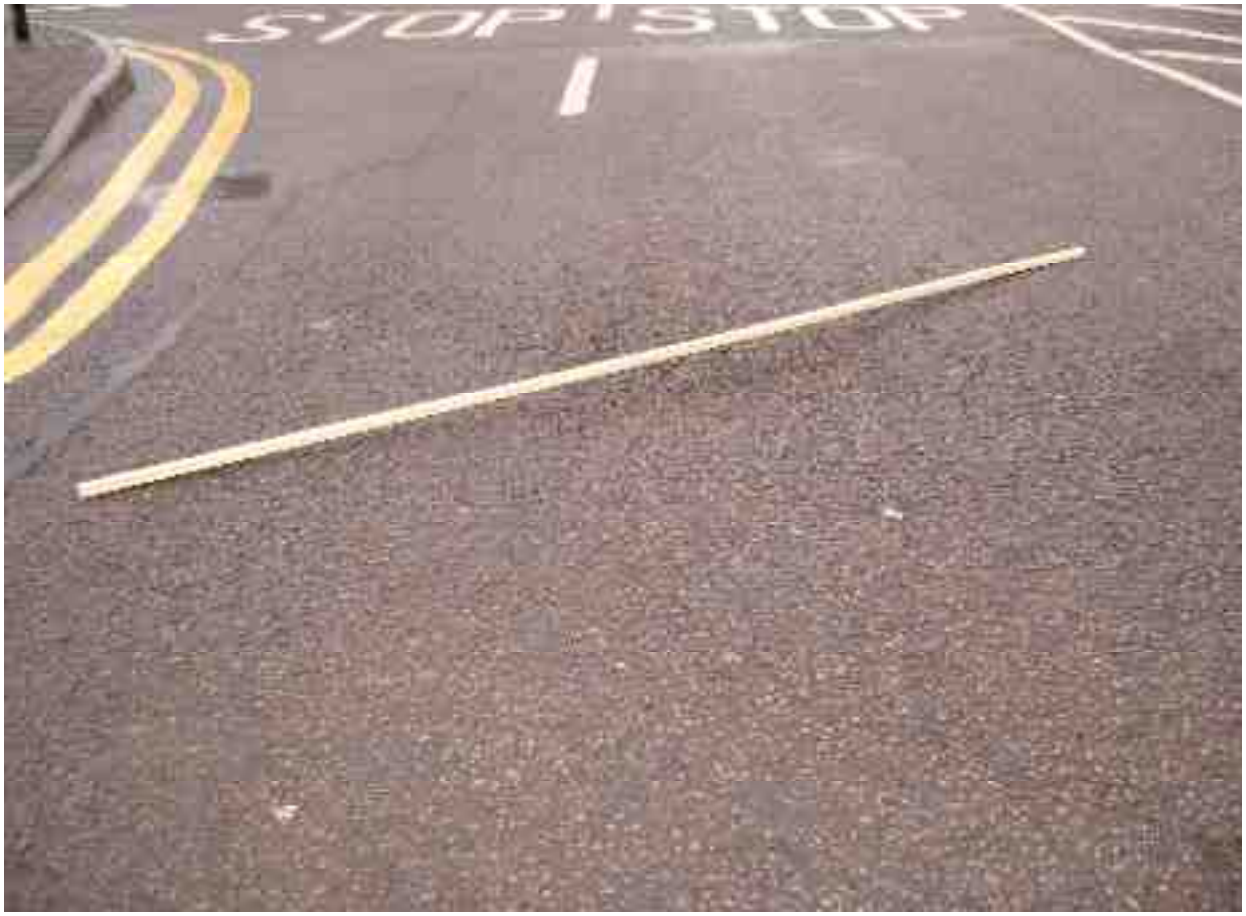
This distress causes roughness and can have a significant effect on driver and passenger comfort. Moderate surface distortion will reduce the driver comfort speed to less than 50 km/hr. Severe surface distortion will reduce the driver comfort speed to less than 30 km/hr.



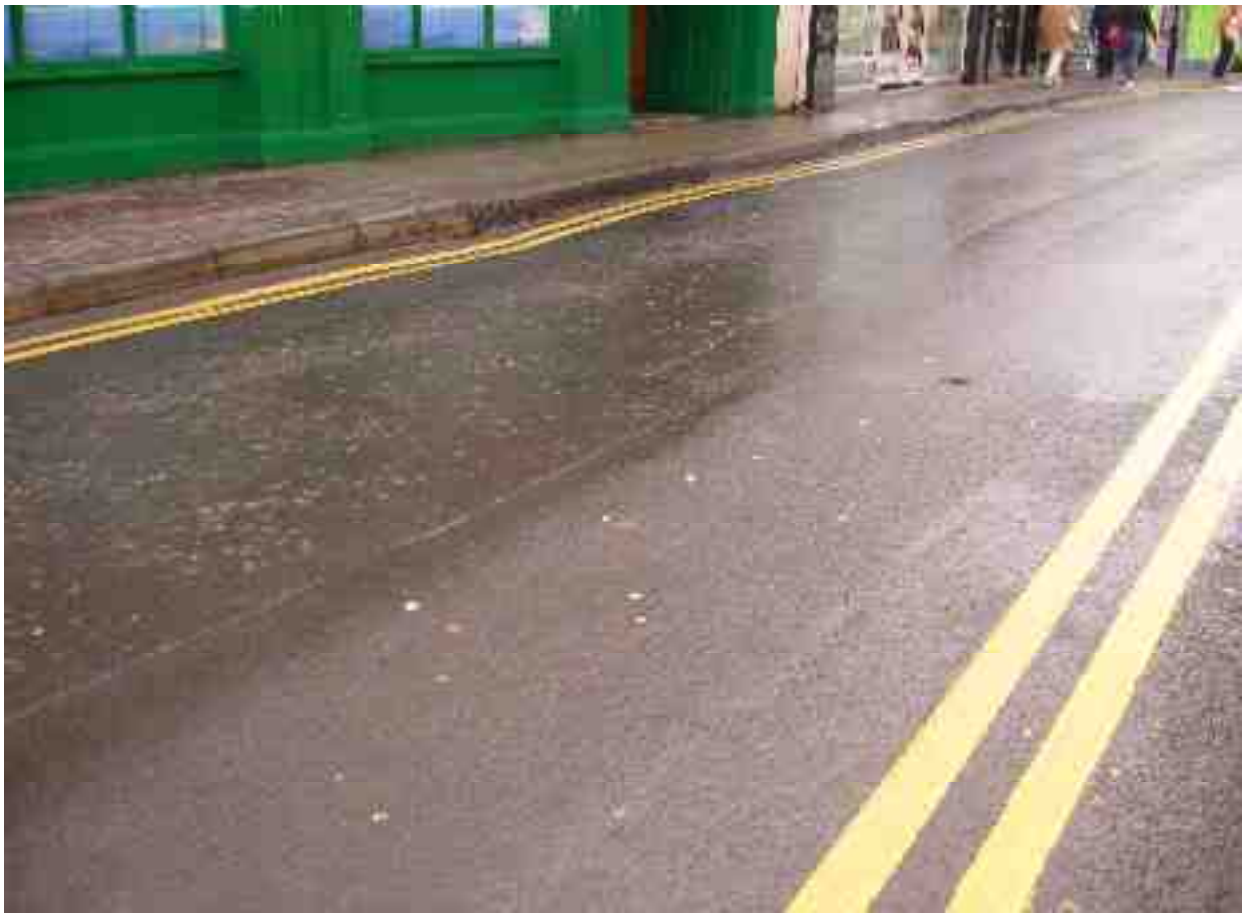
Depression visible in subsided area

PAVEMENT DEFORMATION

Surface Distortion



Depression in pavement surface producing flat irregular shaped basin



Pavement deformation (note road marking on left edge)

CRACKS

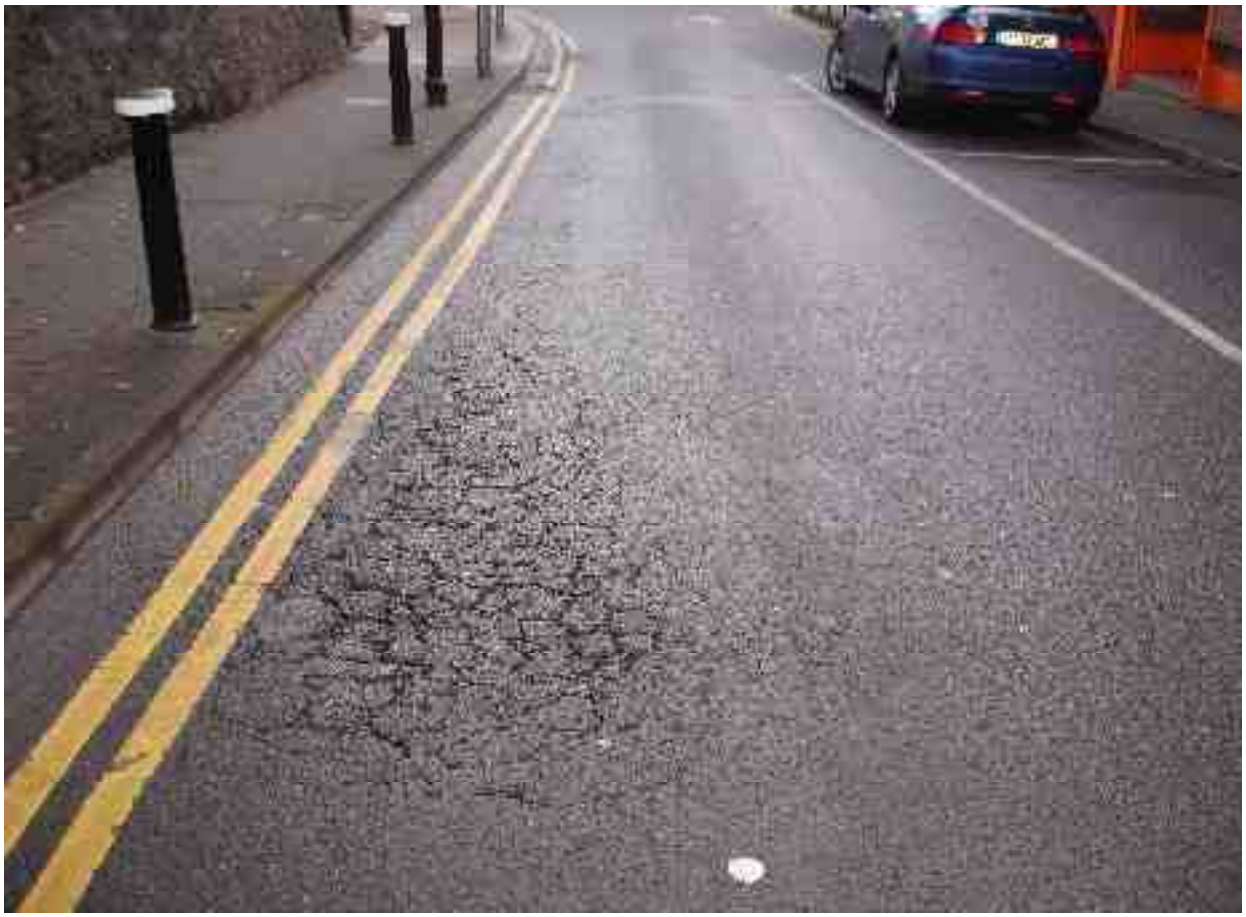
Alligator Cracking

Alligator cracking is a series of interconnected cracks forming small, many-sided, sharp-angled polygons ranging in size from about 25mm to 125mm resembling chicken wire or the skin of an alligator. It's caused by fatigue failure of the surface due to repeated traffic loading and very often also due to inadequate base or subgrade support. The edges of the cracks may or may not be spalled. Spalling is the loss of a piece of the pavement from along the edges of cracks.

Alligator cracking may comprise;

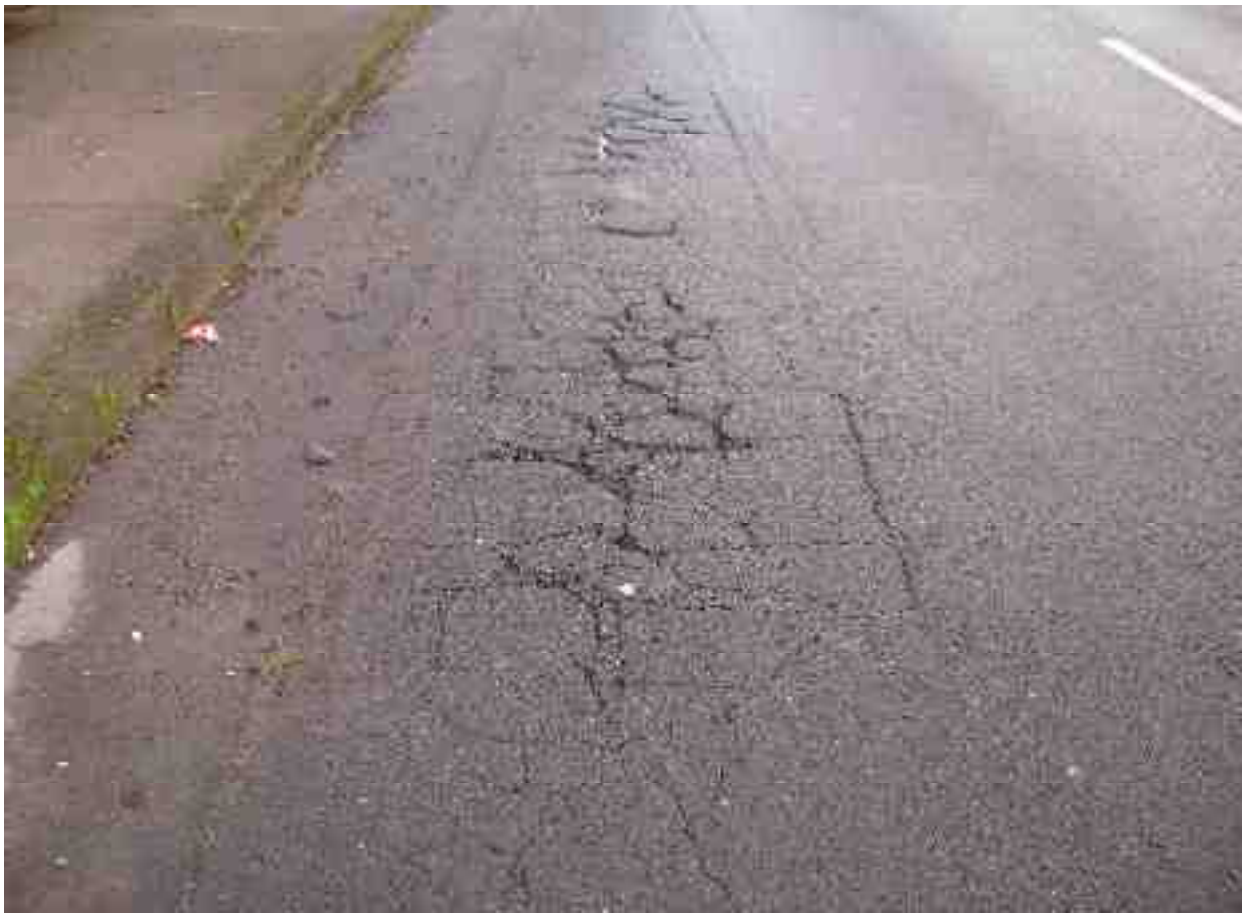
- Fine, longitudinal hairline cracks running parallel to each other and with none or only a few interconnecting cracks. There is no spalling which is a breakdown of material along the sides of a crack.
- A pattern of parallel and interconnecting cracks that may be lightly spalled.
- A well-defined pattern of interconnected polygon shaped cracks which are spalled at the edges. Some pieces may appear to be loose or may appear to rock under traffic.

Repair by excavating localised areas and replacing base and surface. Large areas require overlay or reconstruction. Improvements in drainage may often be required.

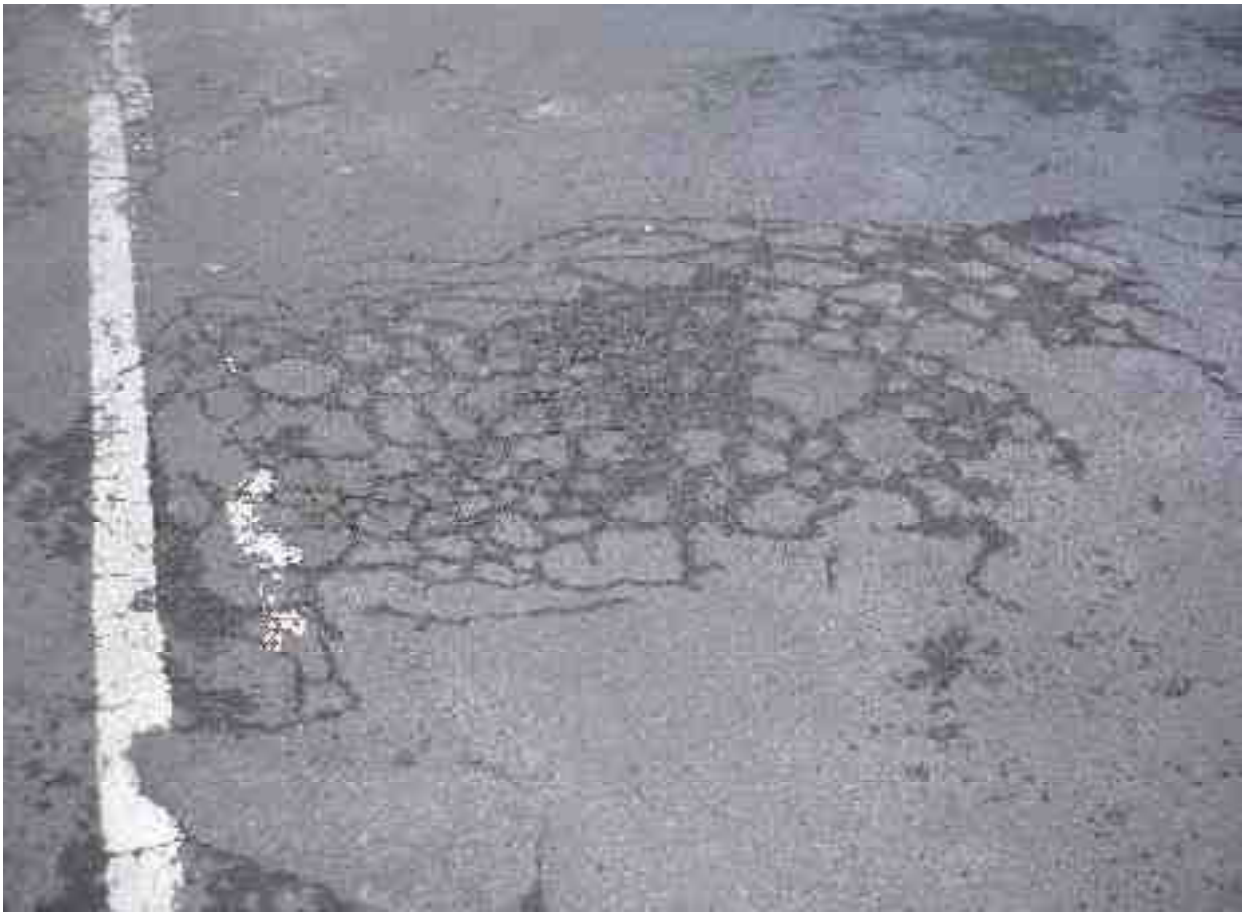


Severe alligator cracking with spalling and loose pieces

Alligator Cracking



Open and spalled alligator cracking in the wheelpath



Alligator cracking made more visible by moisture in cracks

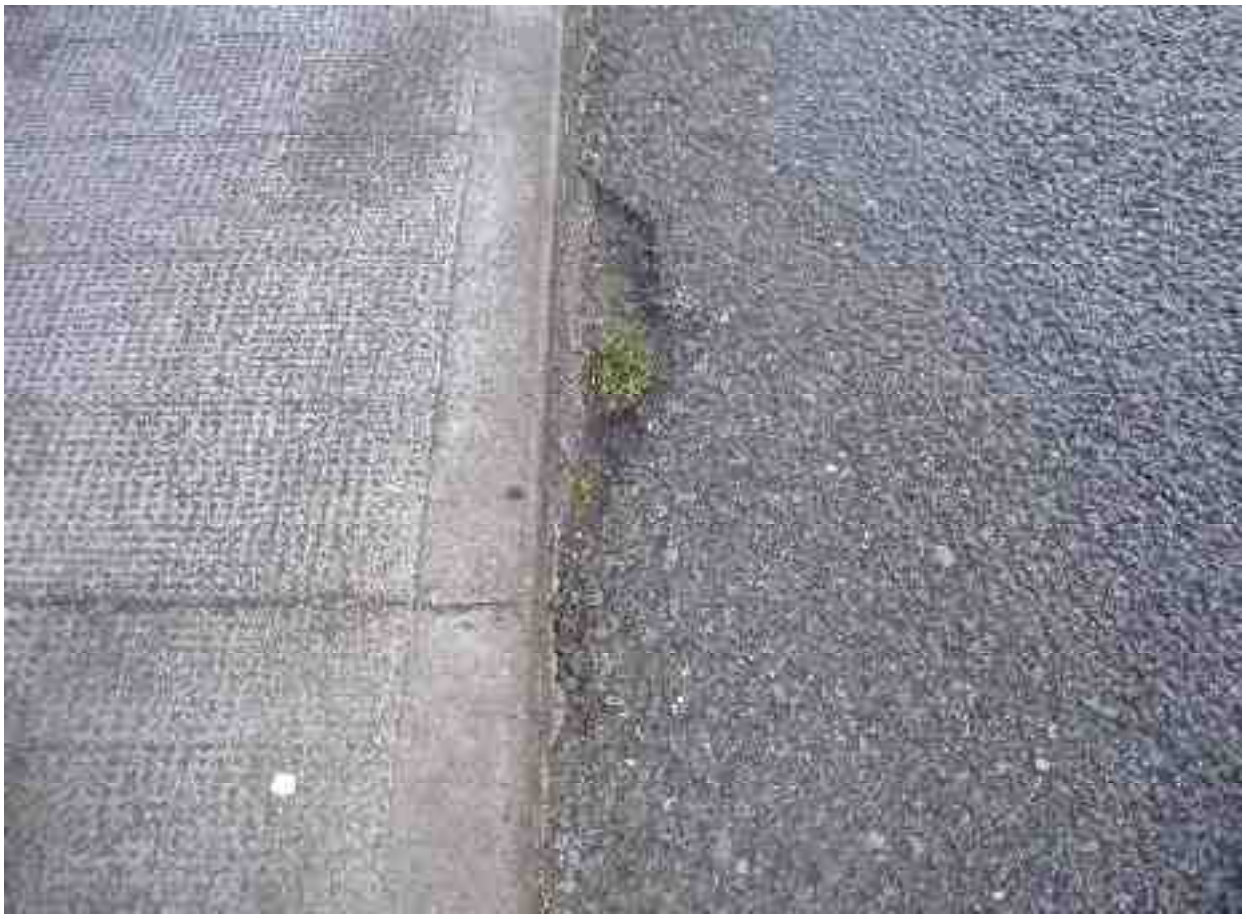
Edge Breakup/Cracking

Edge breakup/cracking can be caused by inadequate pavement width, inadequate lateral support to the pavement, moisture penetration, poor drainage or frost action. It is accelerated by repeated traffic loading. Edge breakup is identified as

- Any singular or multiple cracking within 300 mm of the pavement edge.
- Pavement edge showing considerable breakup with some portions of the edge having been removed.
- Breakup of the pavement edge including a mix of potholing, cracking and patching along the pavement edge.

Edge breakup differs from loss of surface (Ravelling) at the pavement edge as it is a structural distress caused by traffic loading. Edge breakup can be distinguished from Ravelling by the presence of cracking and loss of some or all the underlying pavement layers at the pavement edge.

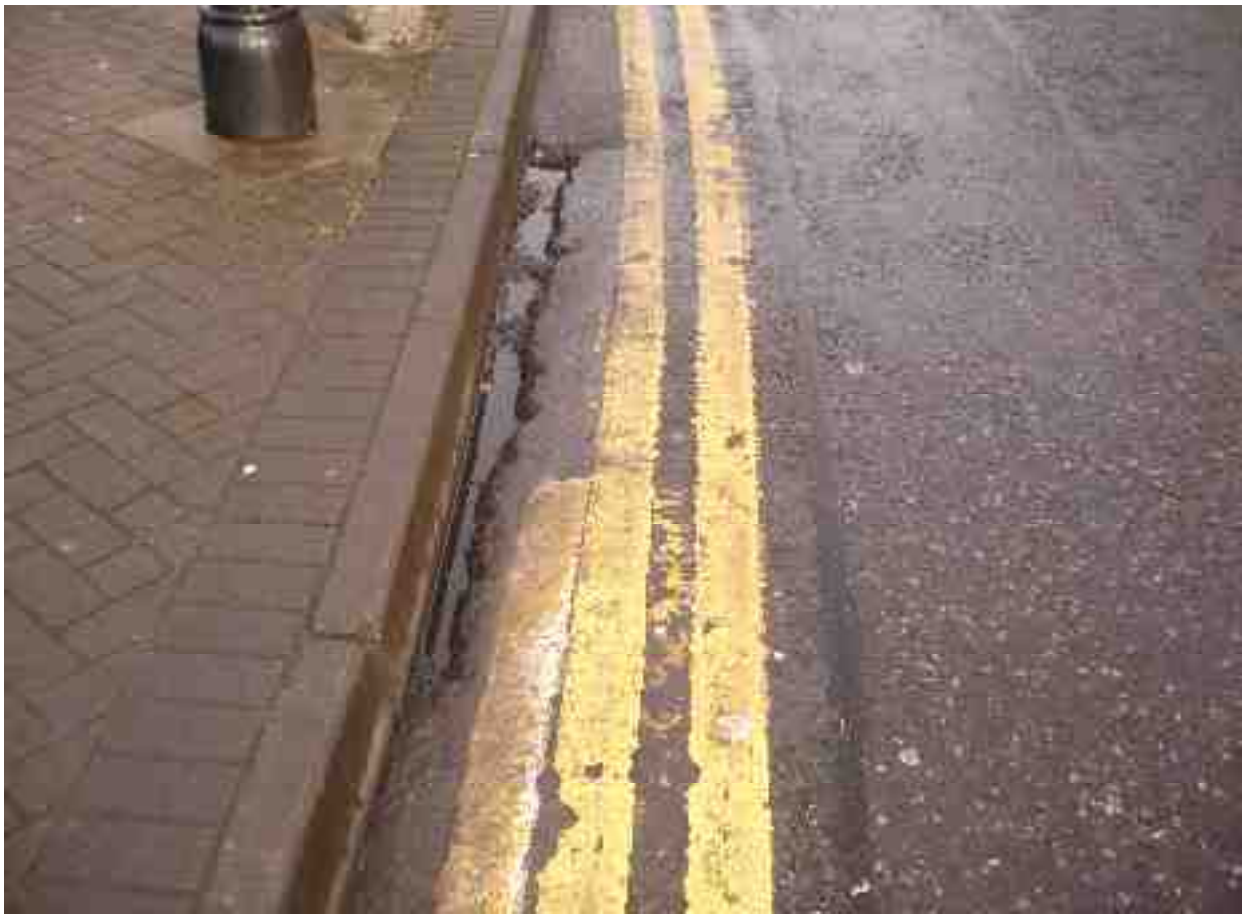
Multiple longitudinal cracks in the pavement edge indicate a need for strengthening with an overlay or reconstruction.



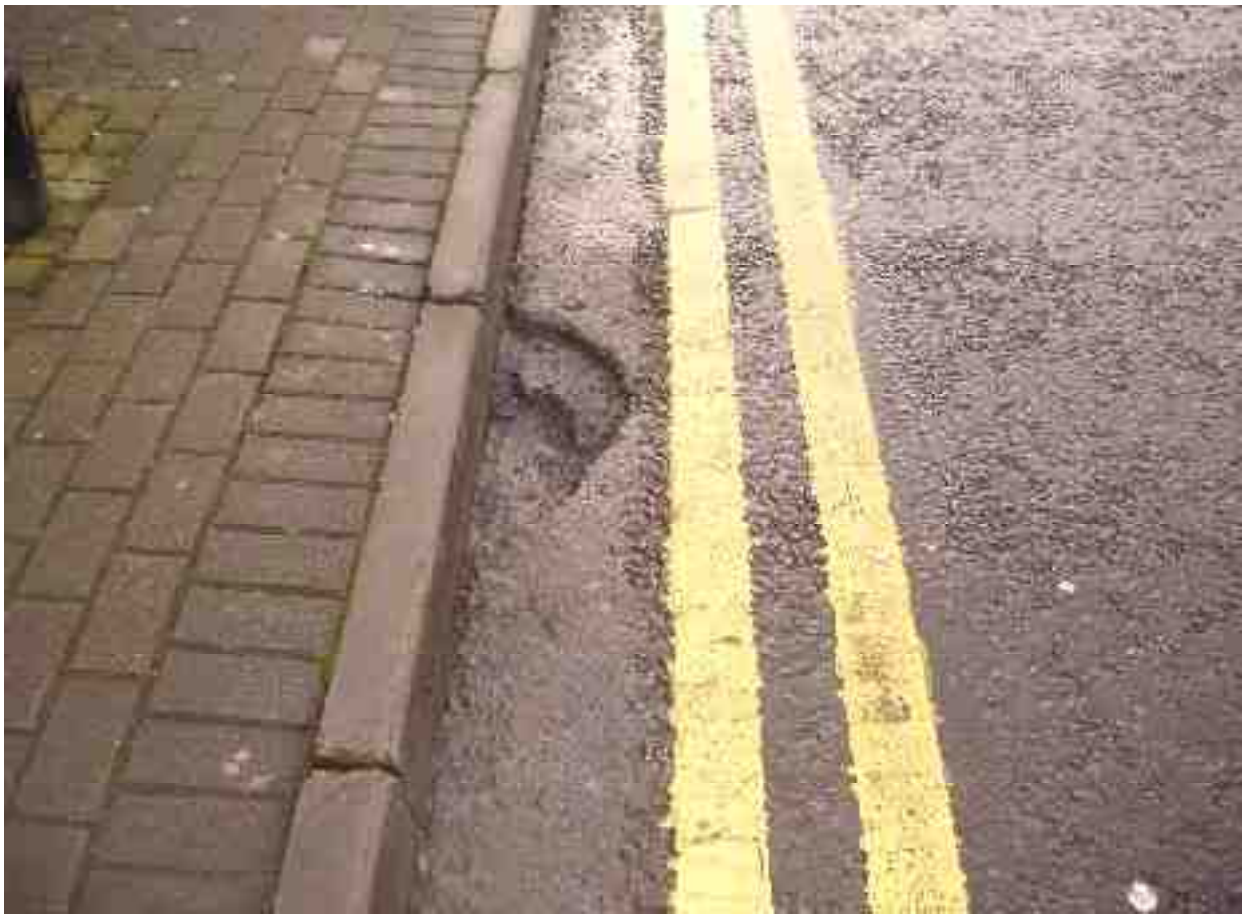
Edge breakup with loss of pavement material

CRACKS

Edge Breakup/Cracking



Edge breakup at road/foothpath edge with material loss



Edge breakup/cracking at road edge

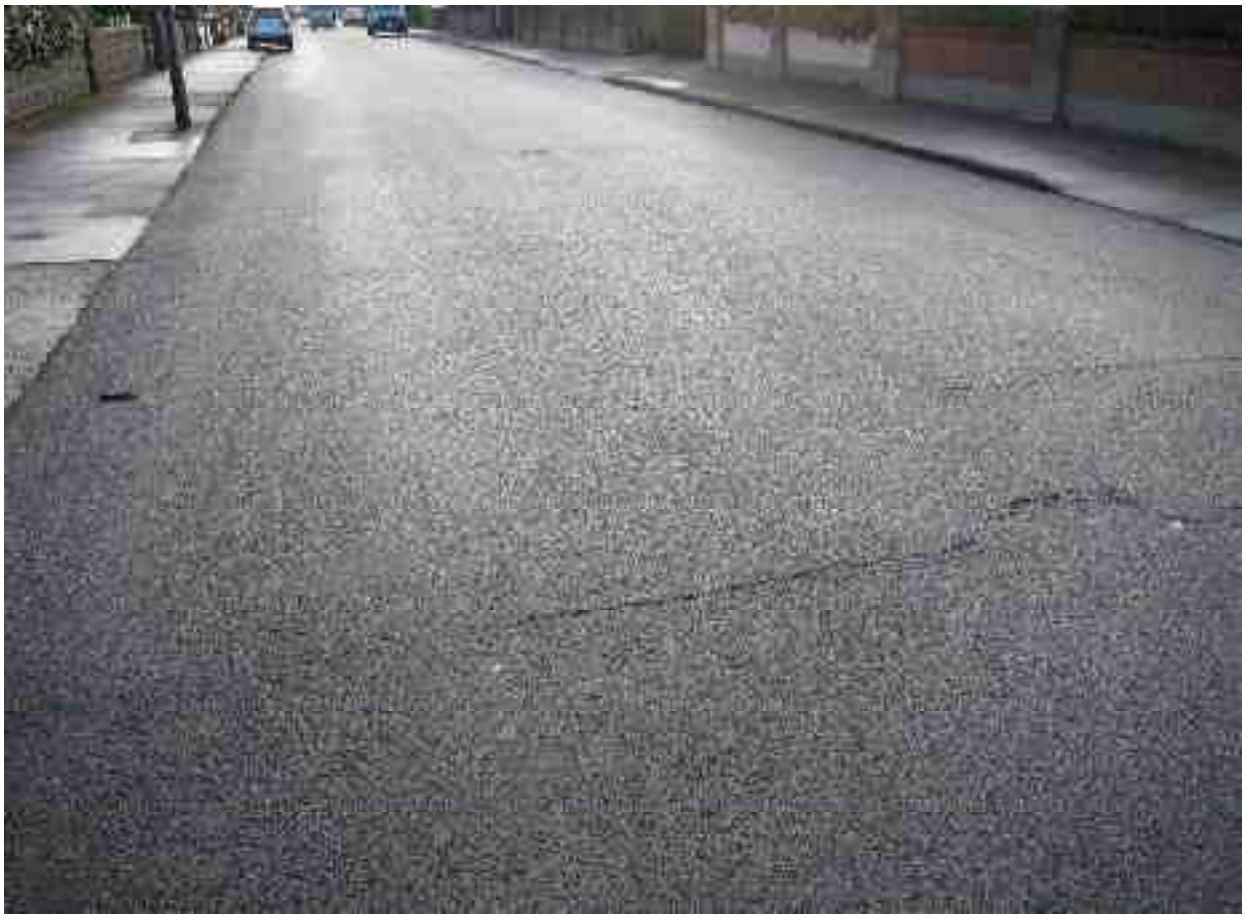
Other Cracking

Linear cracks include longitudinal, transverse and meander cracks. Longitudinal cracks are parallel to the pavement centreline. Transverse cracks extend across the pavement at approximately right angles to the pavement centreline and are often regularly spaced. Some pavement cracks appear to wander randomly, Meander cracks.

These types of cracking can be caused by Reflection cracking in the bituminous surfacing reflecting the pattern of joints or cracks in the underlying pavement layers, most typically concrete or cement-bound pavement layers. These cracks can also be caused by movement of the underlying layers due to moisture penetration, temperature changes, binder hardening due to aging or traffic loading. The crack edges can further deteriorate by ravelling or spalling, eventually eroding the adjacent pavement. Spalling is the loss of a piece of the pavement from along the edges of cracks.

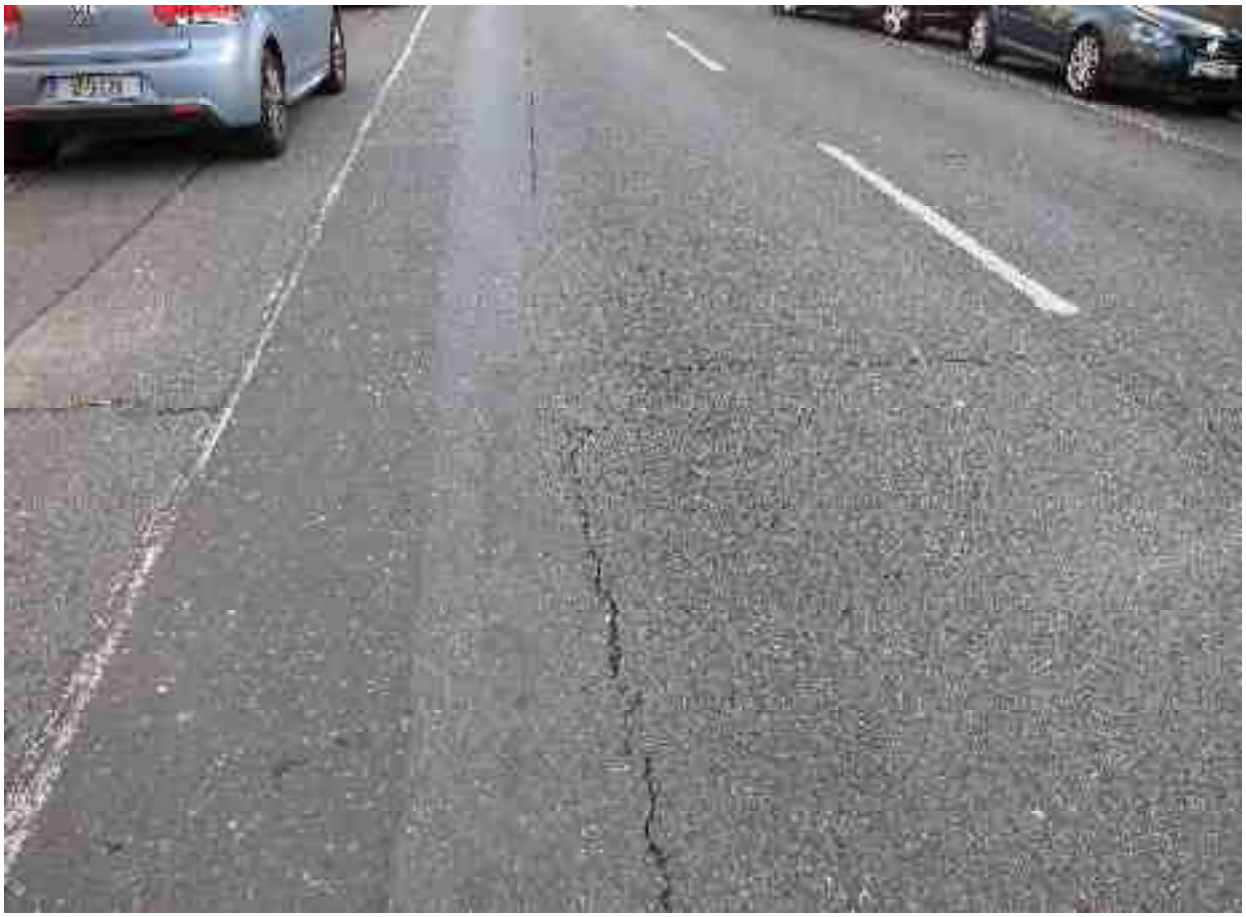
Linear cracks may be non-filled or may be filled with a sealant. Non-filled cracks ≤ 12 mm in width, filled cracks of any width where the sealant is in satisfactory condition, and cracks where no spalling/ravelling exists would be considered to be at the lower end of deterioration. Non-filled cracks > 12 mm in width, filled cracks of any width where the sealant is in poor condition, and cracks where spalling exists are classified as having more severe deterioration.

Other cracking also includes Slippage cracking which are crescent or rounded cracks. They are caused by slippage between an overlay and the underlying pavement due to a low-strength surface mix or poor bond. Slippage is most likely to occur at areas where traffic is stopping and starting, turning or braking.

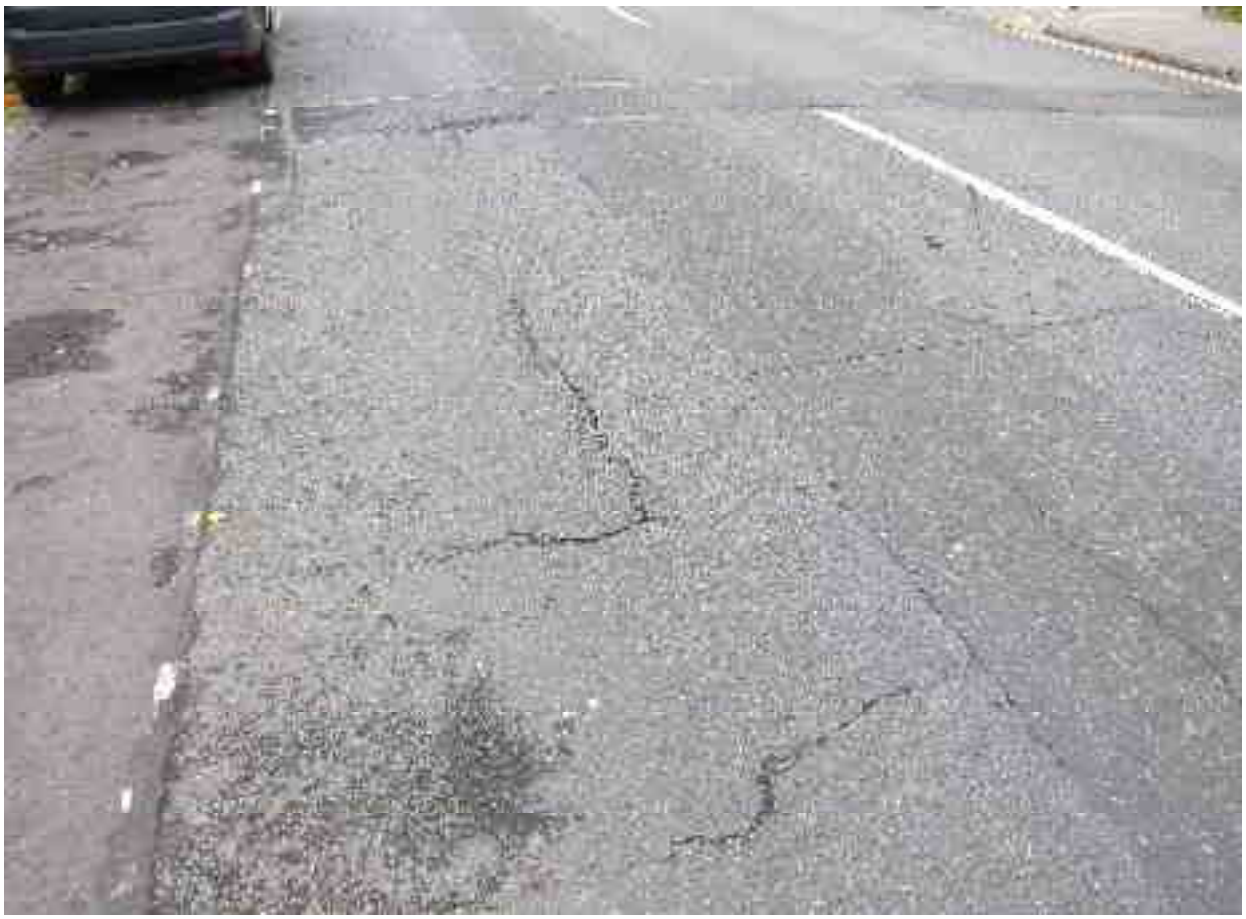


Reflection cracking on new pavement surface

Other Cracking

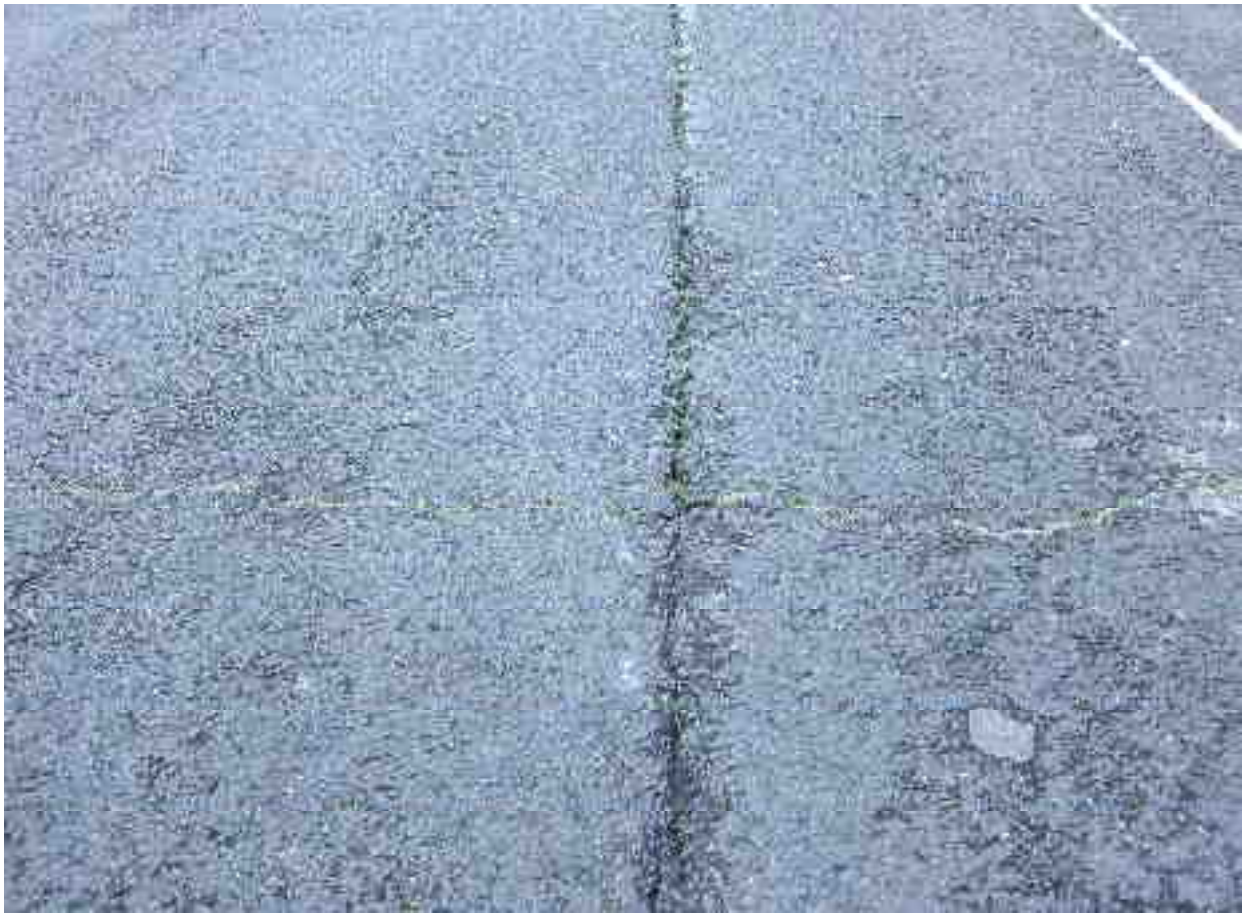


Reflection cracking, narrow width (≤ 12mm)

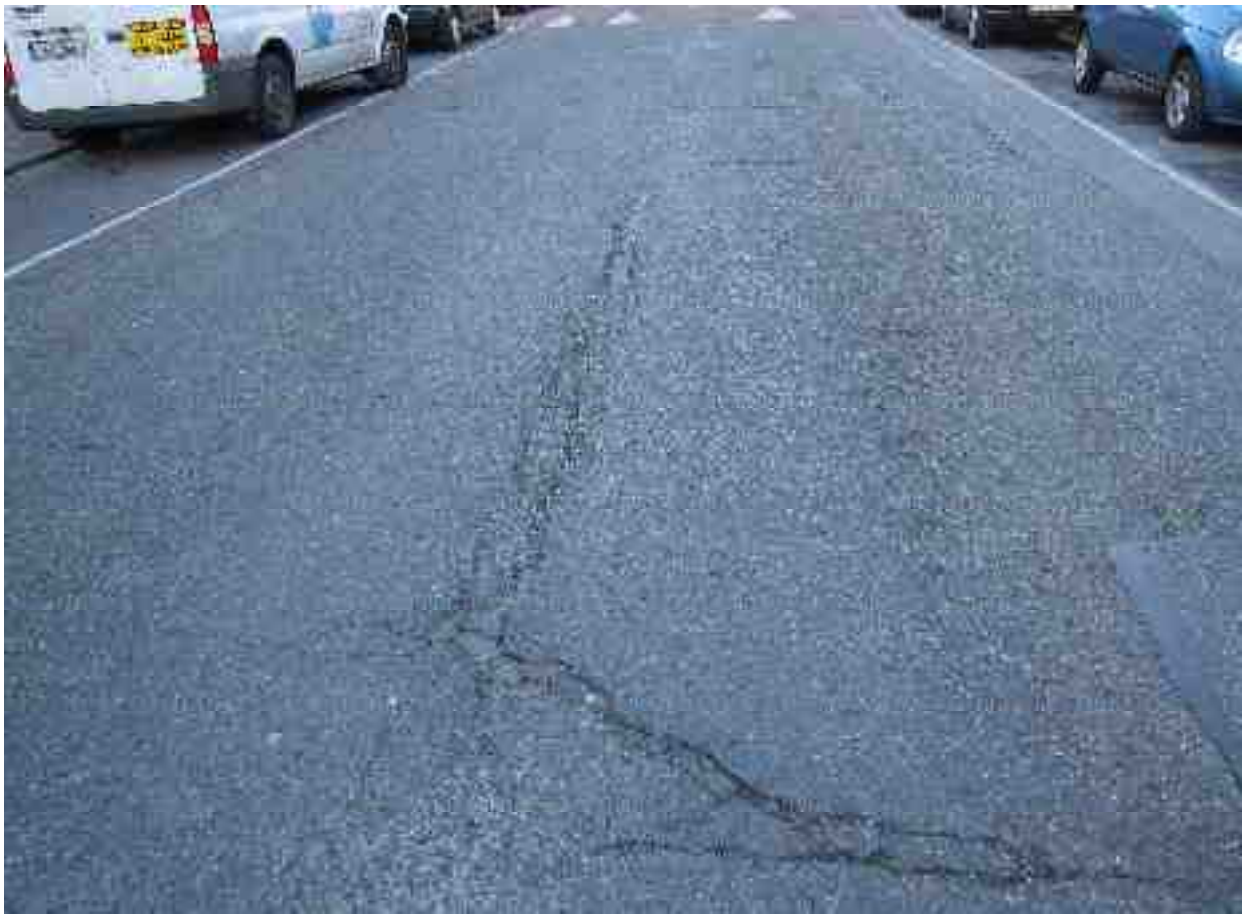


Longitudinal and Transverse cracking, relatively tight cracks

Other Cracking



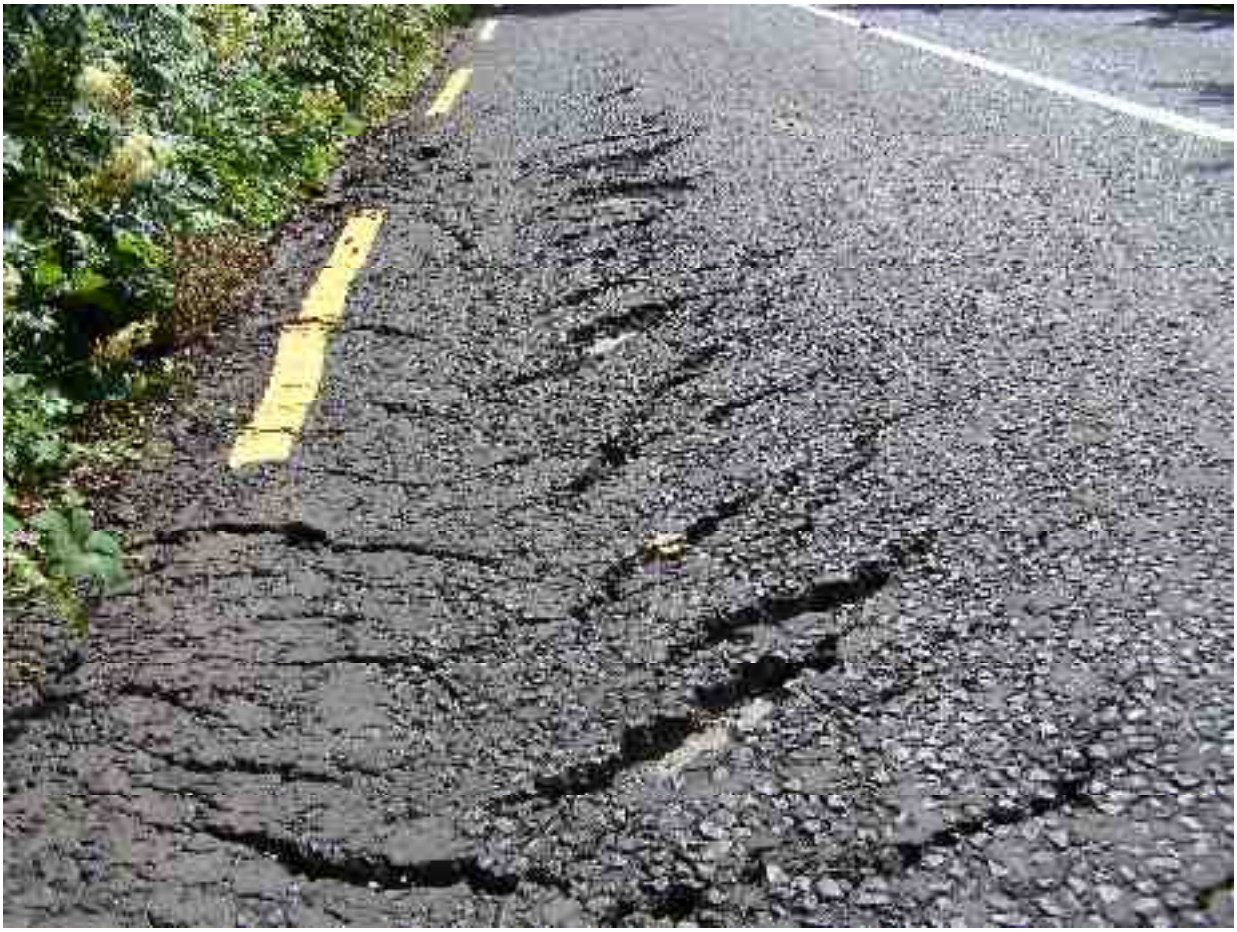
Reflection cracking, open (> 12mm) and unsealed



Wide open reflection cracking (>12mm) with spalling of edges

Other Cracking

Meander reflection cracking



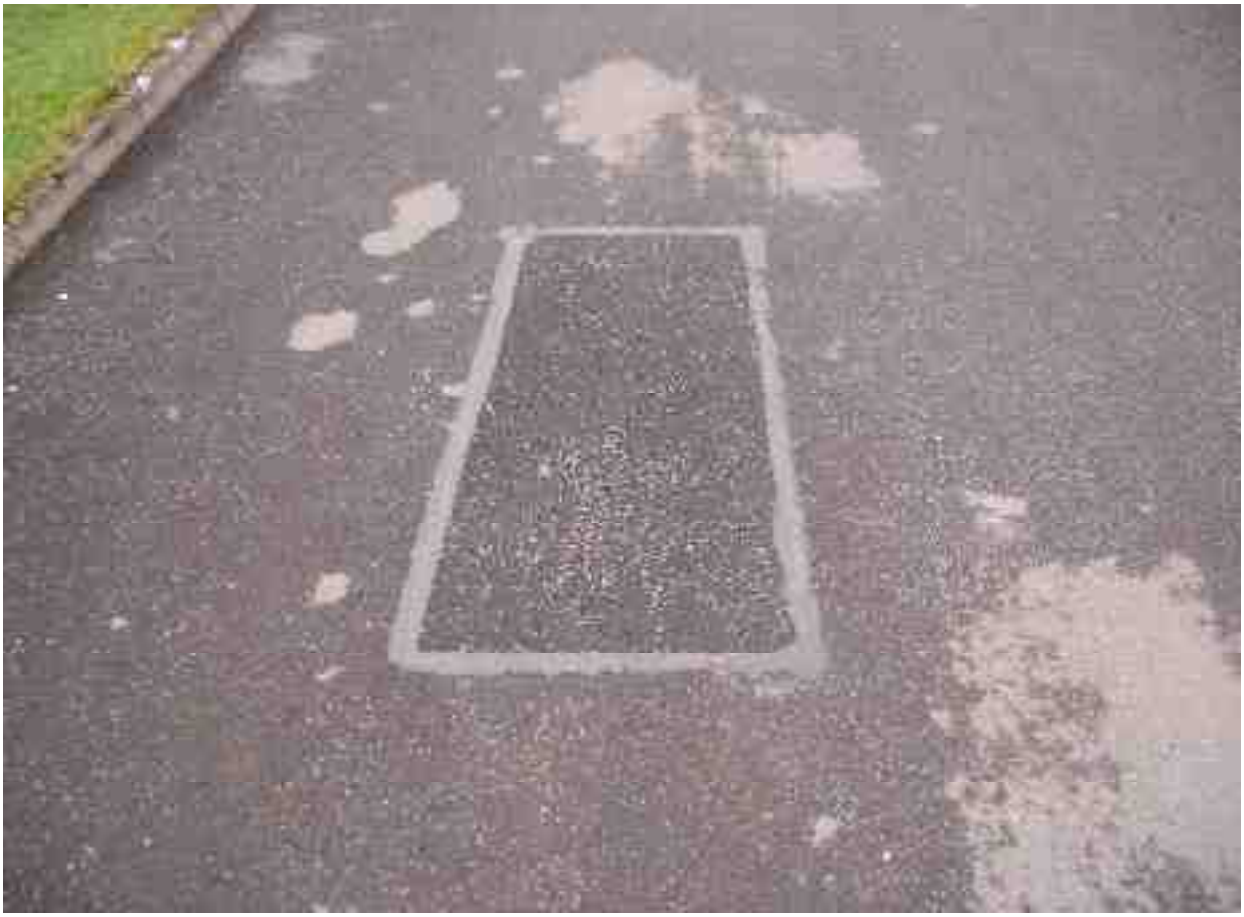
Slippage cracking with underlying stability problems

SURFACE OPENINGS

Patching

A patch is an area where the original pavement has been removed and replaced with new material. A utility cut is a patch that has replaced the original pavement to allow the installation or maintenance of underground utilities. Patches showing cracking, settlement, joint deterioration, or other distress under continued traffic loading indicate underlying causes still remain.

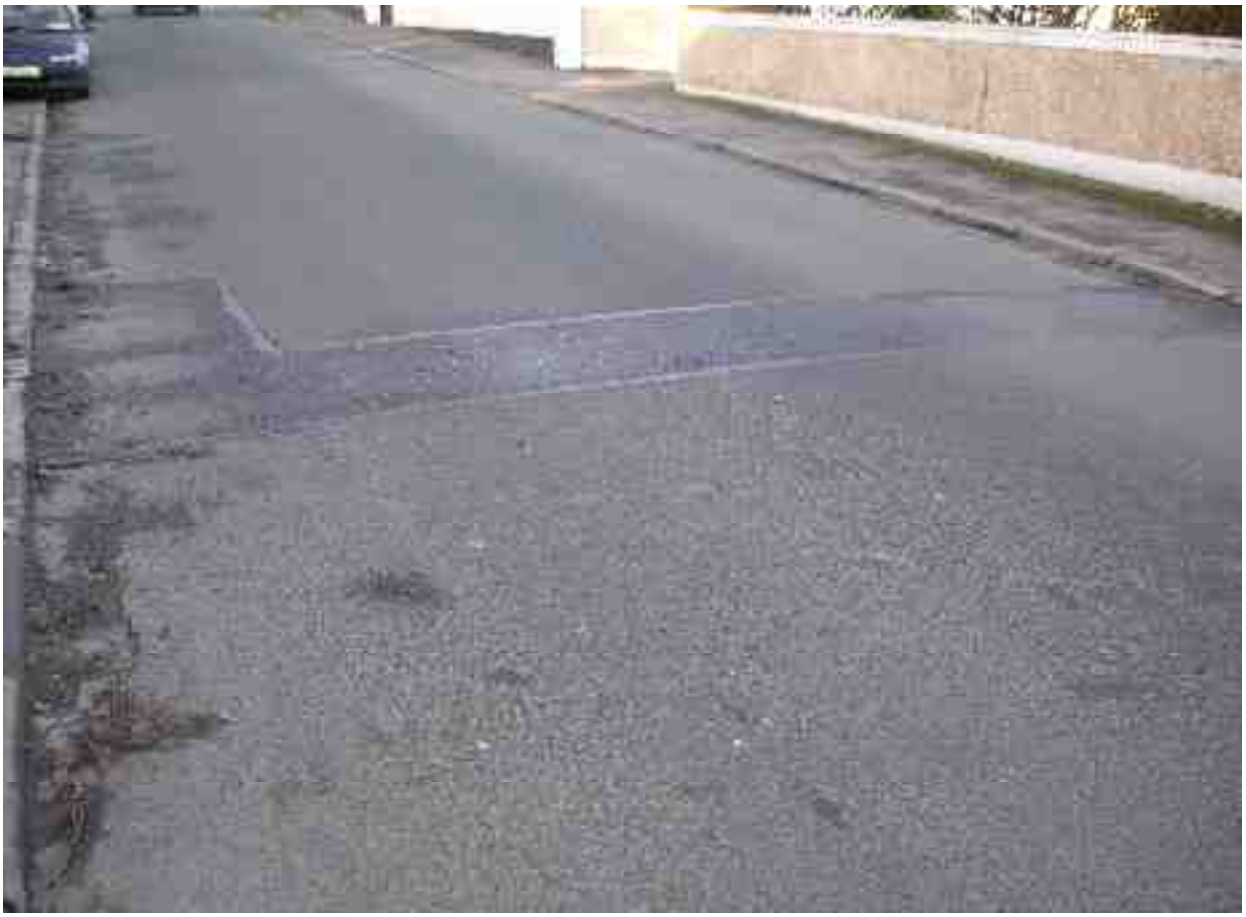
Patches can be both small (< 1 m^2) or large in size such as utility cut repairs. Patches may be in good condition and performing satisfactorily with little or no deterioration. Patches may be moderately deteriorating or badly deteriorating with other defects in the patched area and in need of replacement.



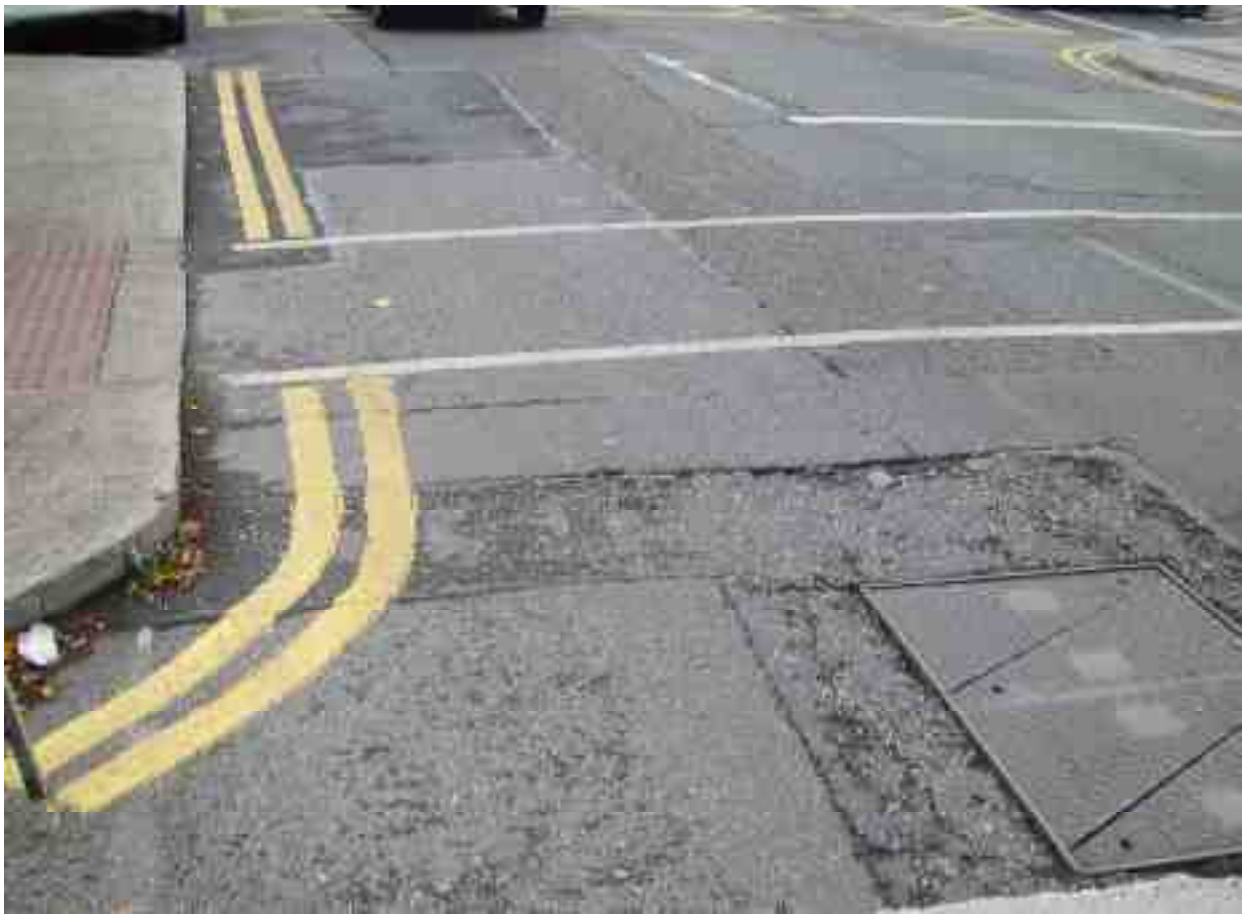
Well sealed small patch in very good condition

SURFACE OPENINGS

Patching



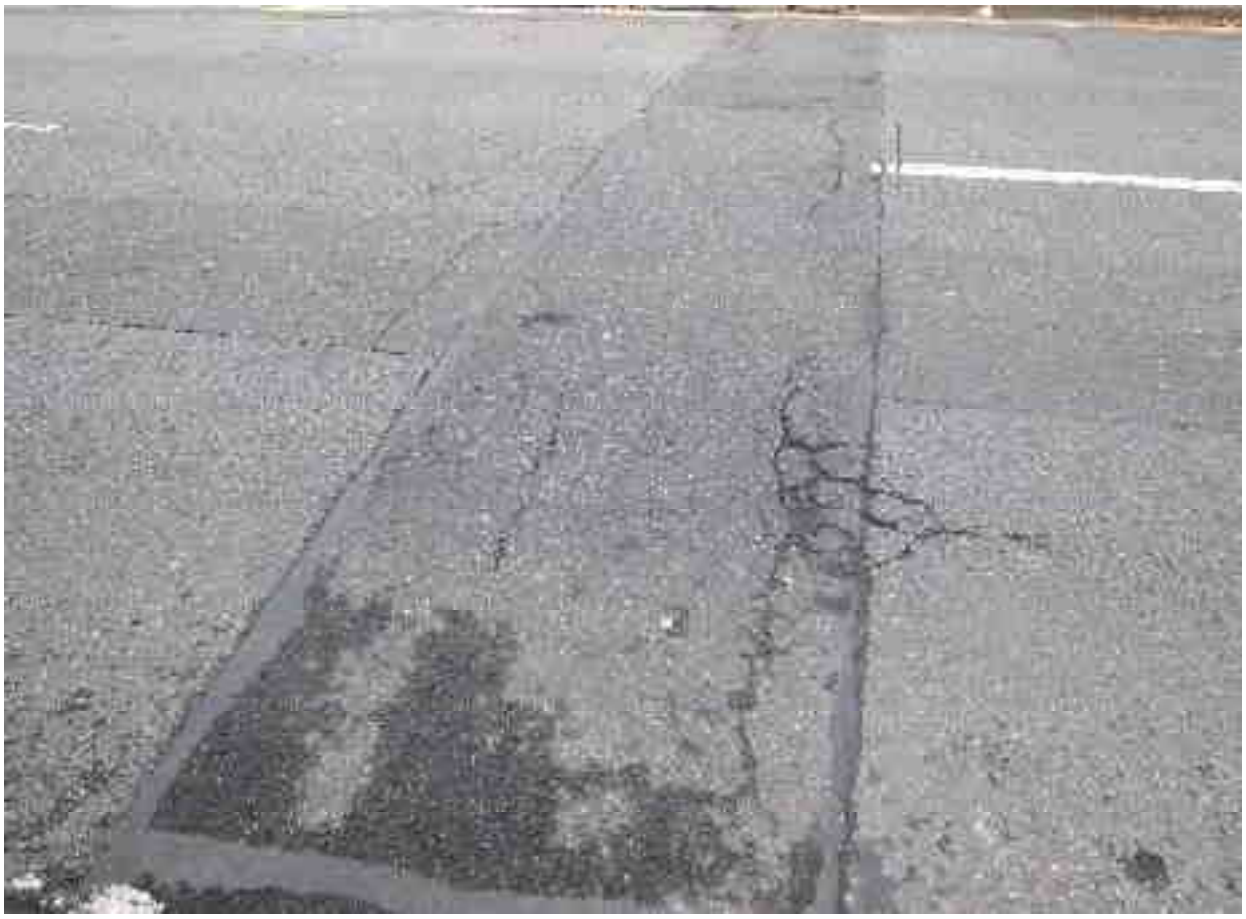
Utility cut repair in very good condition with well sealed joints



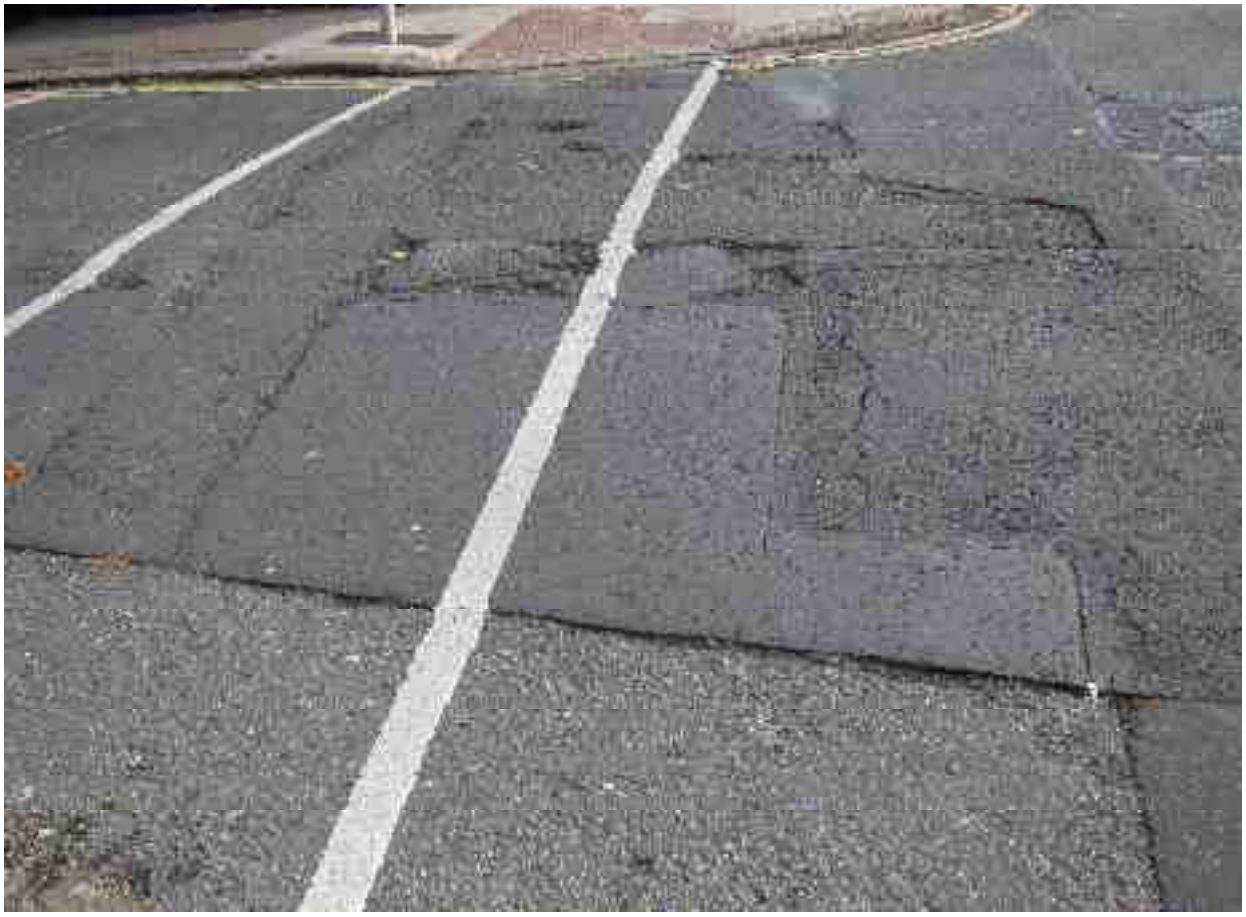
Utility cut patching repairs in fair condition

SURFACE OPENINGS

Patching



Utility Patch showing deterioration with linear and alligator cracking present

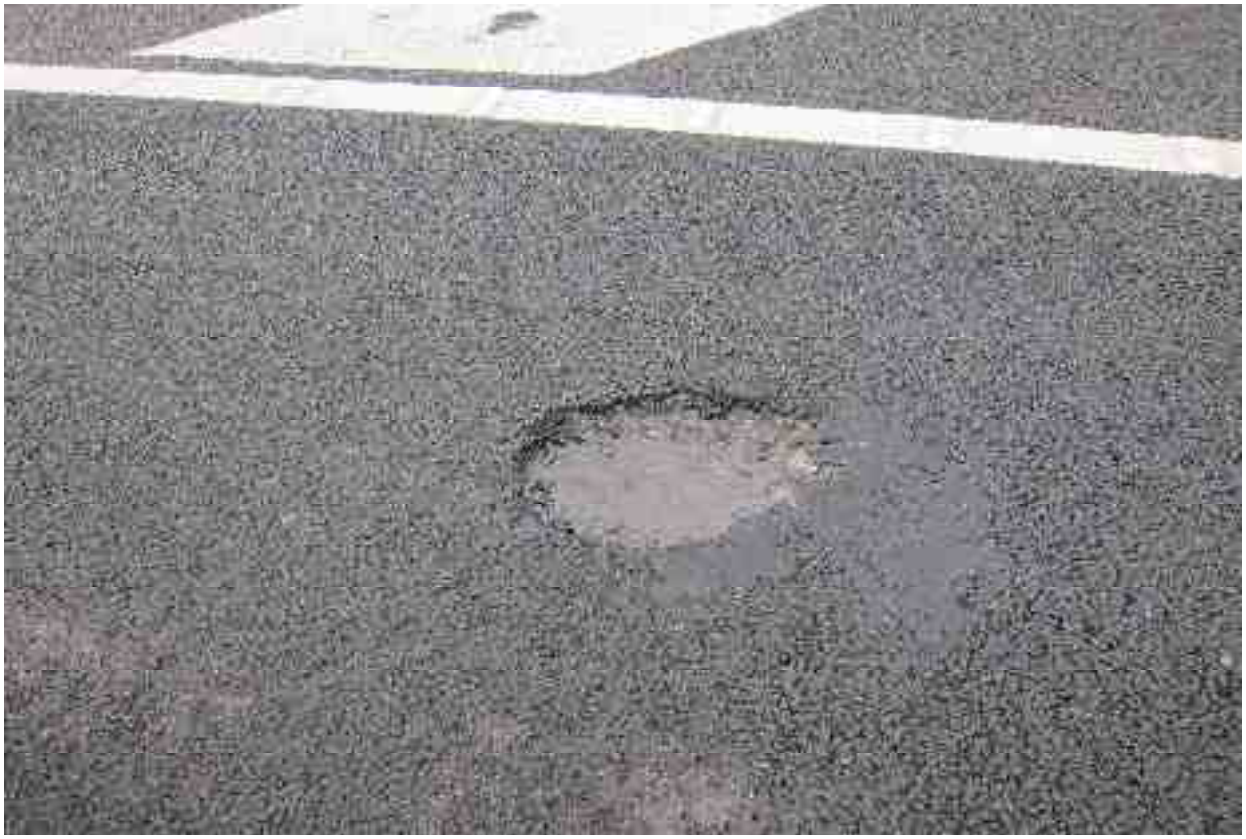


Very poor patching with extensive distress present

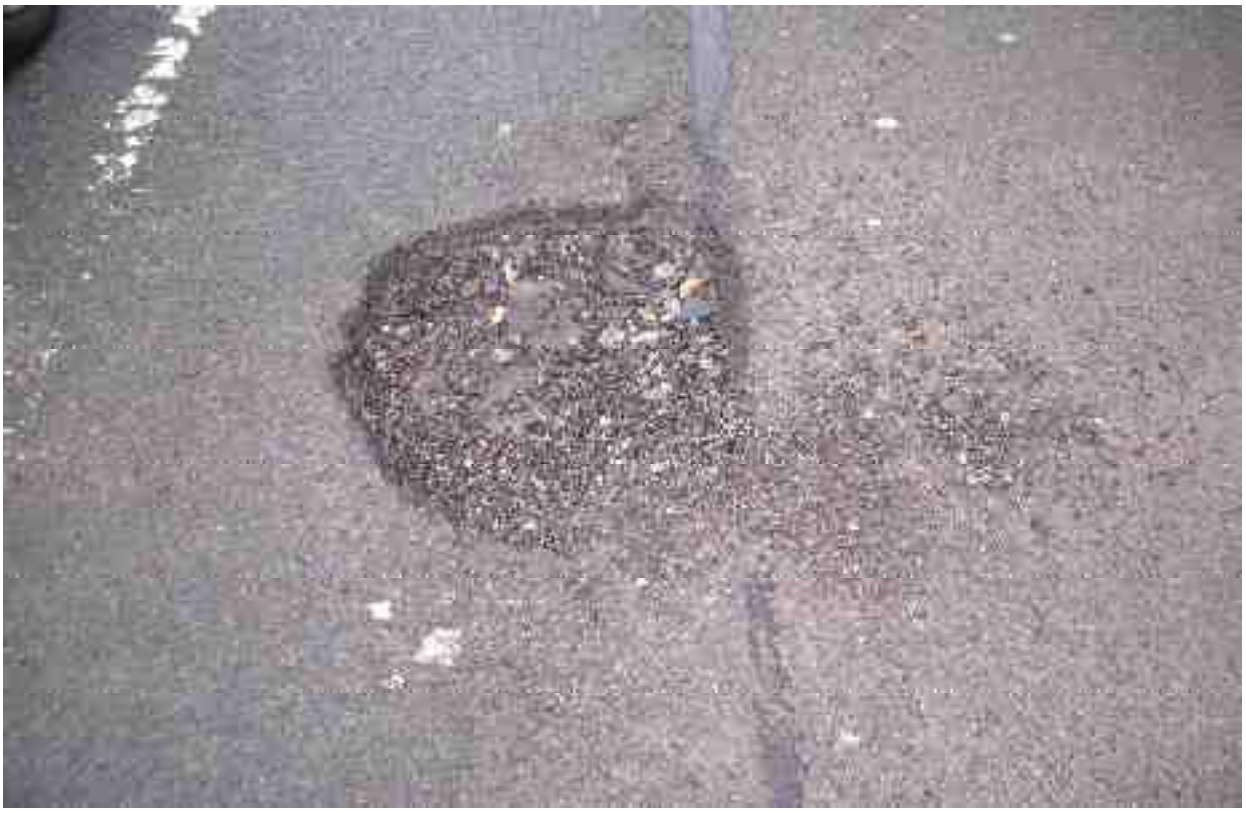
SURFACE OPENINGS

Potholes

Potholes are bowl-shaped depressions where part of the pavement has been removed, exposing the underlying layer(s). They are produced when cracking or some other defect allows moisture to penetrate the pavement surface, which is subjected to repeated traffic loading. This results in disintegration of the surface and the progressive removal of the underlying material. This is often combined with poor drainage. Repair by excavating or rebuilding localised potholes as well as localised surface dressing/overlay of repaired areas. Reconstruction required for extensive defects.



New pothole in PMSMA (Clause 942) surface



Medium sized pothole where top course has broken away

SURFACE OPENINGS

Potholes

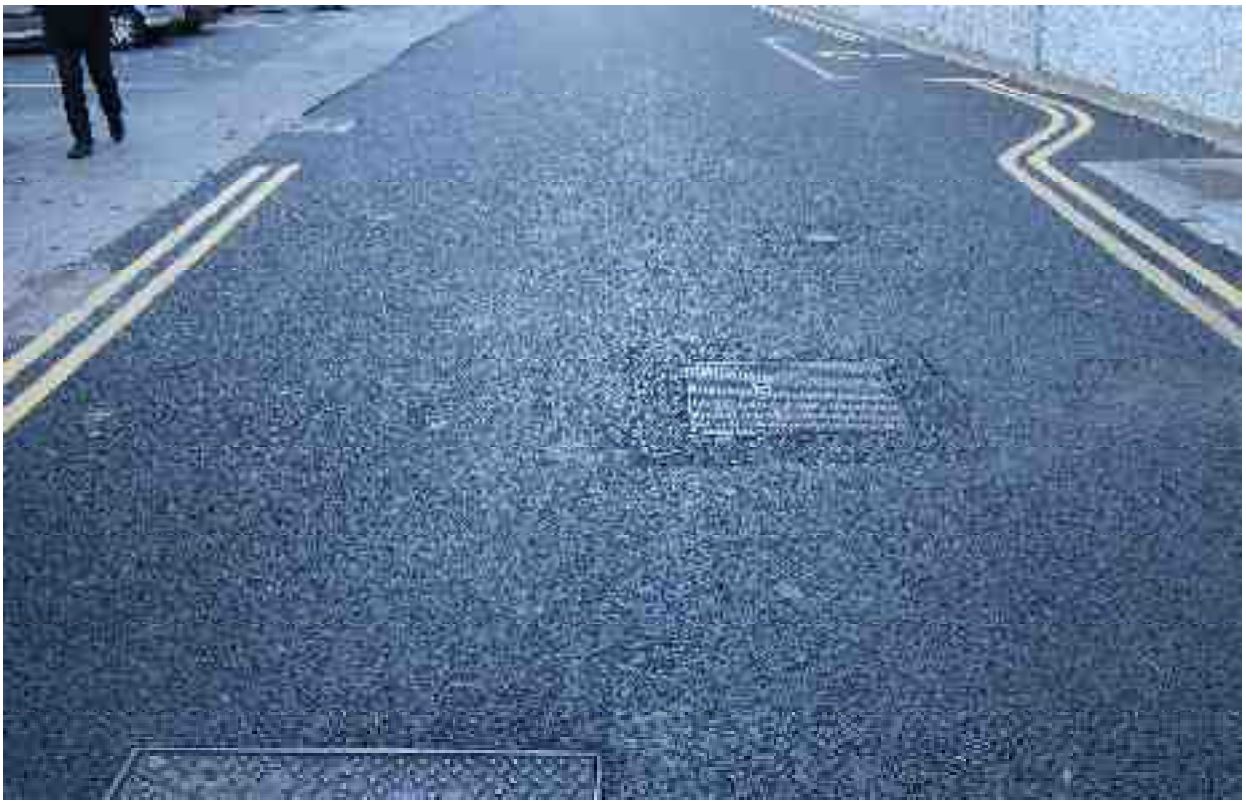
Large isolated pothole, extends through base.
Note adjacent alligator cracks which commonly deteriorate into potholes

SURFACE OPENINGS

Manhole/Ironworks

The surface of a normal pavement maybe interrupted to accommodate manholes, ironworks or a storm sewer inlet. Manholes and ironworks are considered a defect no matter how well they are constructed and are performing. Manholes and ironworks which have been poorly constructed or which have not been raised in line with the pavement surface have a negative effect on pavement condition and cause poor ride quality. Cracks, settlement, potholes etc. may develop around manholes and ironworks which may deteriorate further. These are often localised defects that may not indicate a general pavement problem.

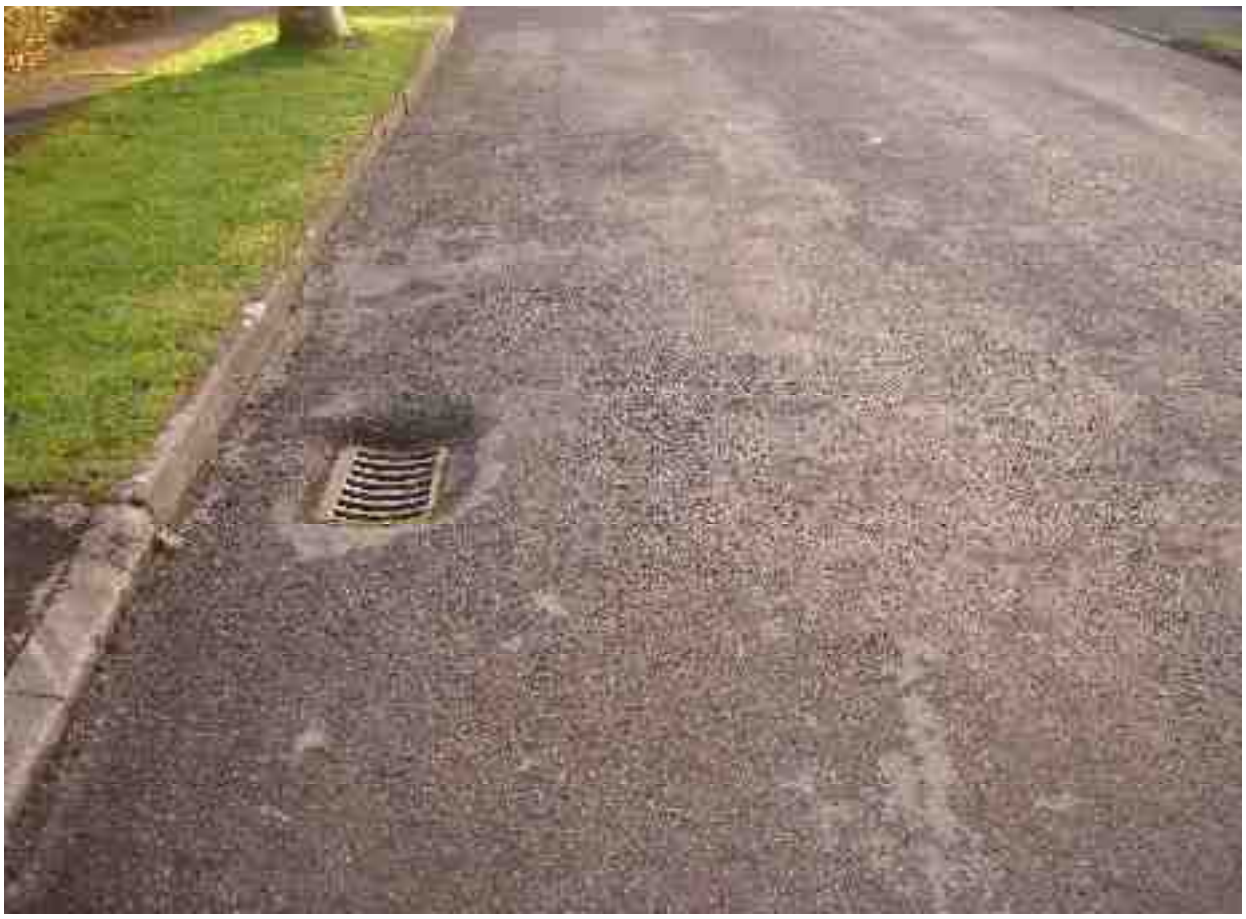
Dual pavement inlet gullies with new well sealed utility cut patch in excellent condition



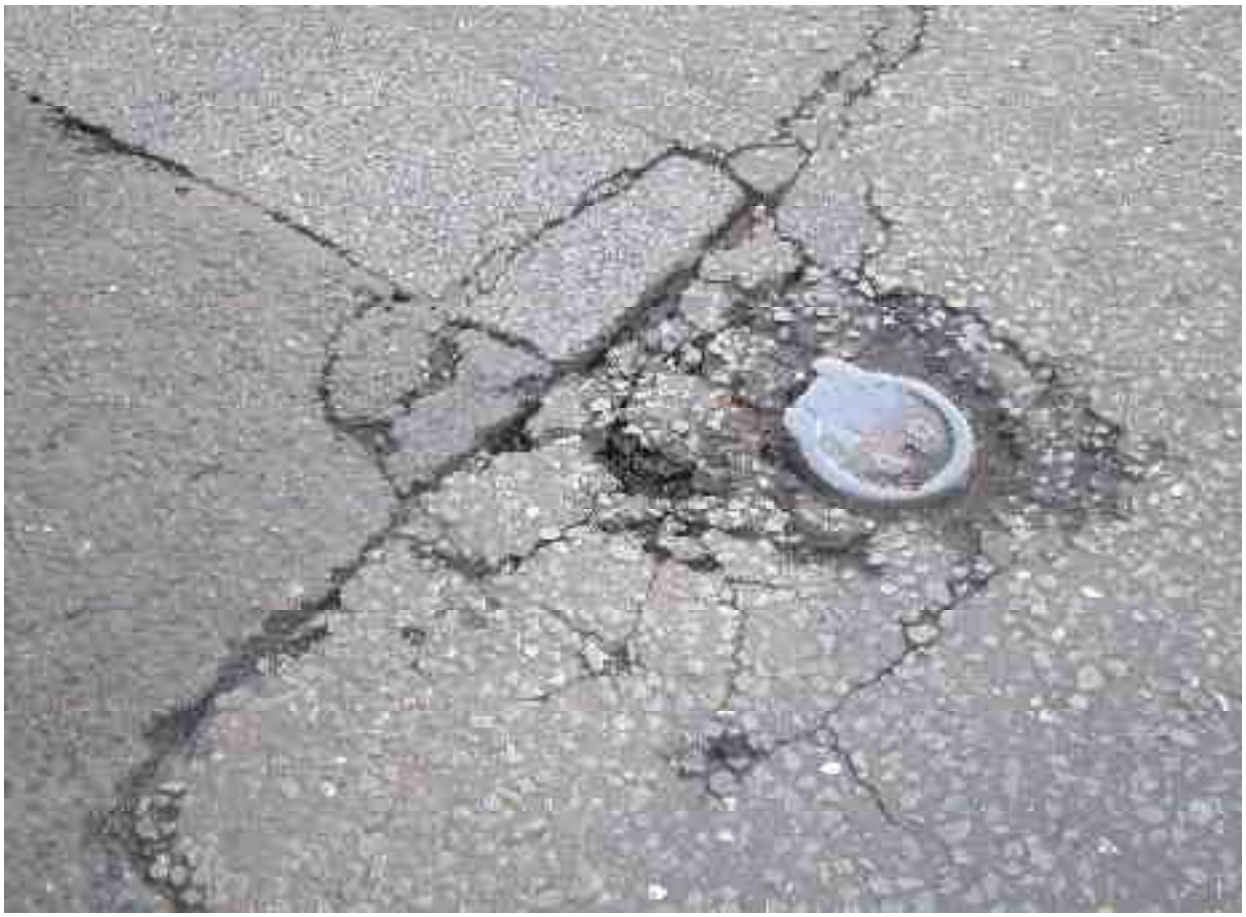
Services ironworks with new utility cut patch in very good condition, joint sealing absent

SURFACE OPENINGS

Manhole/Ironworks



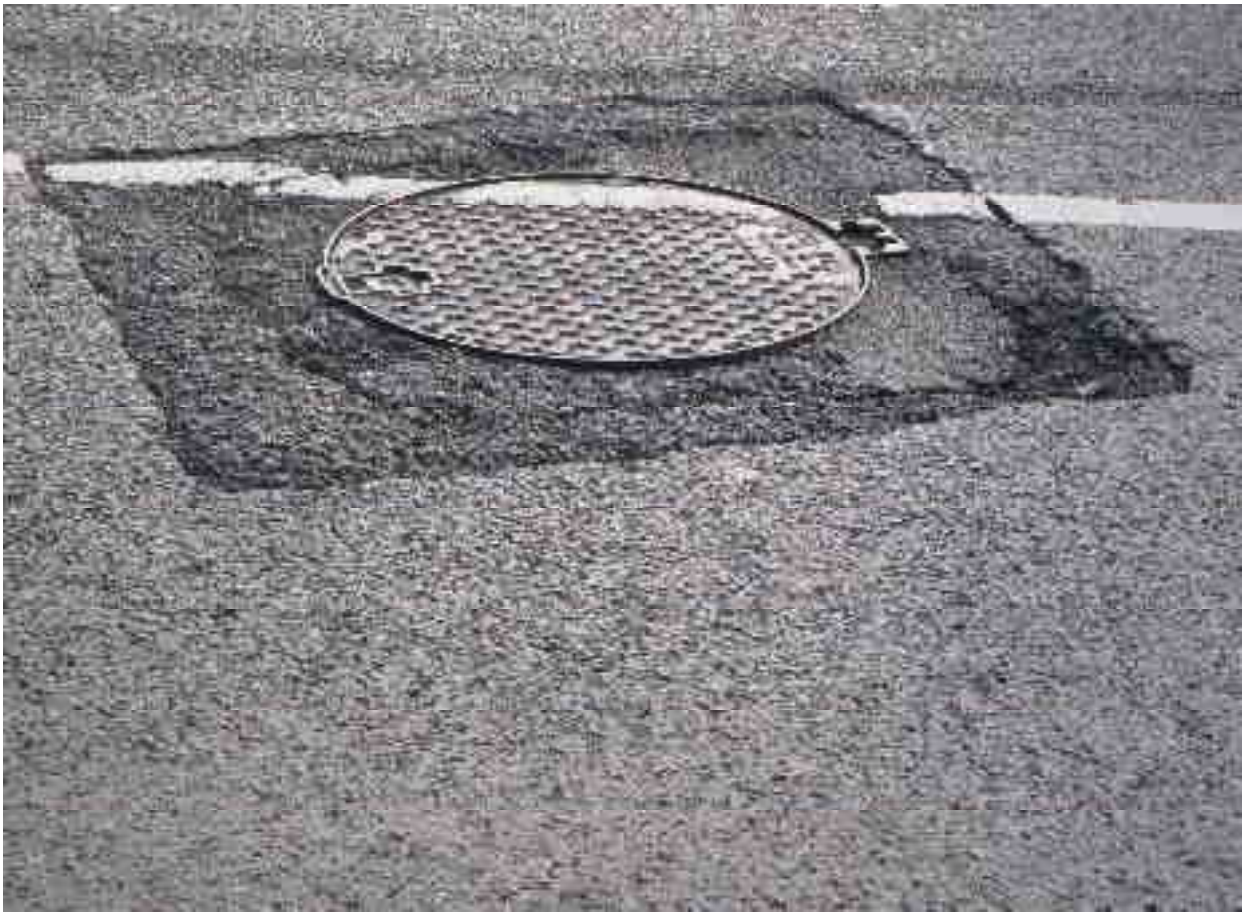
Inlet gully not raised to new road surface causing severe and sudden dip in left wheelpath



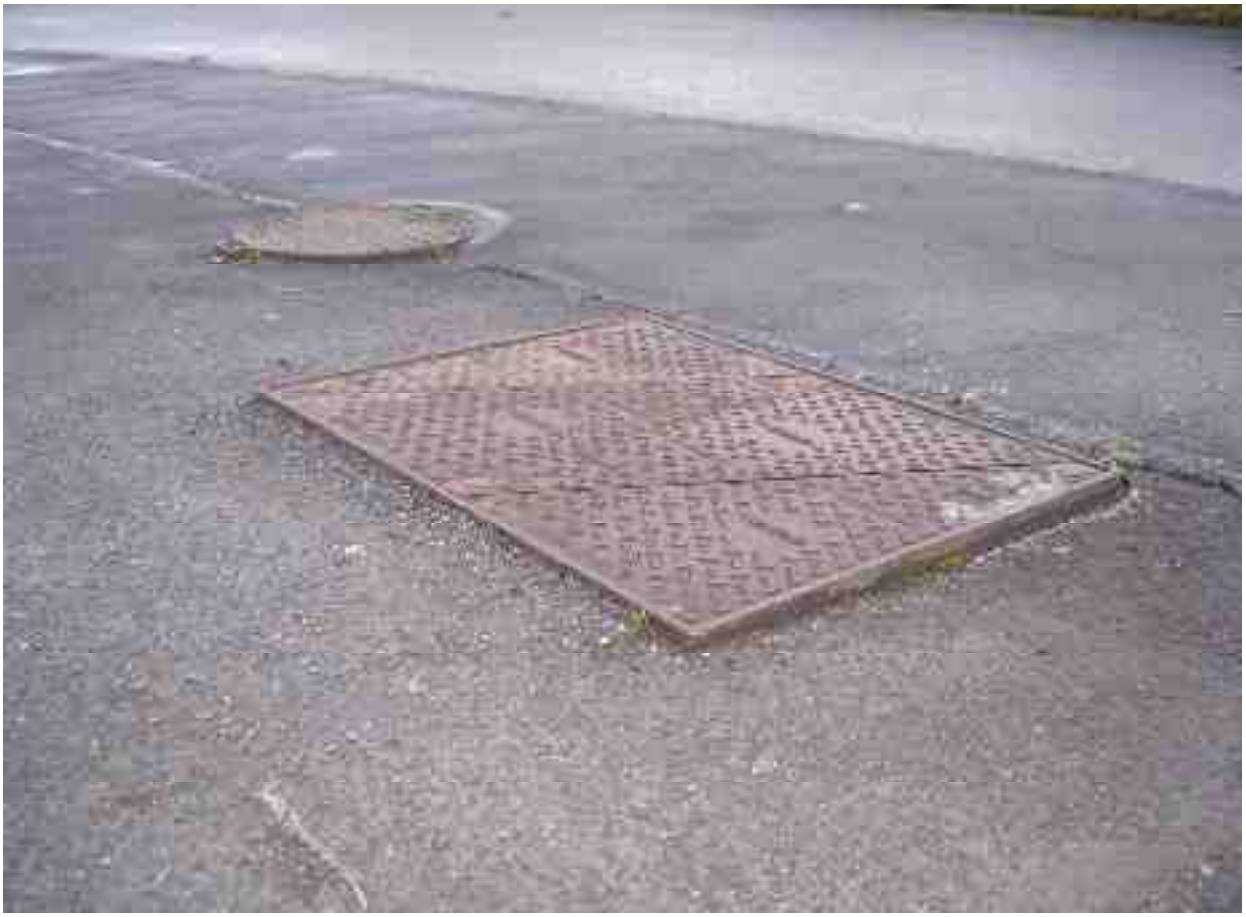
Failed pavement surface in vicinity of small ironworks

SURFACE OPENINGS

Manhole/Ironworks



Manhole with utility repair in poor condition



Ironworks above the pavement surface causing poor ride quality

Section 3: Rating Pavement Condition

Table 1 on the following page outlines the rating system for rating pavement condition. With an understanding of surface defects, structural distresses and other pavement defects, you can evaluate and rate flexible pavement surfaces. **Surface defects** comprise ravelling and bleeding; **Structural distresses** (i.e. load-related) include rutting, alligator cracking, edge cracking/breakup, potholes and poor/failed patching; while **Other pavement defects** include **Other cracking** (longitudinal, transverse, reflection, meander and slippage cracking); **Surface distortion** (depressions/sags, shoving, bumps, settlement, or heave), and **Surface openings** (good/fair patching, utility-cut patches and manholes/ironworks).

The rating scale ranges from 10 for a pavement in excellent condition to 1 for a pavement in failed condition. Most pavements will deteriorate through the phases listed in the rating scale. The time it takes to go from excellent condition (10) to complete failure (1) depends largely on the quality of the original construction and the amount of heavy traffic loading.

Once significant deterioration begins, it is common to see pavement decline rapidly. This is usually due to a combination of loading and the effects of additional moisture. As a pavement ages and additional cracking develops, more moisture can enter the pavement and accelerate the rate of deterioration.

Look at the photographs in this section to become familiar with the descriptions of the individual rating categories. To evaluate an individual pavement segment, first determine its general condition. Is it relatively new, toward the top end of the scale? Is it in very poor condition and at the bottom of the scale? Or somewhere in-between?

Finally, review the individual pavement distresses and using the primary rating indicators and secondary rating indicators given in Table 1, select the appropriate PSCI surface rating category for the pavement segment.

Individual pavements will not have all of the types of distress listed for any particular rating. They may have only one or two types.

Table 1: The PSCI Rating System

Overall PSCI Rating	Primary Rating Indicators*	Secondary Rating Indicators*
10	**No Visible Defects.**	Road surface in perfect condition.
9	**Minor Surface Defects[1].** **Ravelling or Bleeding <10%.**	Road surface in very good condition. Like new.
8	**Moderate Surface Defects[1].** **Ravelling or Bleeding 10% to 30%.**	Little or No Other defects.
7	**Extensive Surface Defects[1].** **Ravelling or Bleeding > 30%.**	Little or No Other defects.
6	**Moderate Other Pavement Defects[2, 3, 4].** **Other Cracking[2] < 20%. Sealed Cracks in Good condition.** **Some narrow Open Cracks[2] (≤ 12 mm).** **Patching in Good condition[4].** **Surface Distortion[3] requiring some reduction in speed.**	Surface defects[1] may be present. No structural distress[5].
5	**Significant Other Pavement Defects[2, 3, 4].** **Other Cracking[2] > 20%. Sealed Cracks in Fair condition.** **More frequent narrow Open Cracks[2] (≤ 12 mm).** **Patching in Fair condition[4].** **Surface Distortion[3] requiring reduction in speed.**	Surface defects[1] may be present. **Very localised structural distress[5]** (< 5 m^2 or a few isolated potholes) may be present.
4	**Structural Distress[5] Present.** **Rutting, Alligator Cracking or Poor Patching for 5% to 25%.** **Wide Open Cracks[2] (> 12 mm) with moderate Spalling.** **Sealed Cracks in Poor condition. Frequent Potholes.** **Short lengths of Edge Breakup.**	Other defects may be present.
3	**Significant Areas of Structural Distress[5].** **Rutting, Alligator Cracking or Poor Patching for 25% to 50%.** **Many Wide Cracks[2] (> 12 mm) with severe Spalling.** **More frequent Potholes.** **Continuous lengths with Edge Breakup.**	Other defects may be present.
2	**Large Areas of Structural Distress[5].** **Rutting, Alligator Cracking or Very Poor Patching for > 50%.** **Severe Rutting (> 50 mm).** **Extensive Very Poor Patching.** **Many Potholes.**	Pavement badly deteriorated. Very difficult to drive on.
1	**Extensive Structural Distress[5].** **Severe Deterioration of surface. Pavement Failure.** **Many large and deep Potholes.** **Extensive Failed Patching.**	Severe Deterioration Virtually undriveable.

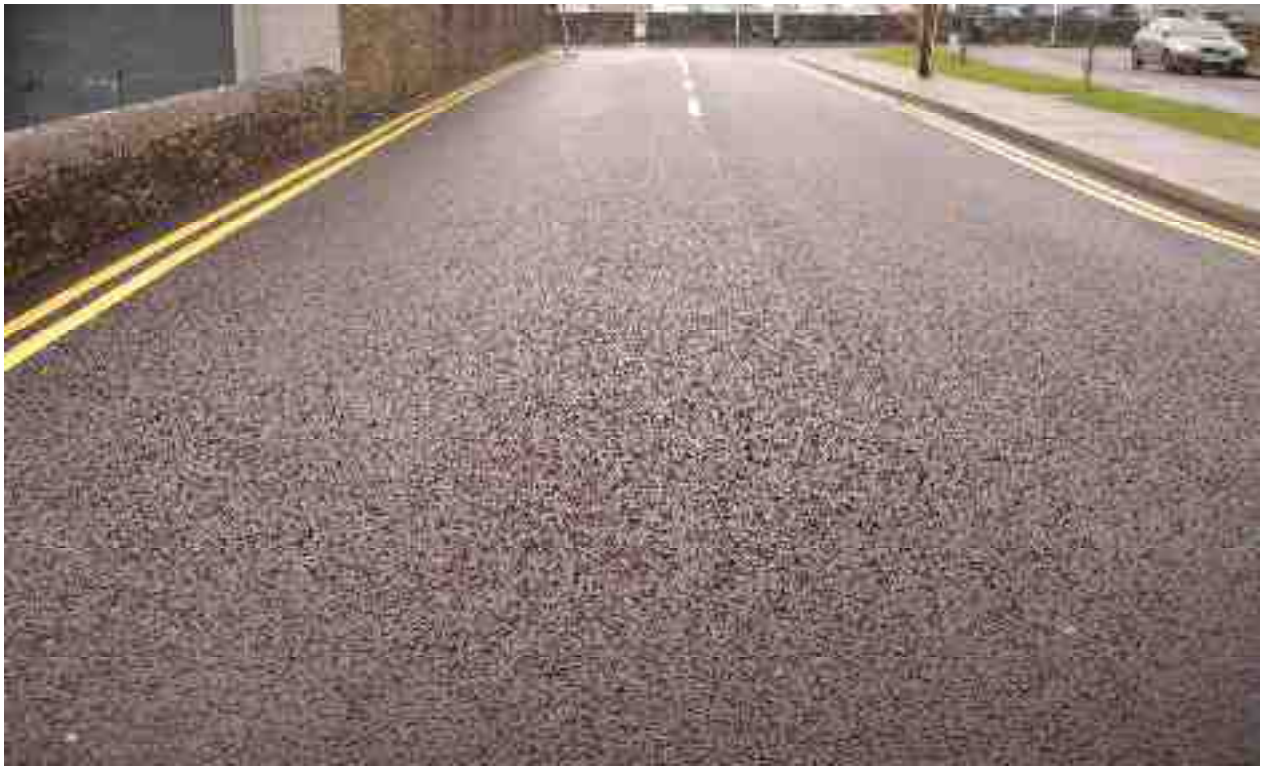
**Individual pavements will not have all the types of distress listed for any particular rating. They may have only one or two types.*

Note 1: Surface Defects = Ravelling or Bleeding.
Note 2: Other Cracking = Longitudinal, Transverse, Reflection, Meander or Slippage Cracking.
Note 3: Surface Distortion = Shape Problems, Depressions/Sags, Shoving, Bumps, Settlement or Heave.
Note 4: Surface Openings = Good/Fair Patching and Utility Cut Patches or Manholes/Ironworks.
Note 5: Structural Distress = Load-related defects comprising Rutting, Alligator Cracking, Edge Breakup/Cracking, Potholes or Poor/Failed Patching.

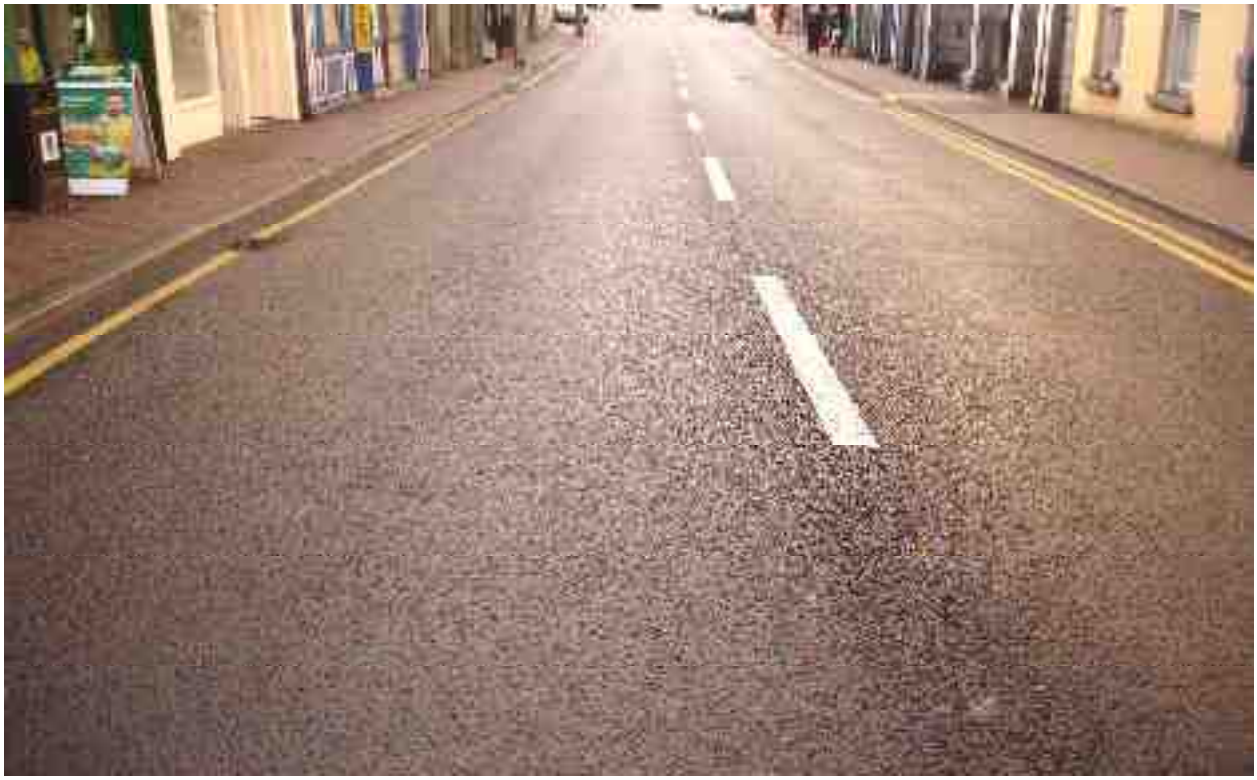
Rating 10

Excellent – Routine Maintenance

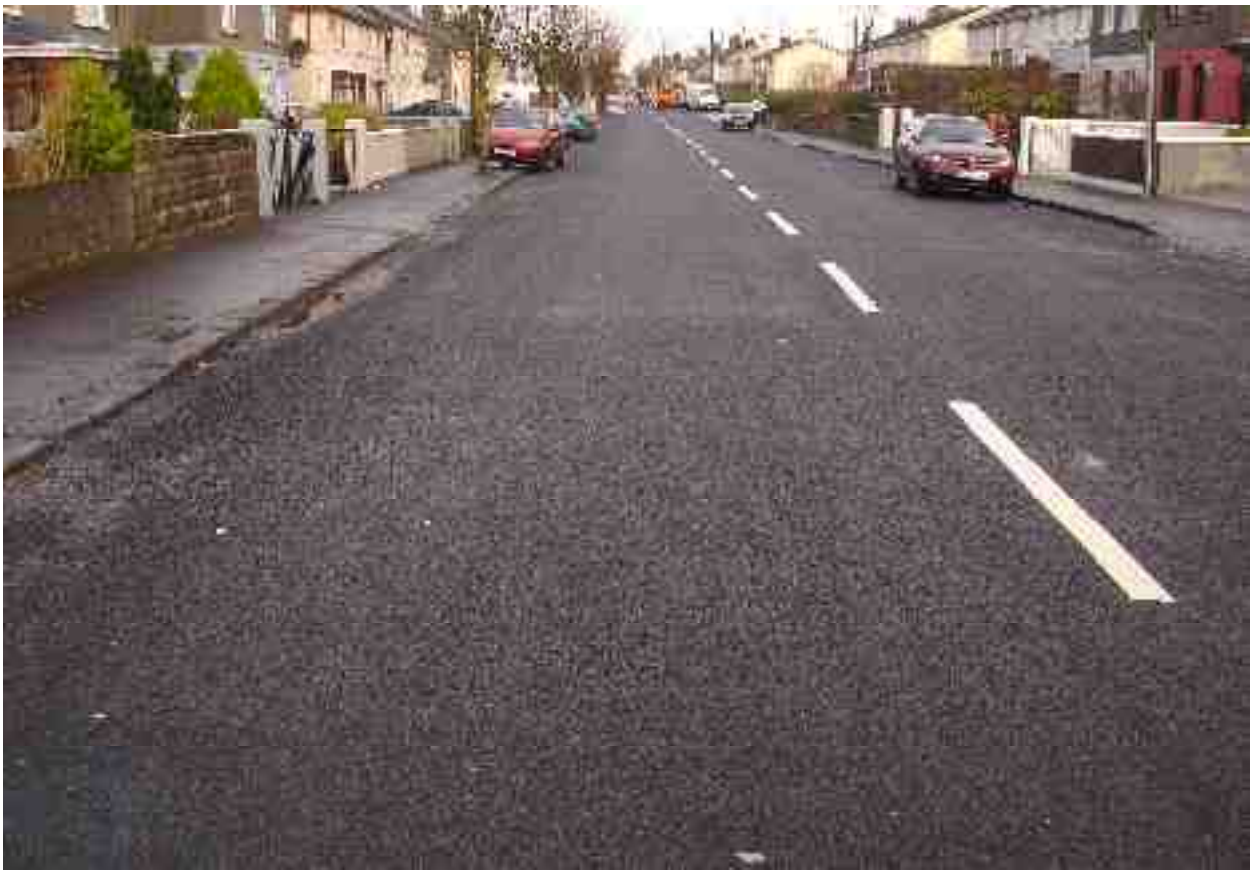
Newly constructed or recently overlaid roads are in excellent condition and require routine maintenance.



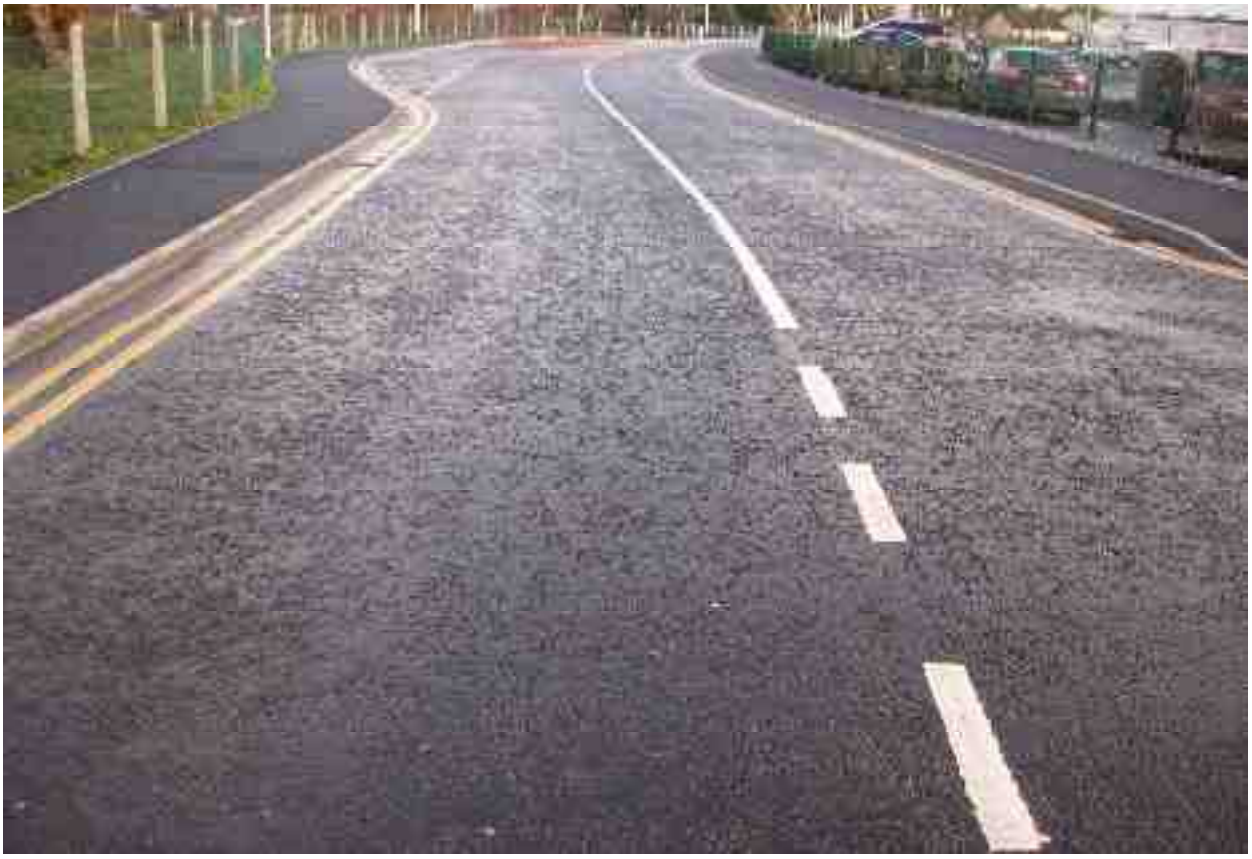
Rating 10: Road with no visible pavement defects, new Clause 942 surface



Rating 10: Road with no visible pavement defects, new Clause 942 surface



Rating 10: Road with no visible pavement defects, relatively new surface dressing



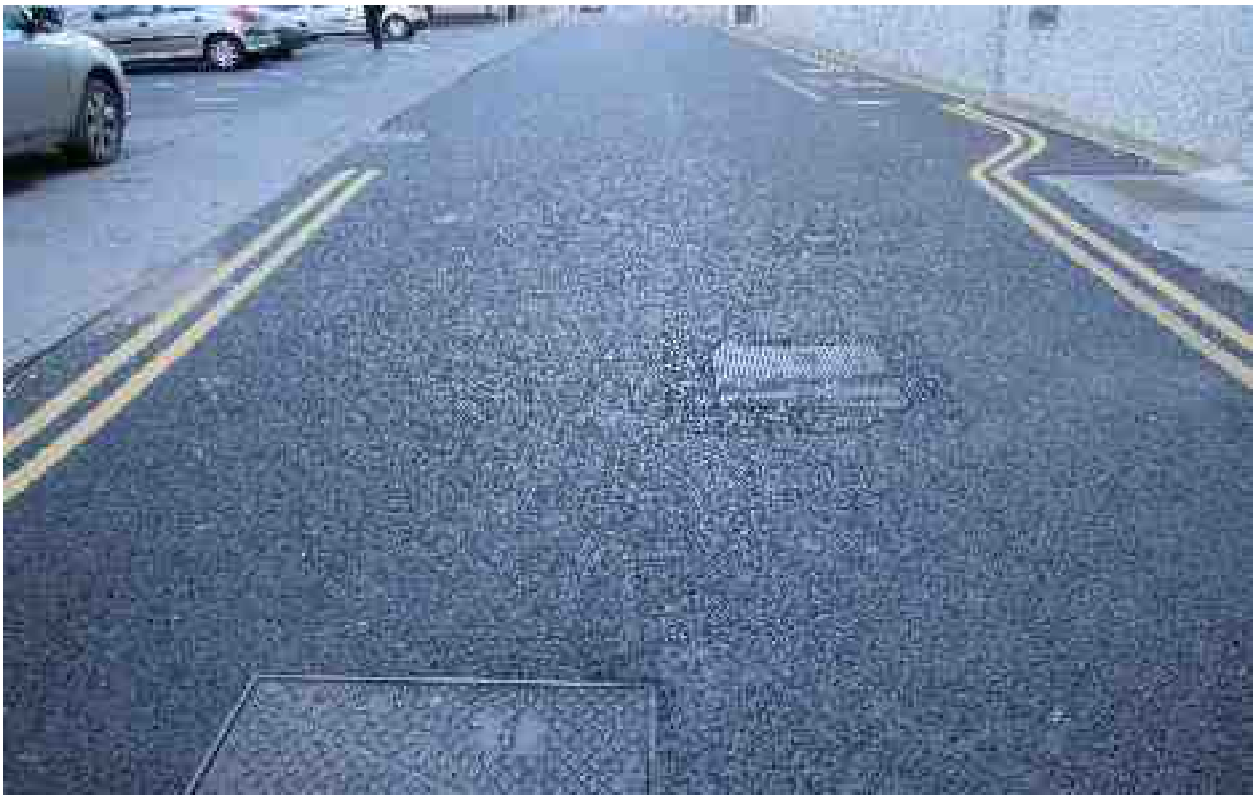
Rating 10: Road with new HRA surface

Rating 9

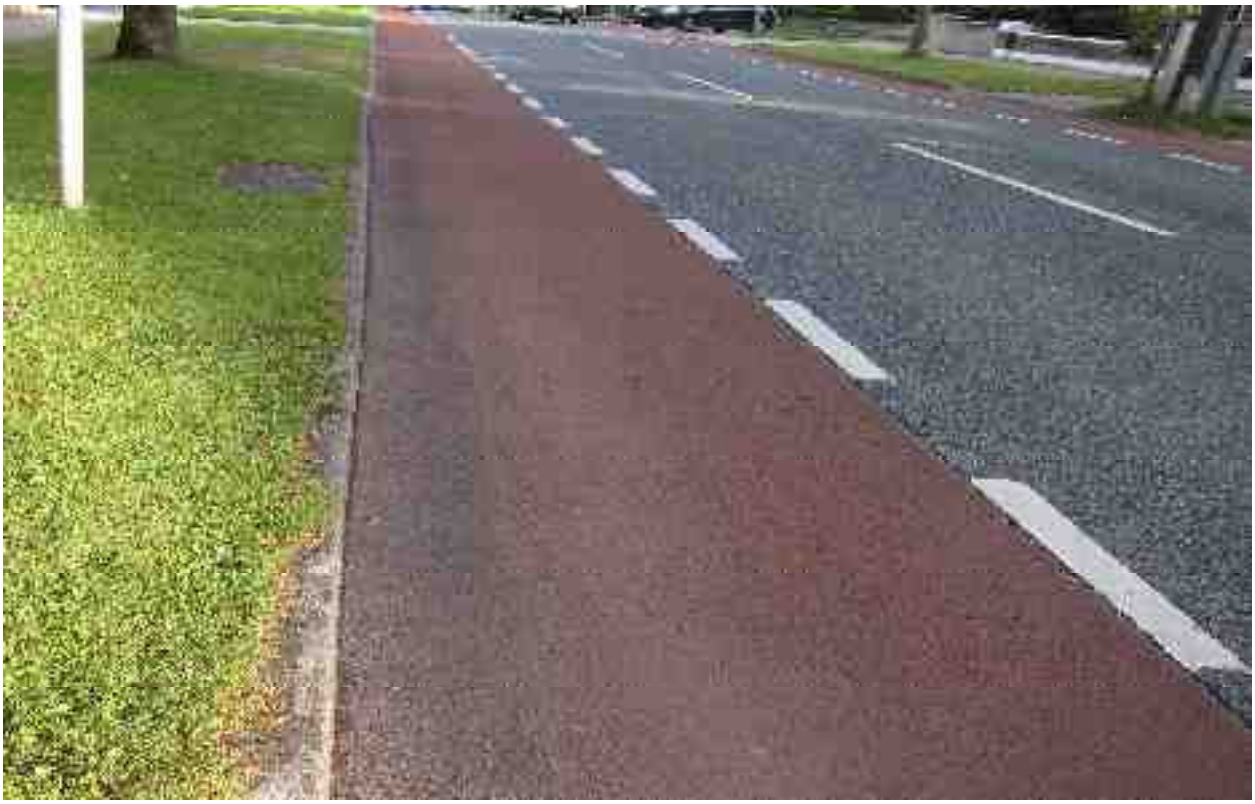
Very Good – Routine Maintenance

Pavements in very good condition with very few visible defects. Newly surface dressed pavements.

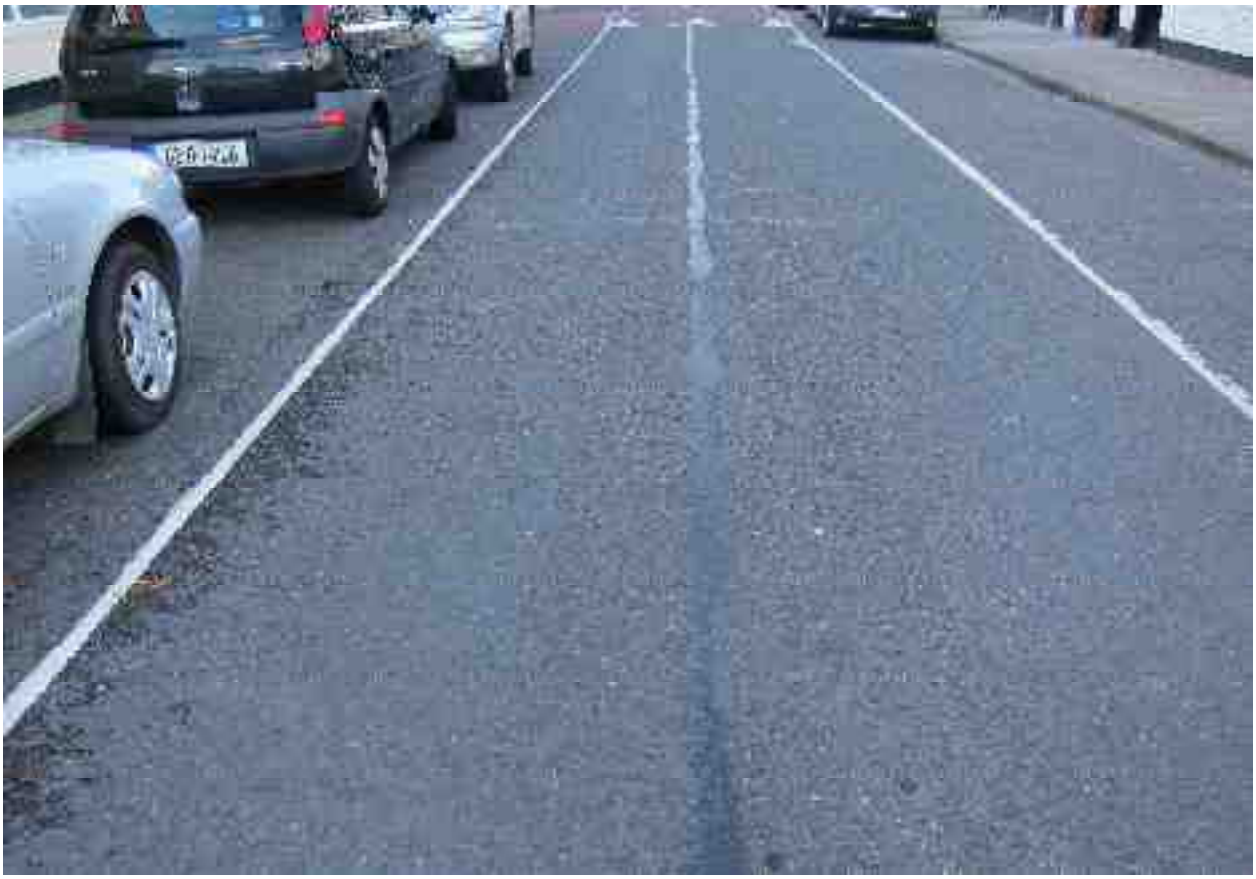
Less than 10% of surface with surface defects (ravelling and bleeding). No other defects.



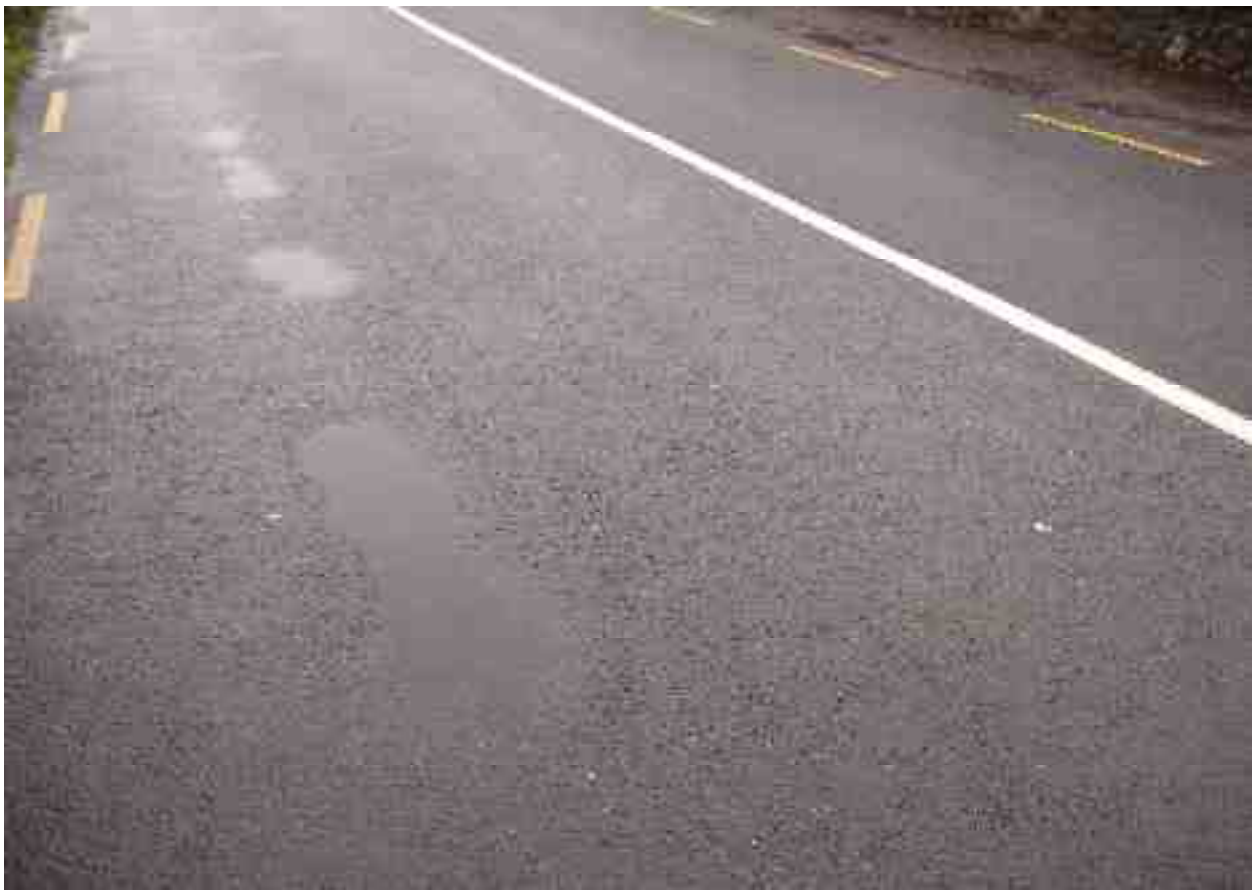
Rating 9: New surface with Manhole/ironworks patching in very good condition



Rating 9: Pavement surface on carriageway and cycle lanes in very good condition



Rating 9: Road with good surface and well sealed joint

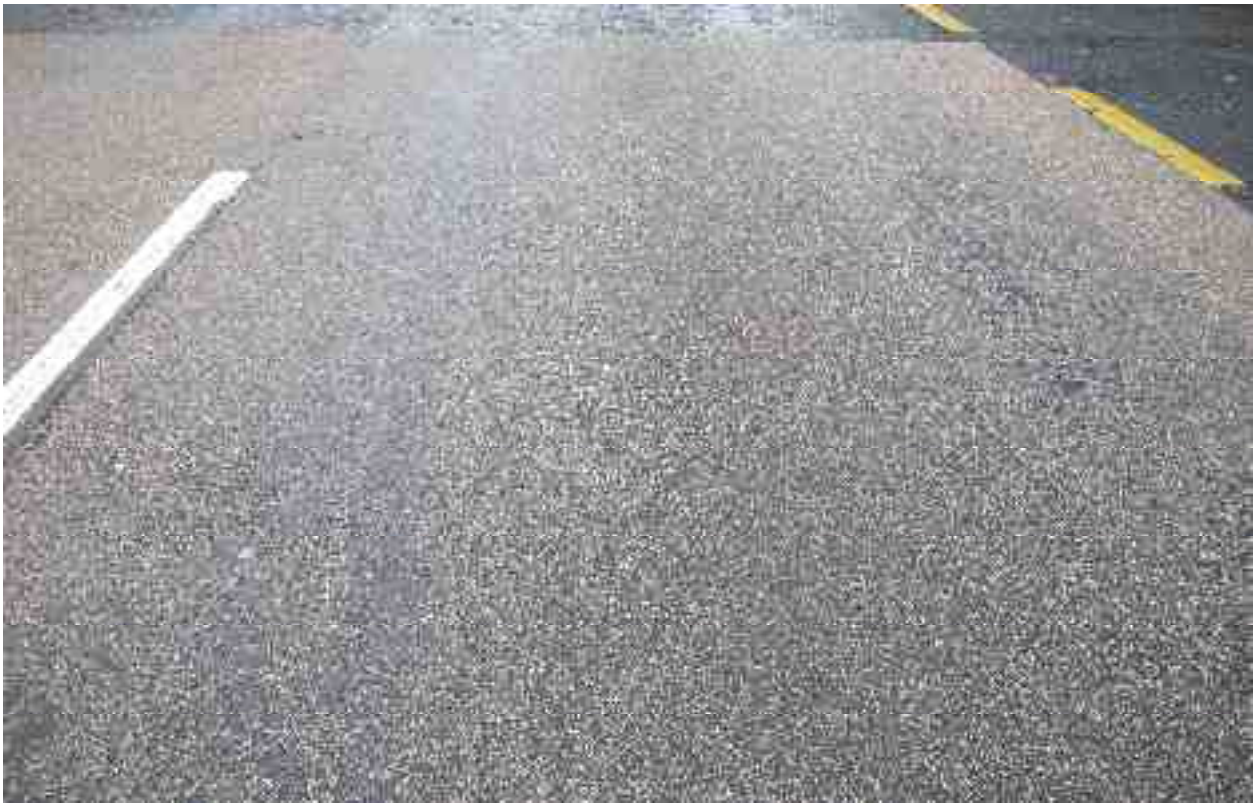


Rating 9: Fatting up of pavement surface less than 10%

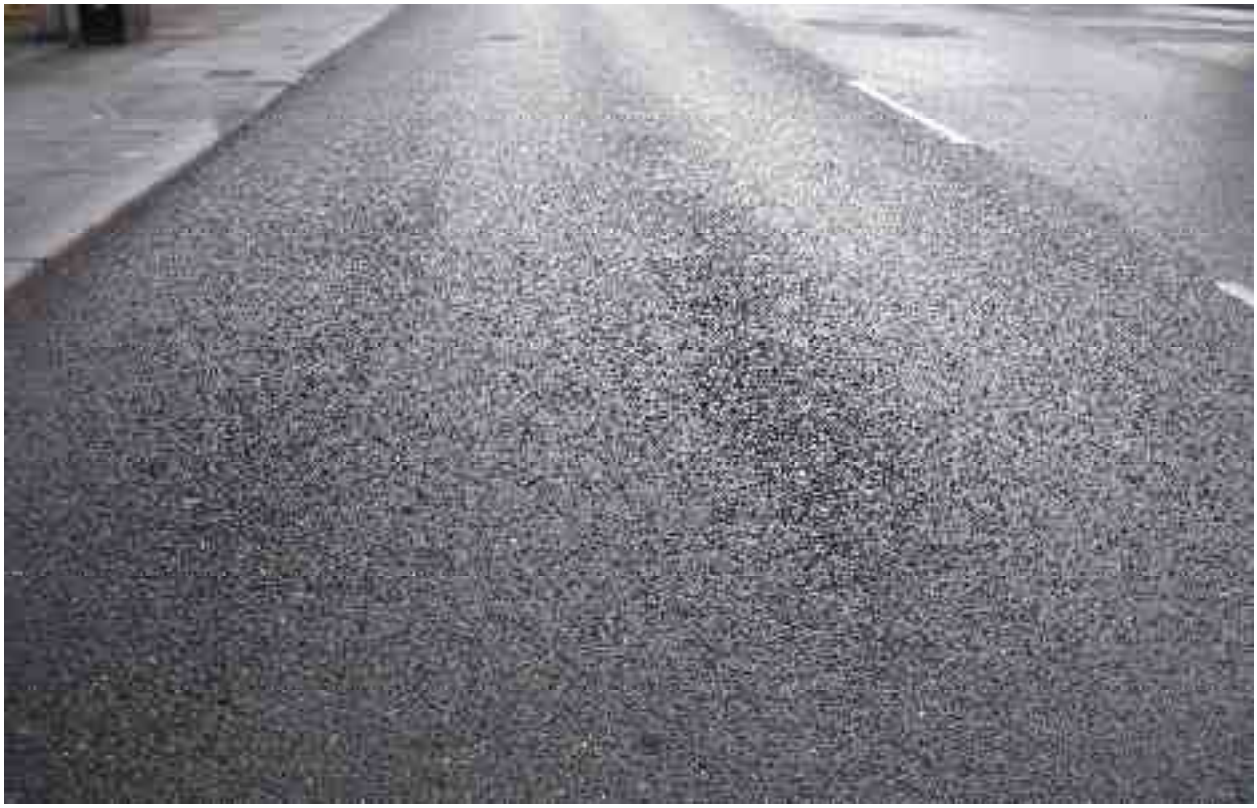
Rating 8

Good – Restoration of Skid Resistance

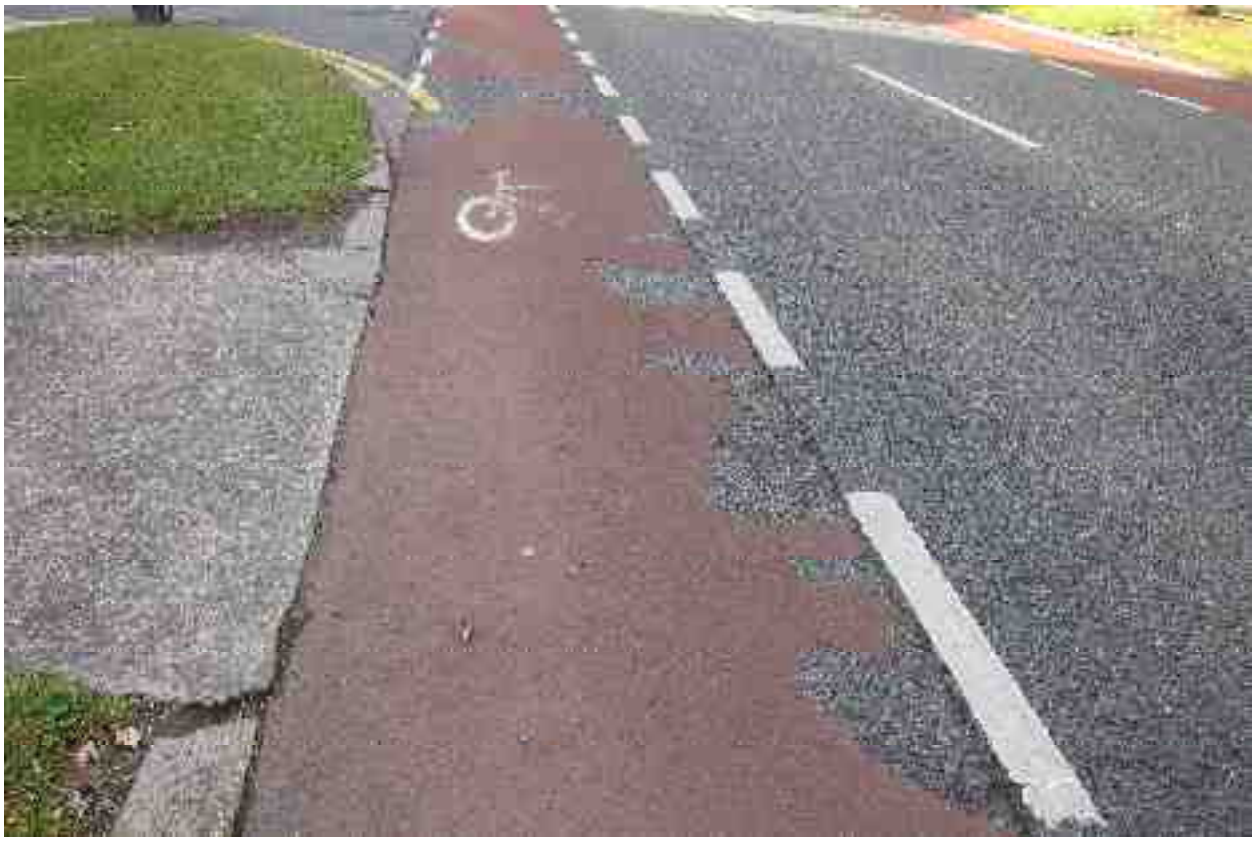
This category includes roads which are showing surface defects (ravelling and bleeding) only. Roads with 10 to 30% of surface with surface defects. Little or No Other defects present: No structural distresses (rutting, alligator cracking, edge problems, potholes); No patching and No other cracking. Road shape is very good.



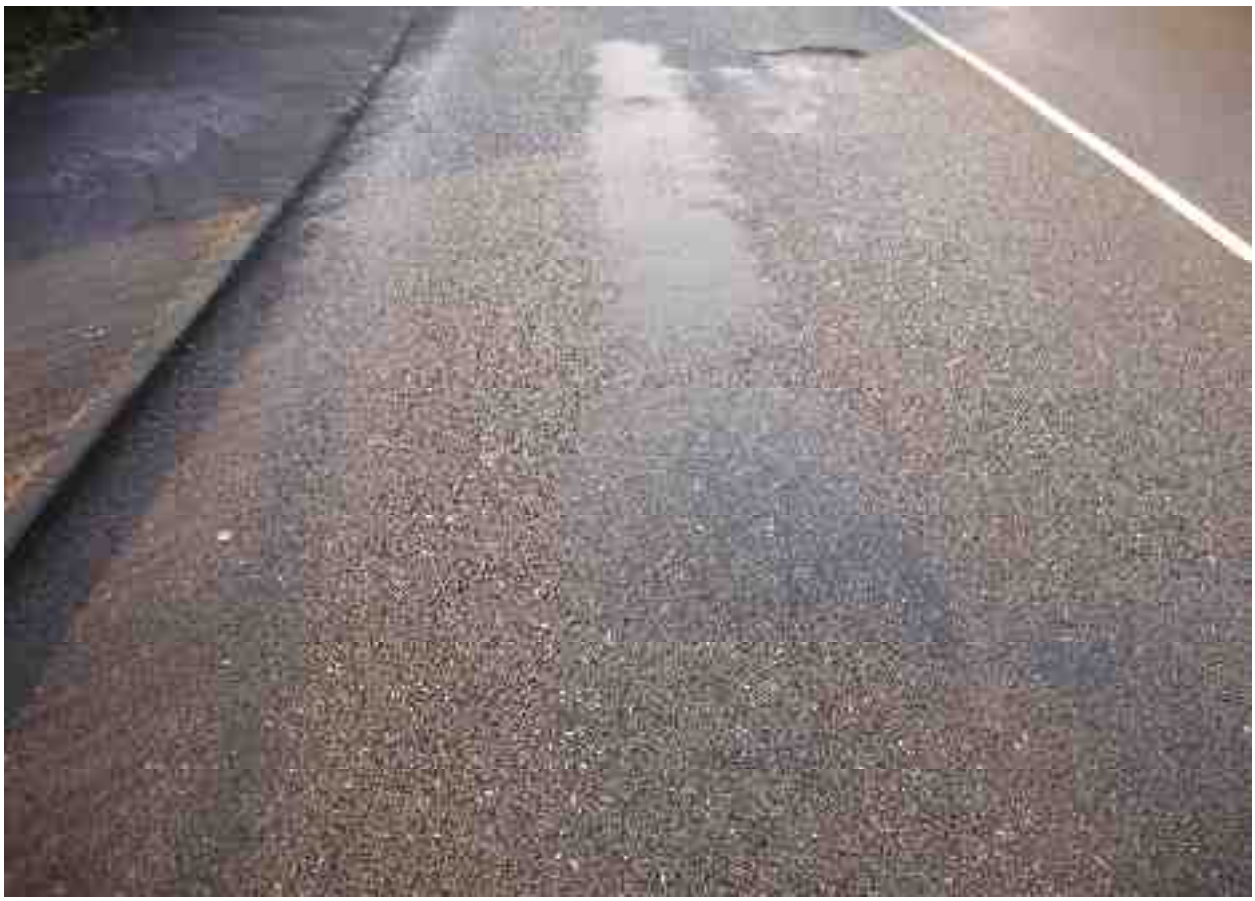
Rating 8: Ravelling in wheelpaths of High Friction Surface (10% to 30%)



Rating 8: Ravelling evident in wheelpaths, 10% to 30% of surface



Rating 8: Ravelling in Cycle track on carriageway lane

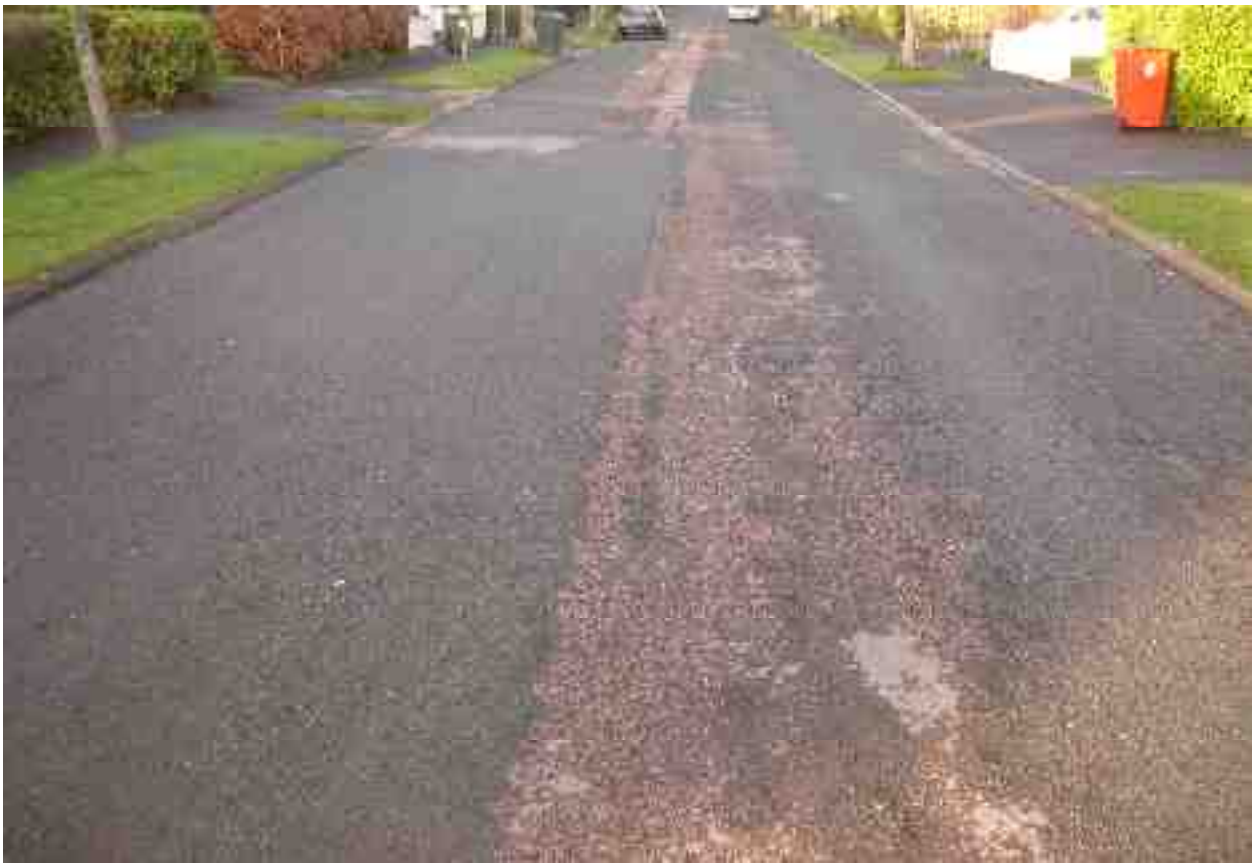


Rating 8: Bleeding on pavement surface (10% to 30%)

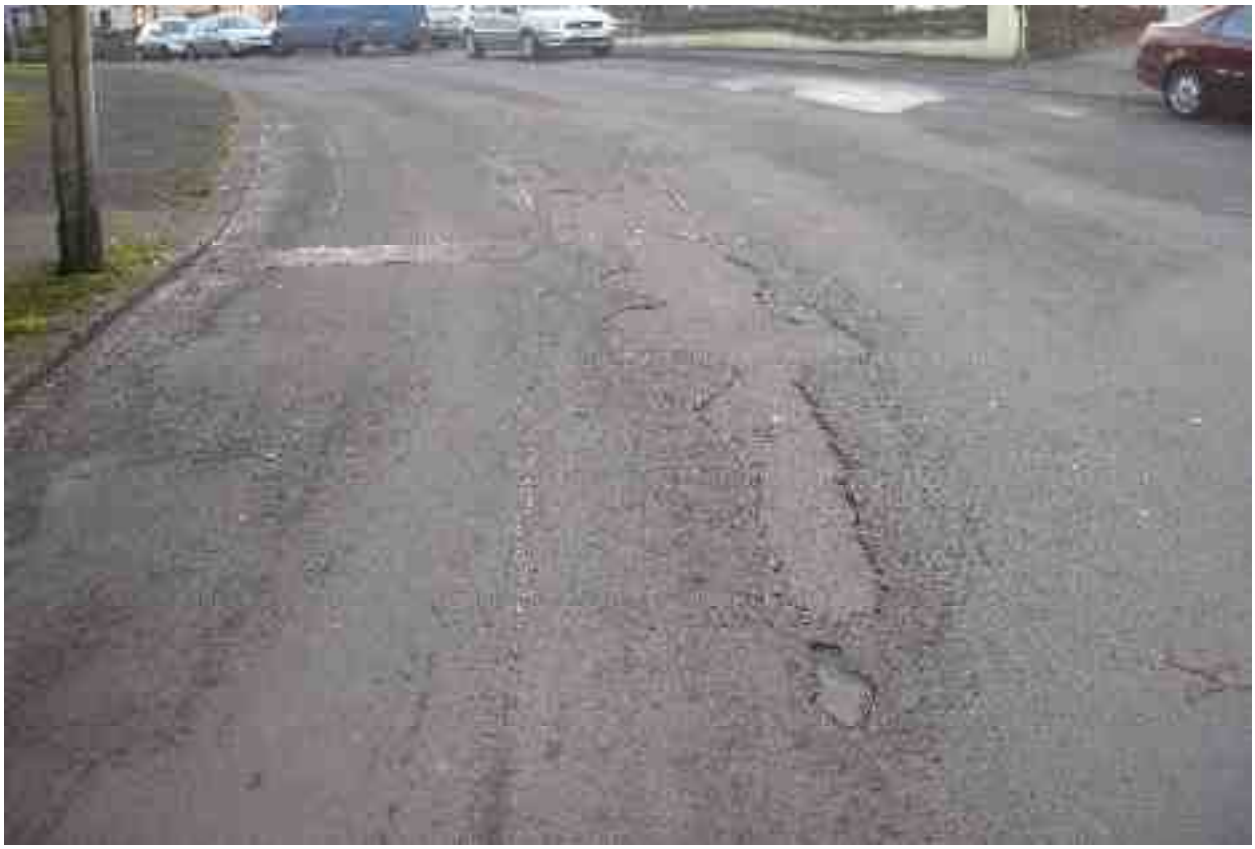
Rating 7

Good - Restoration of Skid Resistance

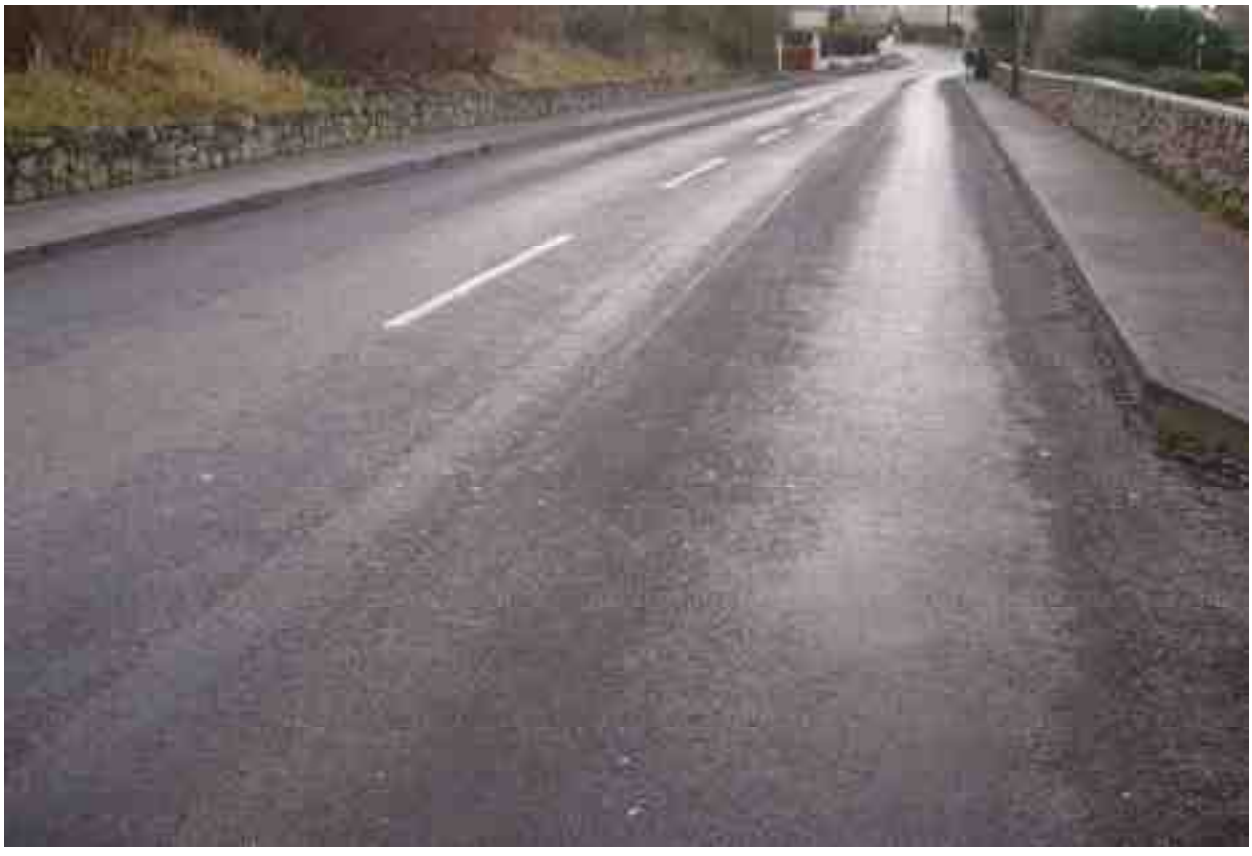
Greater than 30% of surface with surface defects (ravelling or bleeding). Little or No Other defects: No structural distresses (rutting, alligator cracking, edge problems, potholes); No patching; No other cracking present, and road shape is good.



Rating 7: Extensive Ravelling over most of pavement surface (> 30%)



Rating 7: Ravelling or striping of material from pavement surface

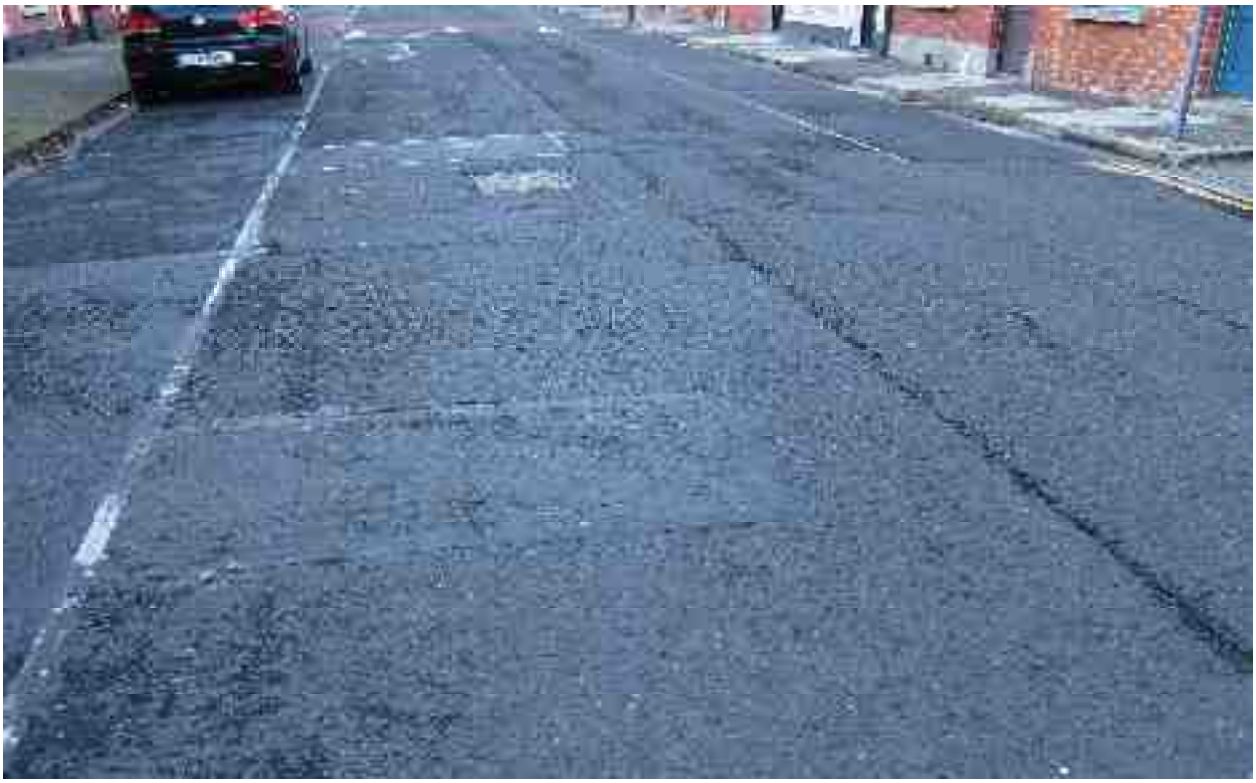


Rating 7: Bleeding in wheelpaths greater than 30% of surface

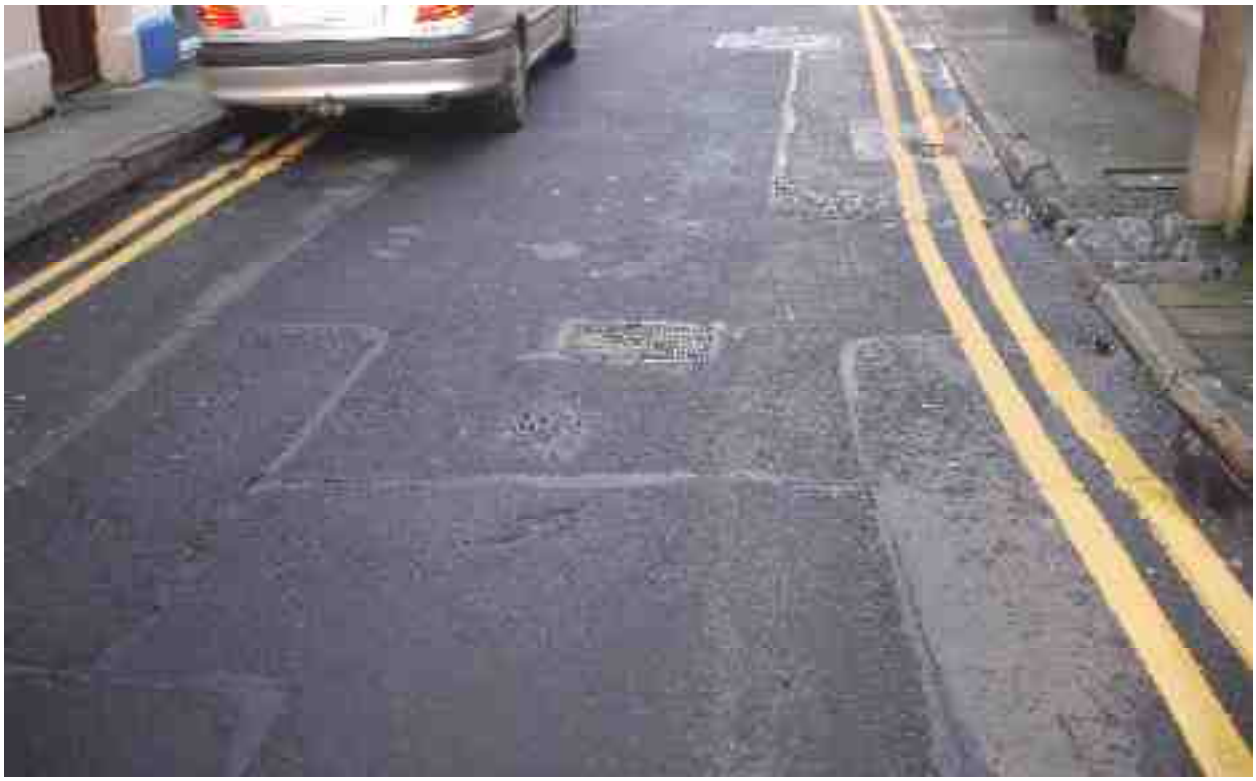
Rating 6

Fair – Surface Restoration

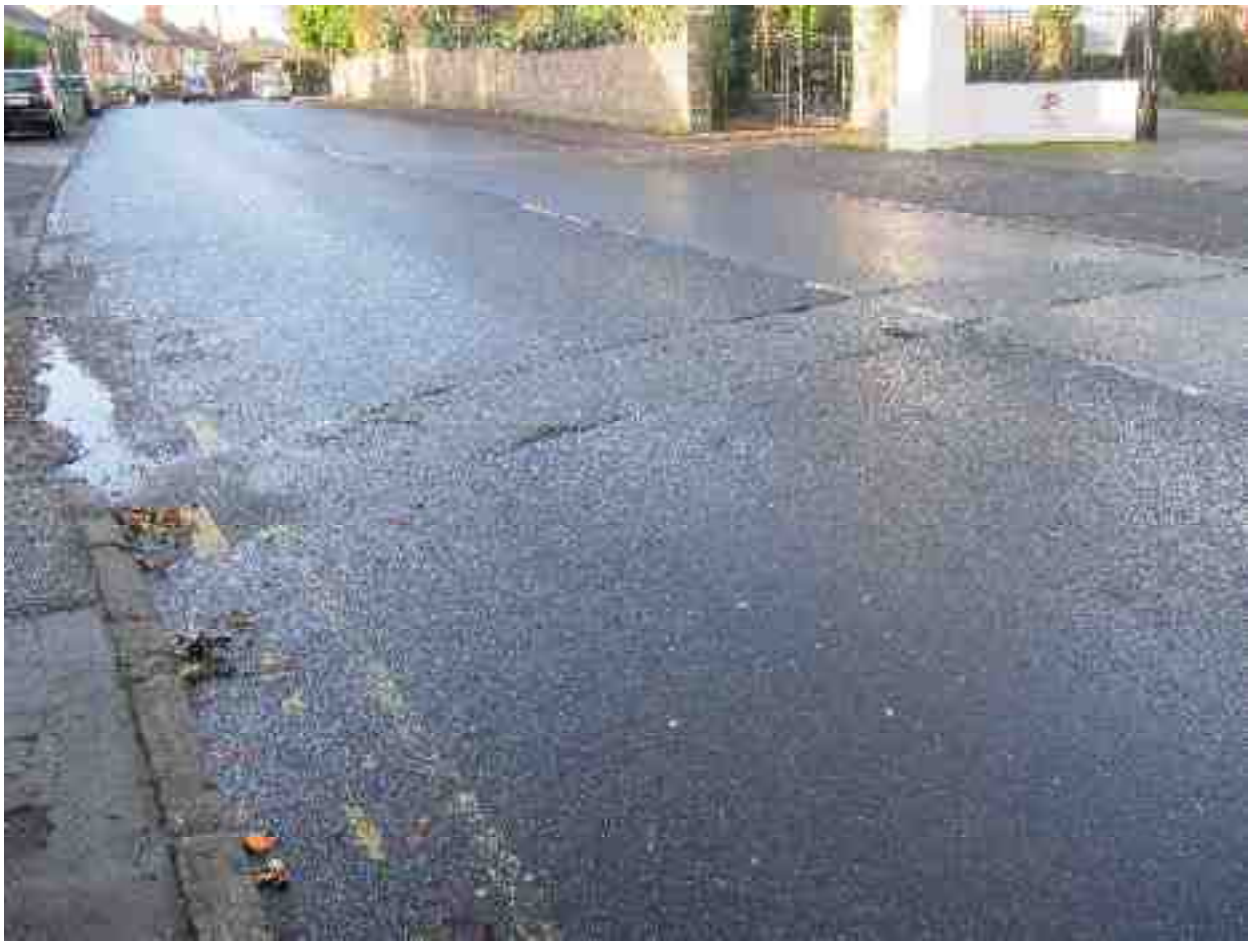
Small quantities (< 20%) of other cracking (longitudinal, transverse, reflection, meander or slippage) may be present with some open (≤ 12 mm). Sealed cracks in good condition. Patching present, generally in good condition. Pavement may be out of shape with some surface distortion present requiring some reduction in driver speed necessary to maintain driver and passenger comfort. Surface defects (ravelling and bleeding) may be present. No structural distresses present (rutting, alligator cracking, edge problems, poor/failed patching or potholes). Localised repair needed before surfacing.



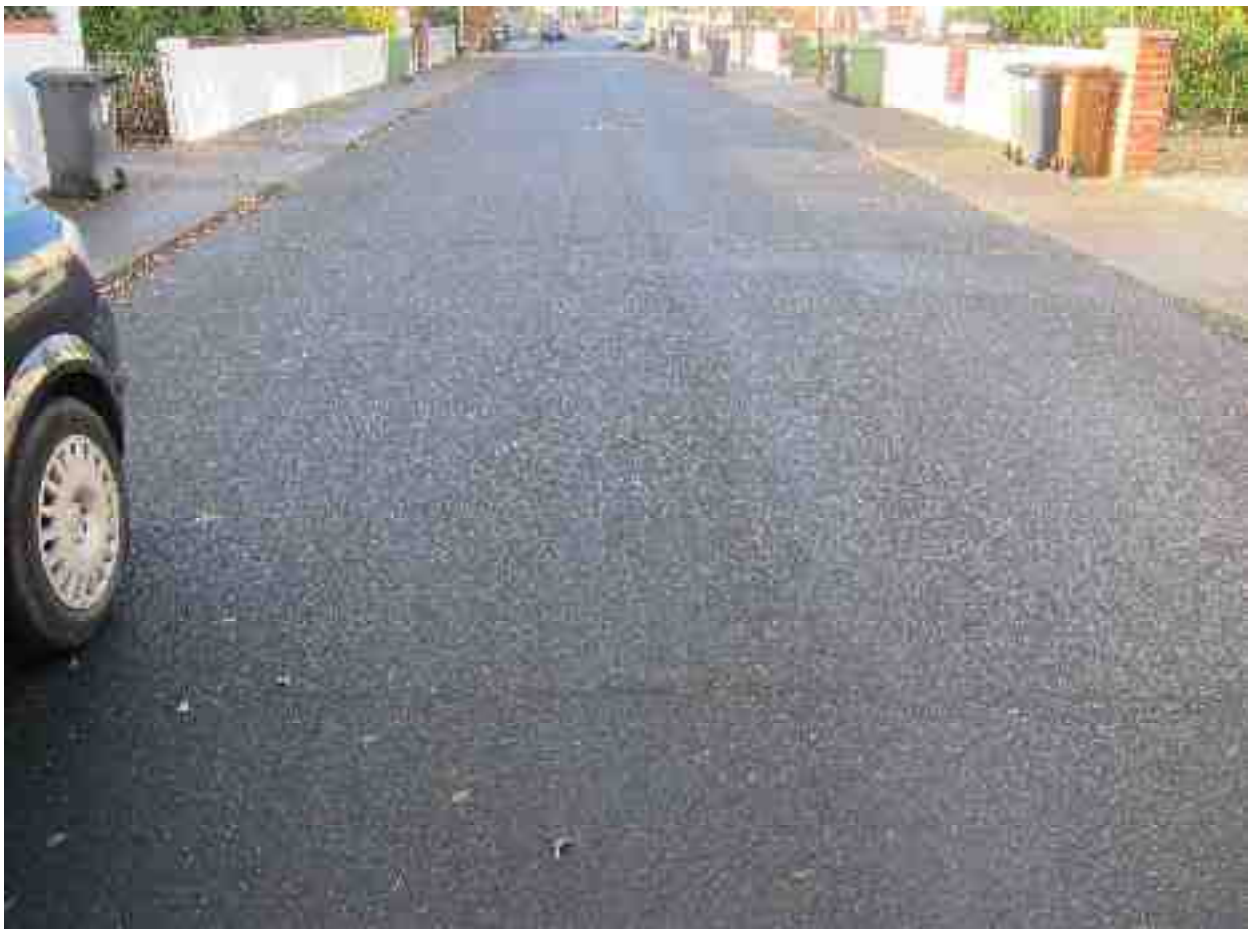
Rating 6: Pavement surface with linear cracking and patching generally in good condition



Rating 6: Extensive utility patching, generally in good condition



Rating 6: Utility cut patch with surface defects present on pavement

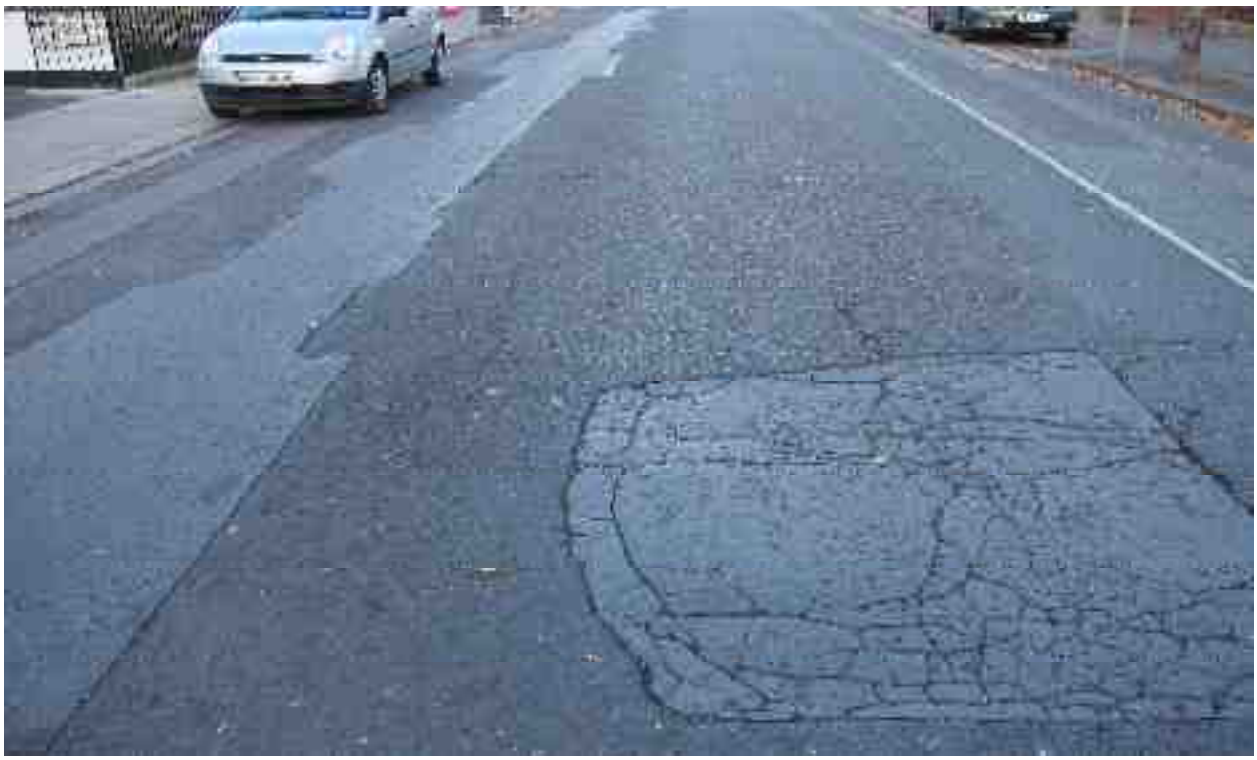


Rating 6: Reflection cracks, tight in nature over less than 20% of pavement surface

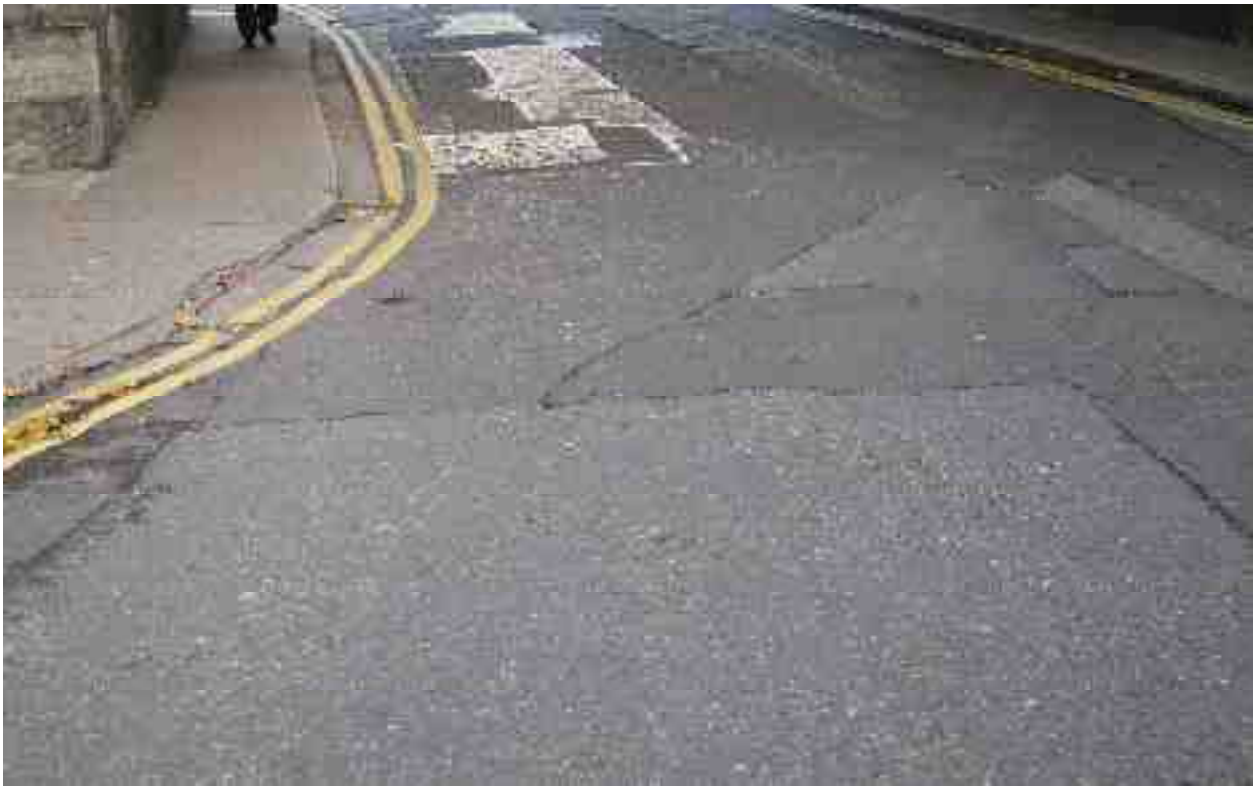
Rating 5

Fair – Surface Restoration

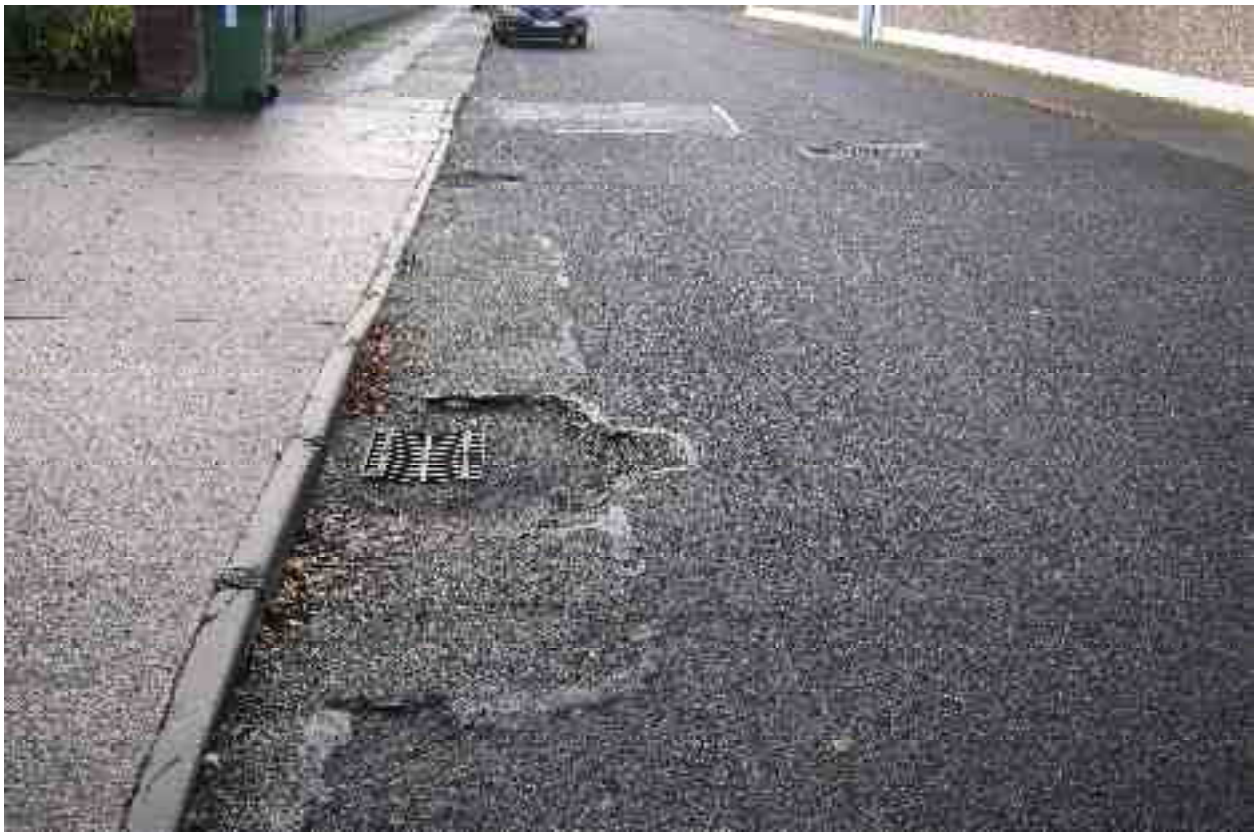
Frequent other cracking present (> 20% of surface) with some open (≤ 12 mm). Sealed cracks in fair condition. Patching present generally in fair condition. Pavement out of shape with significant surface distortions requiring driver to reduce speed. Some very localised structural distress (rutting, alligator cracking, edge problems , poor/failed patching or potholes) may be present in small quantities (< 5 sq.m of surface or a few isolated potholes). Surface defects (ravelling and bleeding) may be present. The road requires either large quantities of localised repair before surfacing or the road is in need of reshaping with significant driver discomfort.



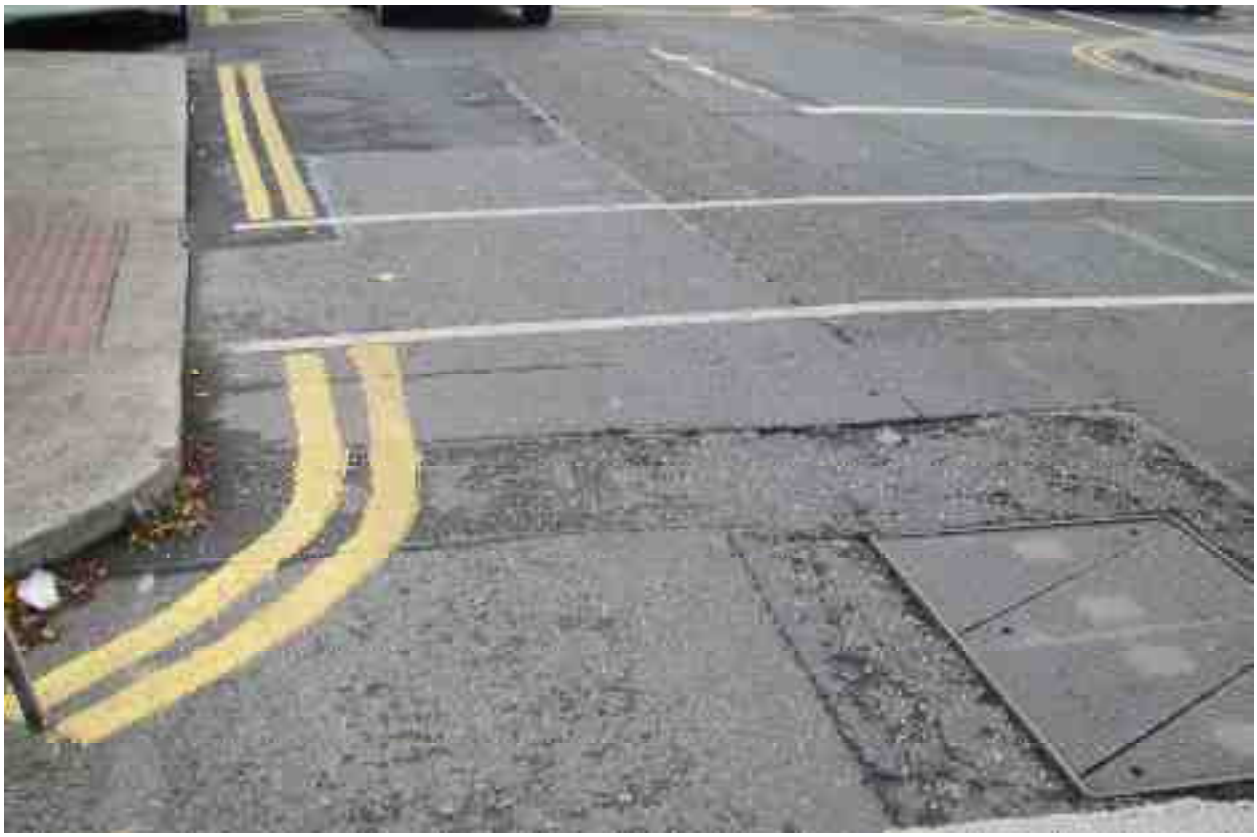
Rating 5: Utility patching in fair condition and localised structural distress in isolated patch



Rating 5: Extensive unsealed patching generally in fair condition



Rating 5: Patching generally in fair condition but failed in vicinity of ironworks

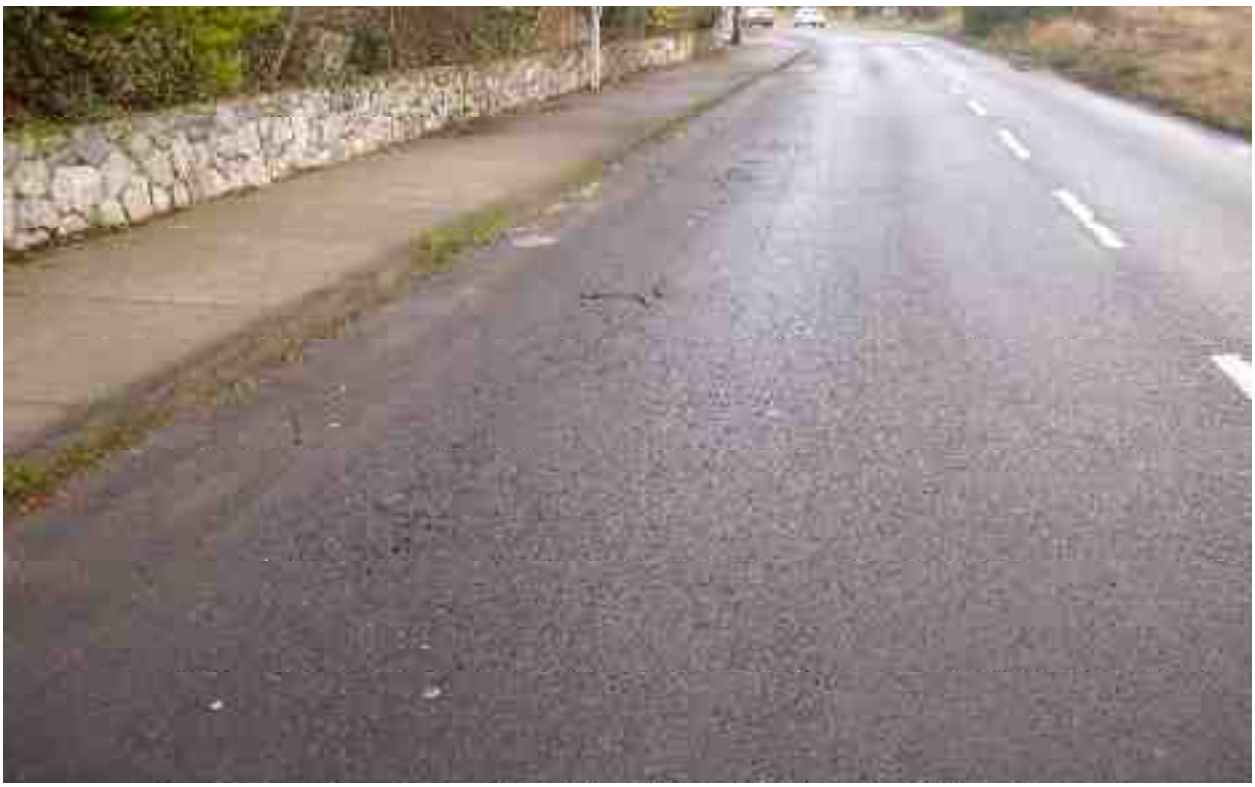


Rating 5: Patching generally in fair condition with signs of distress in vicinity of ironworks

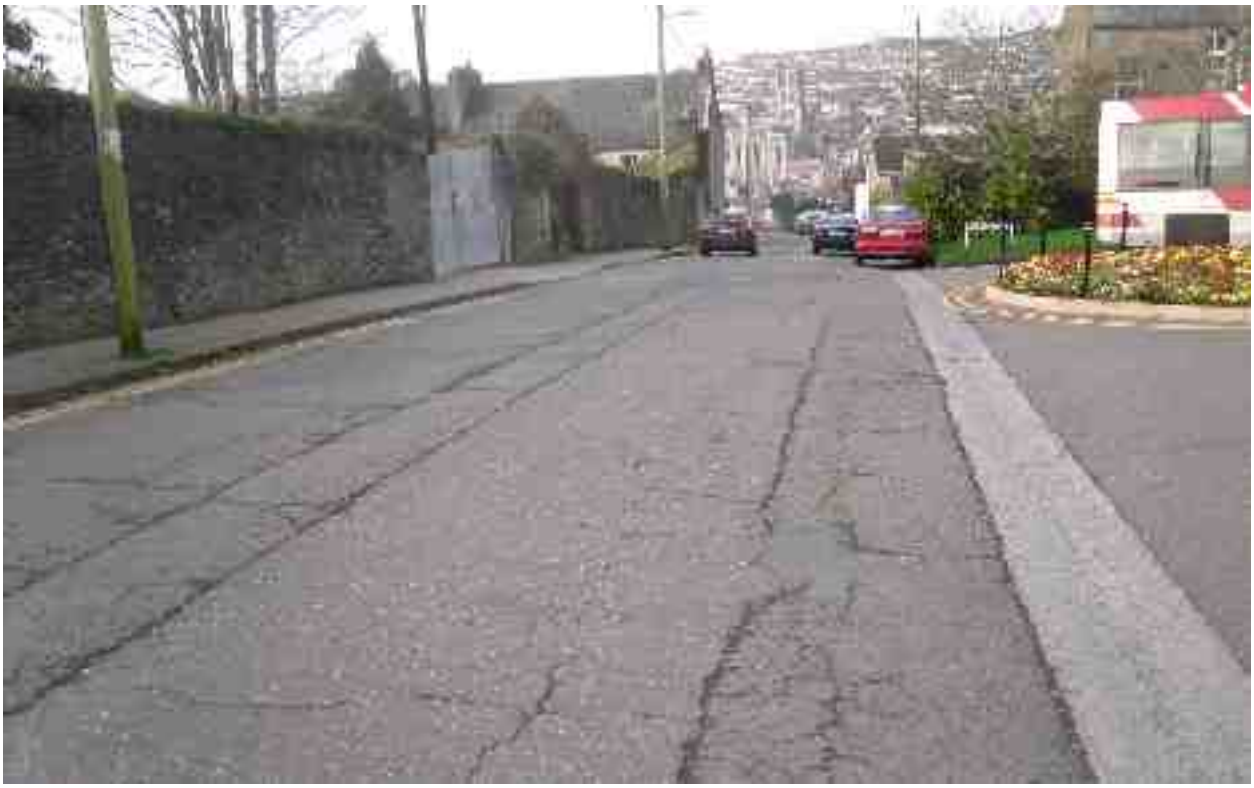
Rating 4

Poor – Structural Overlay

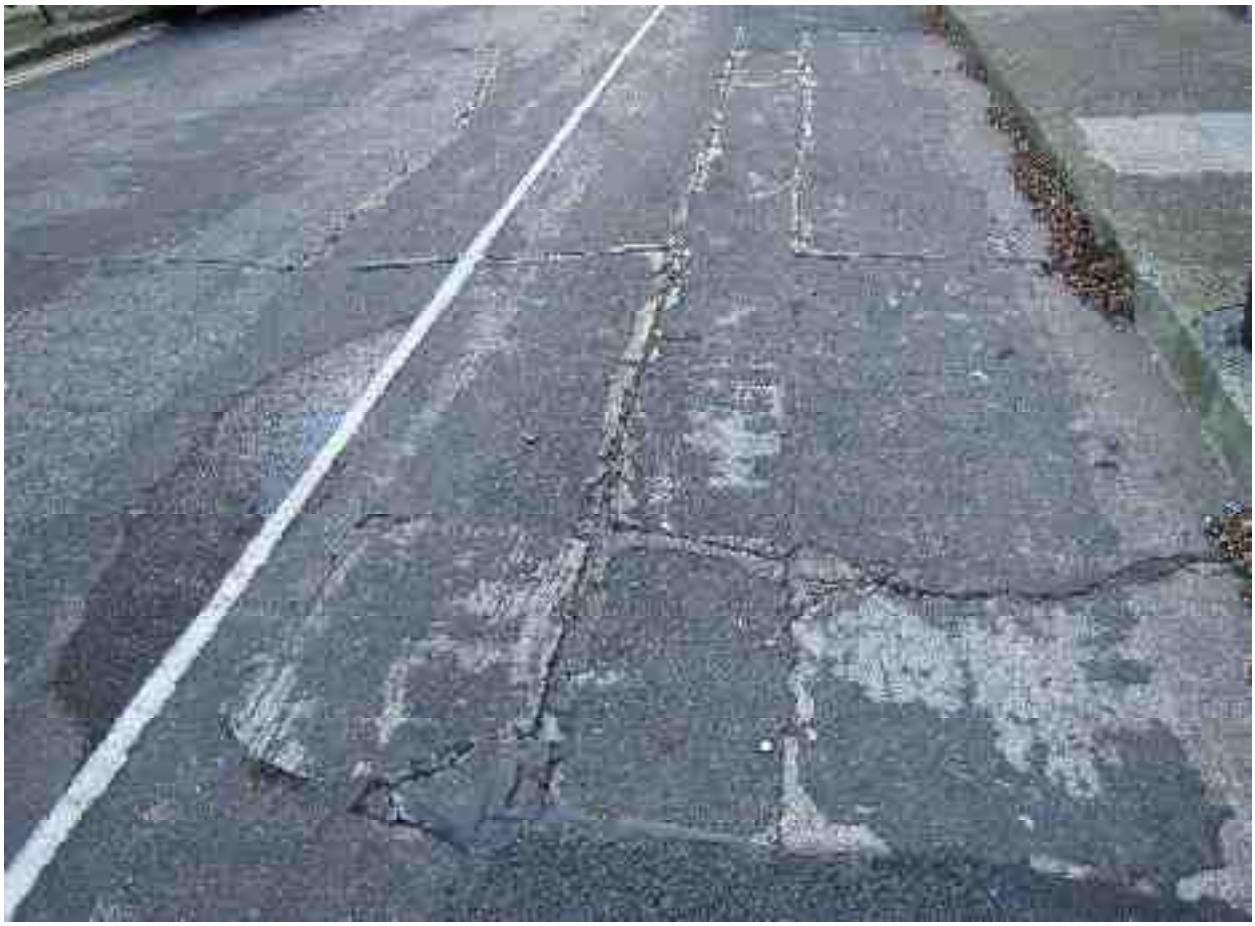
Road shows signs of needing strengthening by structural overlay. Structural distresses are present (rutting, edge problems, alligator cracking, poor/failed patching or potholes). Rutting, alligator cracking or poor patching present (5% to 25% of surface). Wide open cracks (>12mm) with moderate spalling or sealed cracks in poor condition present. Short lengths of edge breakup/cracking present. Frequent pot-holes present. Other defects (ravelling, bleeding, surface distortion or other cracking) may be present.



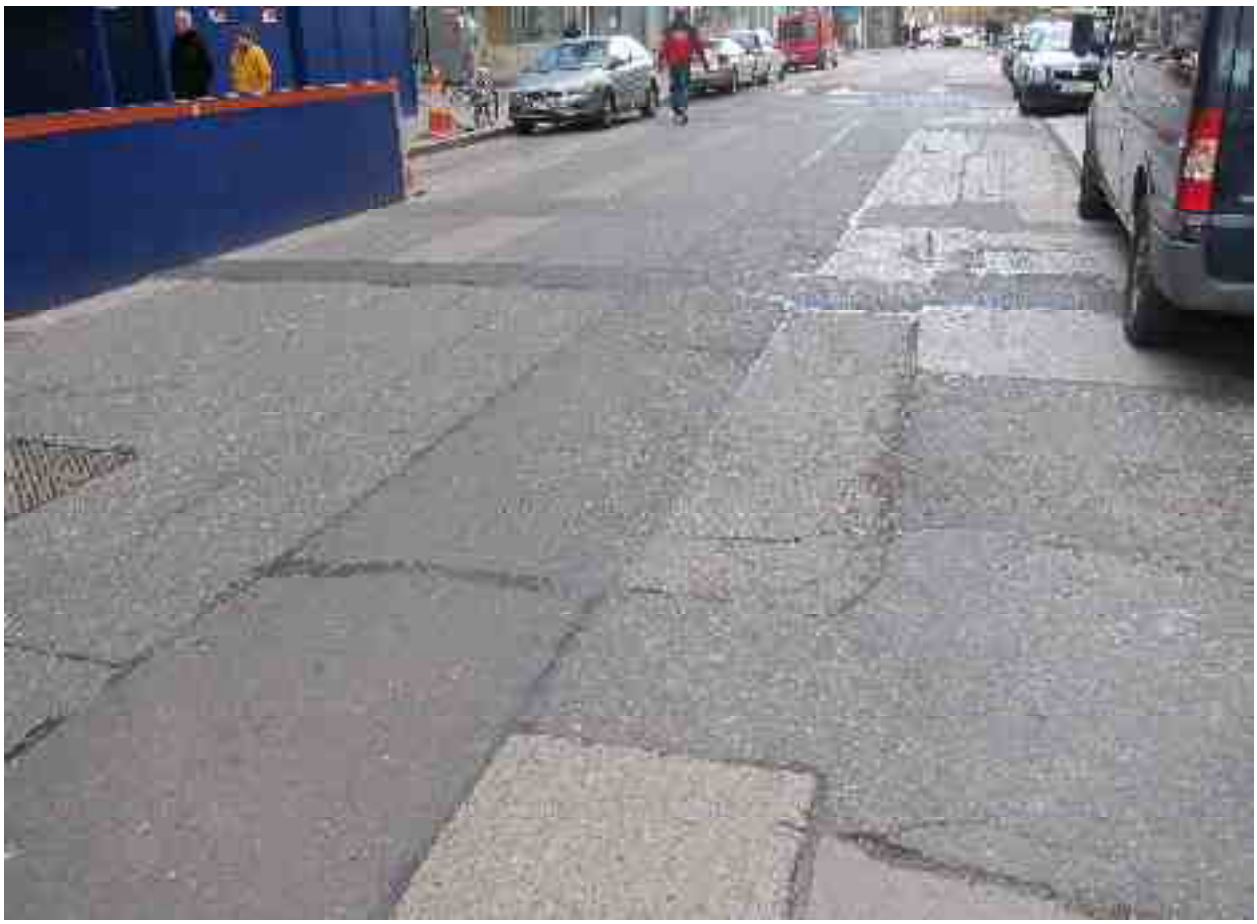
Rating 4: Alligator cracking in wheelpath, 5% to 25% of pavement surface



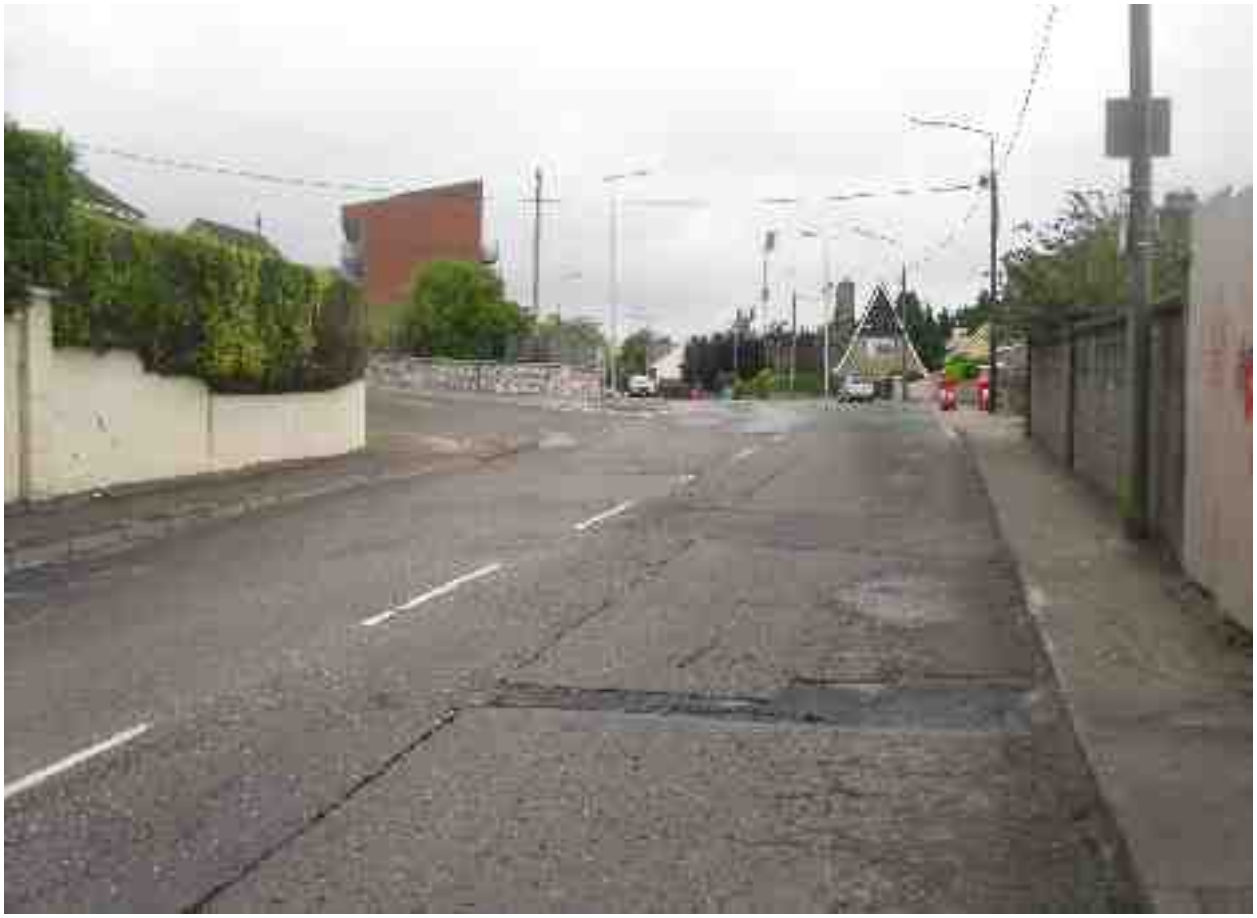
Rating 4: Structural distress (5 to 25%) and linear cracking on pavement surface



Rating 4: Wide open cracks and poorly sealed joints and cracks, bituminous surface failed on concrete pavement



Rating 4: Extensive patching showing signs of distress and deterioration

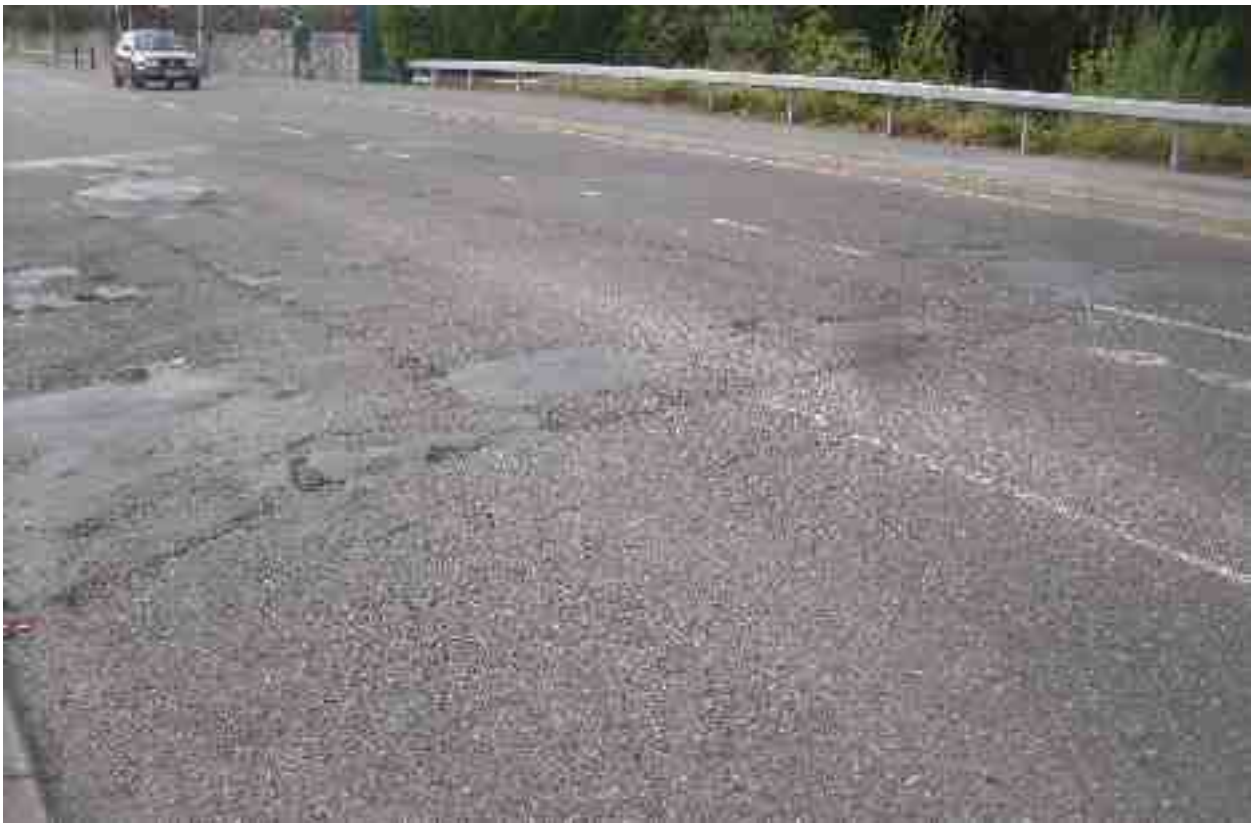


Rating 4: Structural distress (5 to 25%), with some patching in poor condition

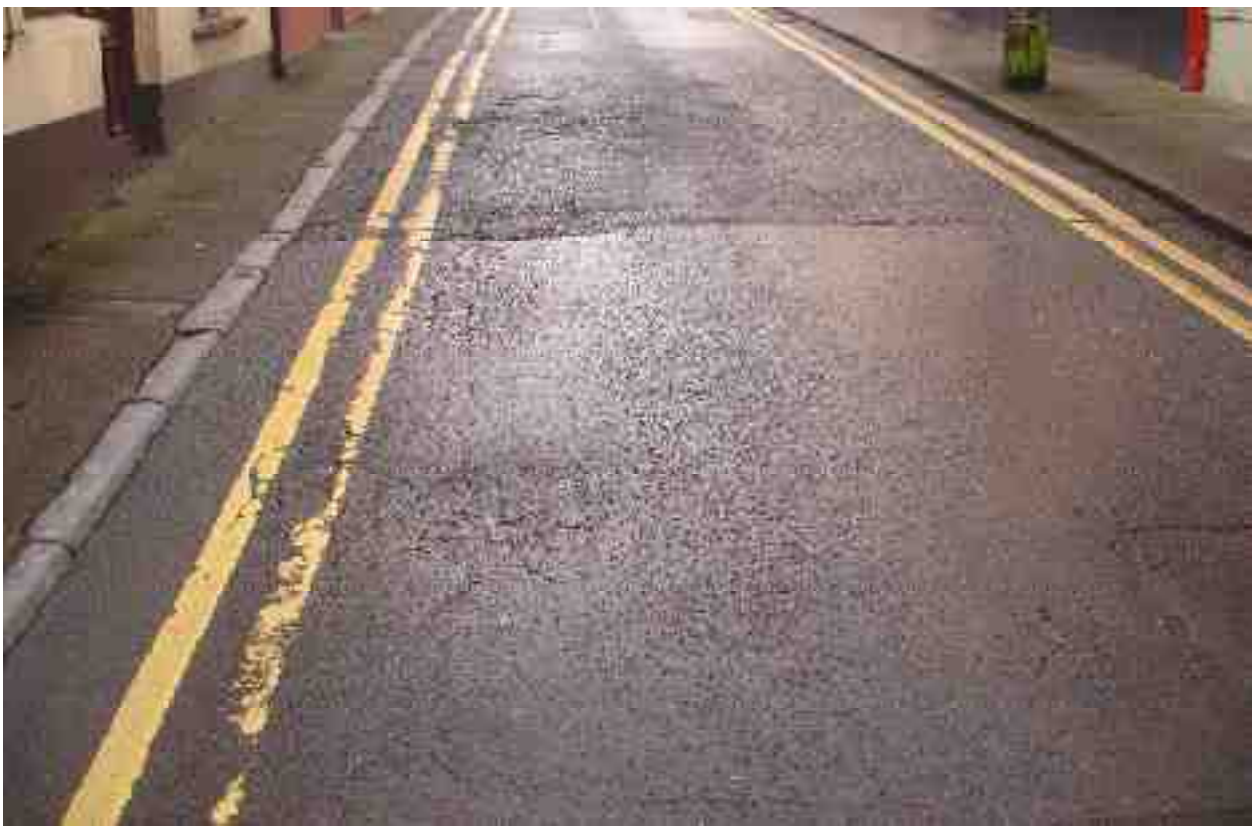
Rating 3

Poor – Structural Overlay

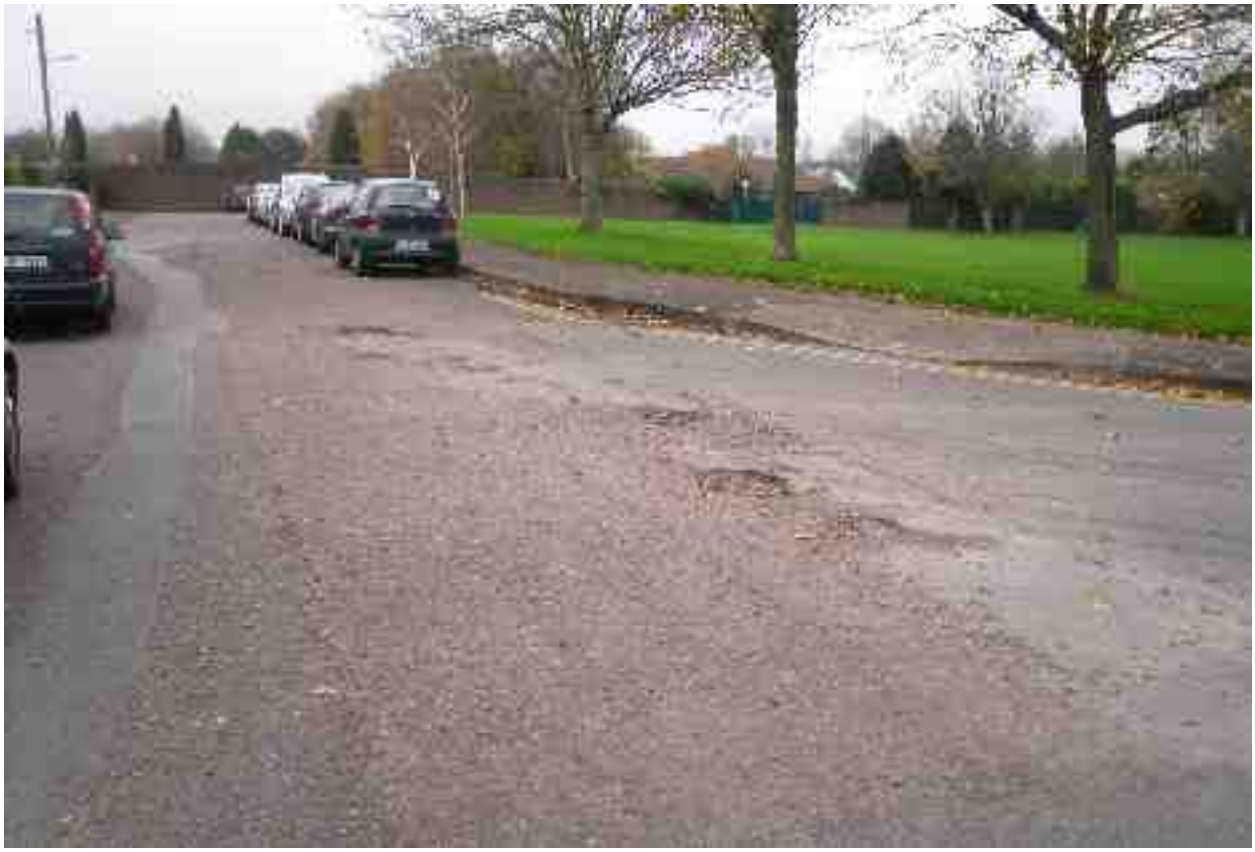
Significant quantities of structural distress present (rutting, edge problems, alligator cracking, poor/ failed patching or potholes). Rutting, alligator cracking or poor patching (25% to 50% of surface). Many wide open cracks (>12mm) with severe spalling present. Significant continuous lengths with edge breakup/cracking and loss of material at edges. More frequent potholes. Other defects may be present. Structural overlay required to strengthen road.



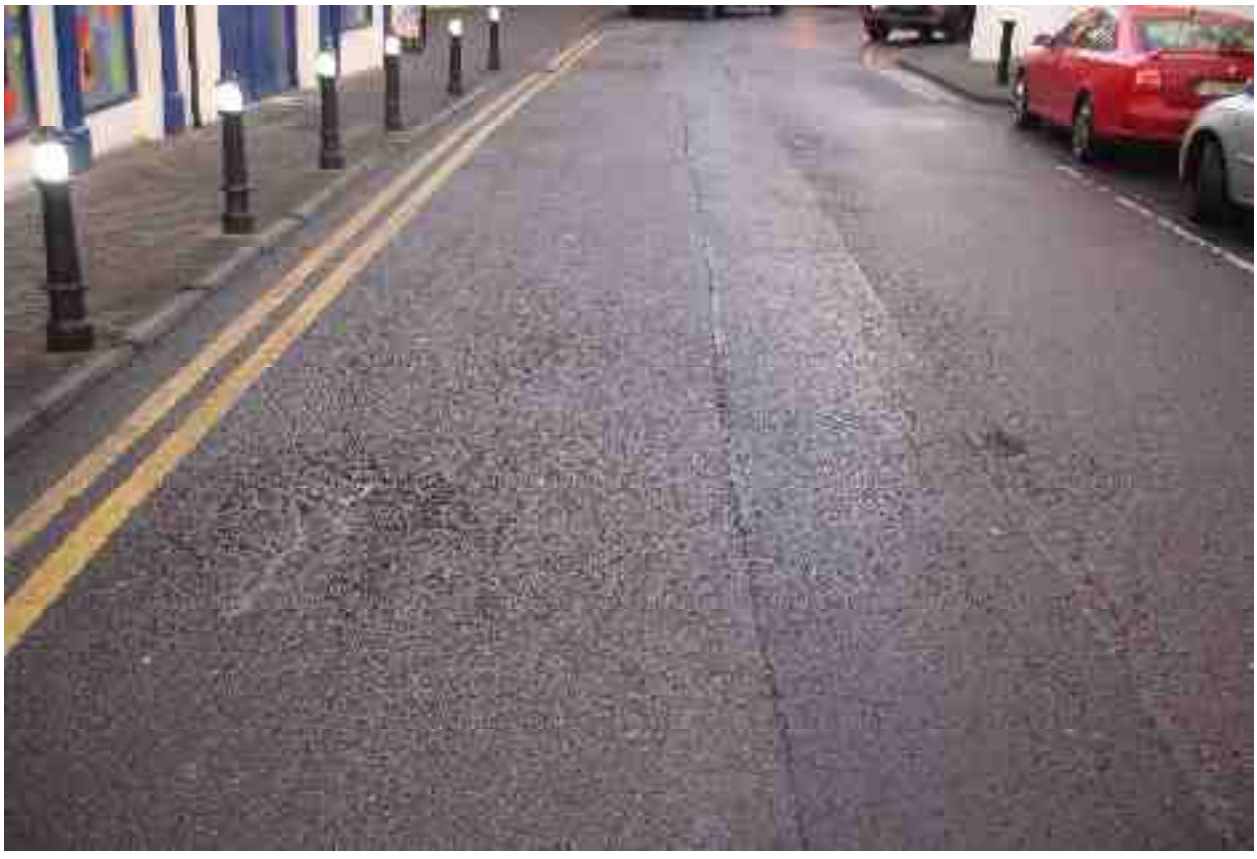
Rating 3: Extensive patching in poor condition



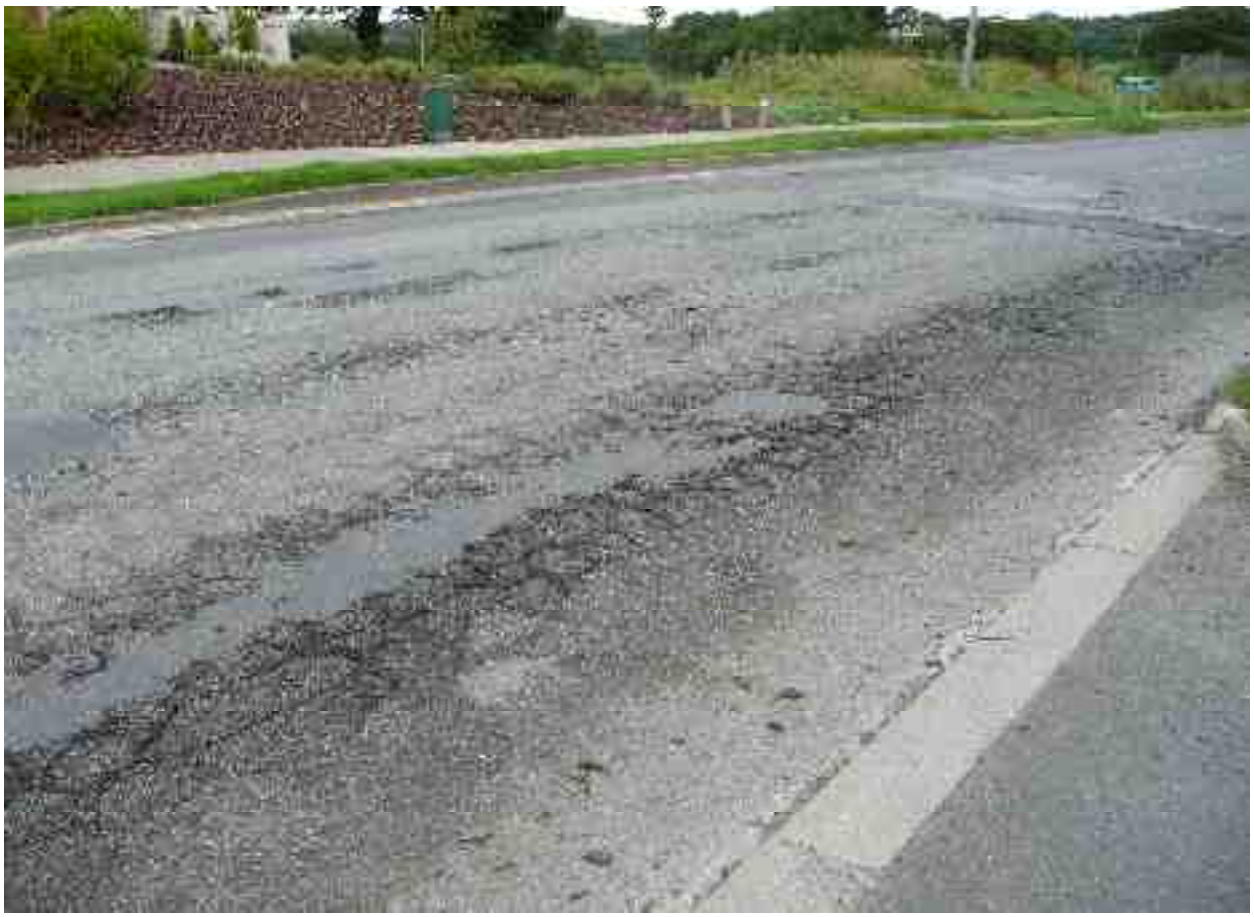
Rating 3: Extensive alligator cracking with surface deformation



Rating 3: Pavement in poor condition, with potholes and poor patching present



Rating 3: Severe alligator cracking and rutting evident over 50% of surface

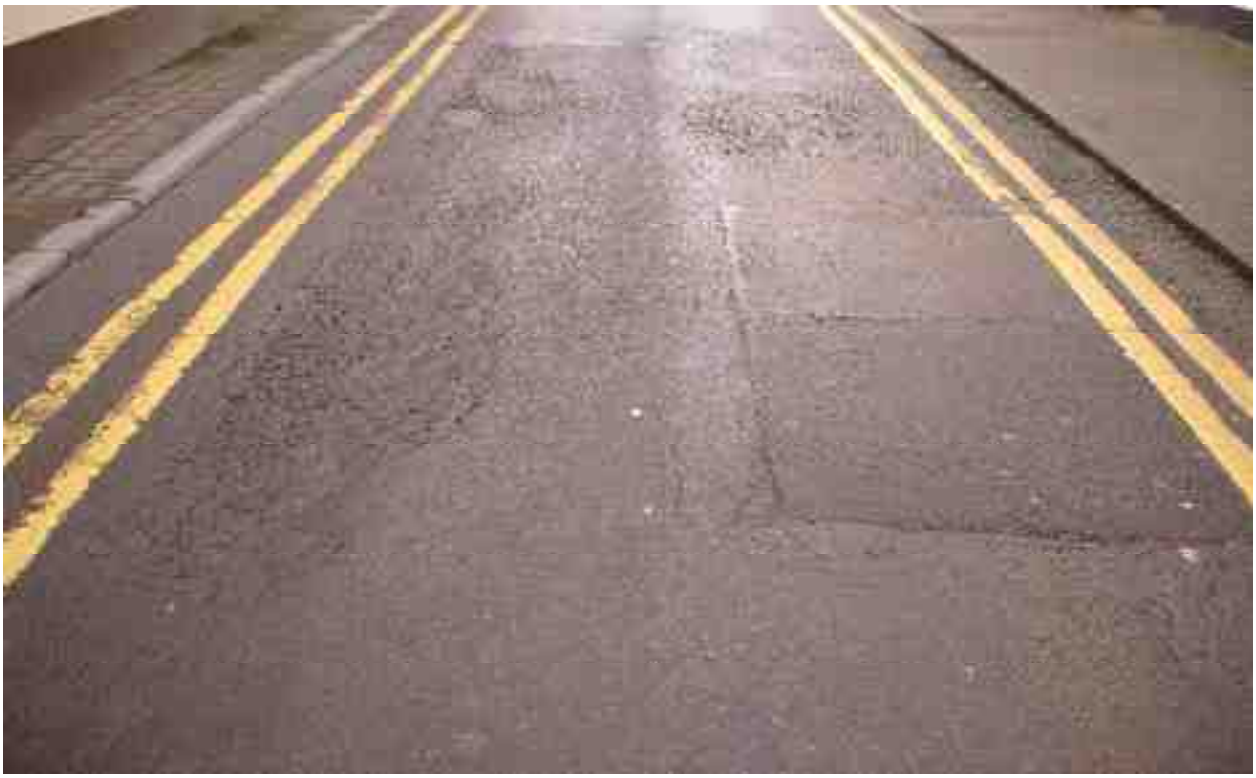


Rating 3: Extensive Alligator cracking and poor patching

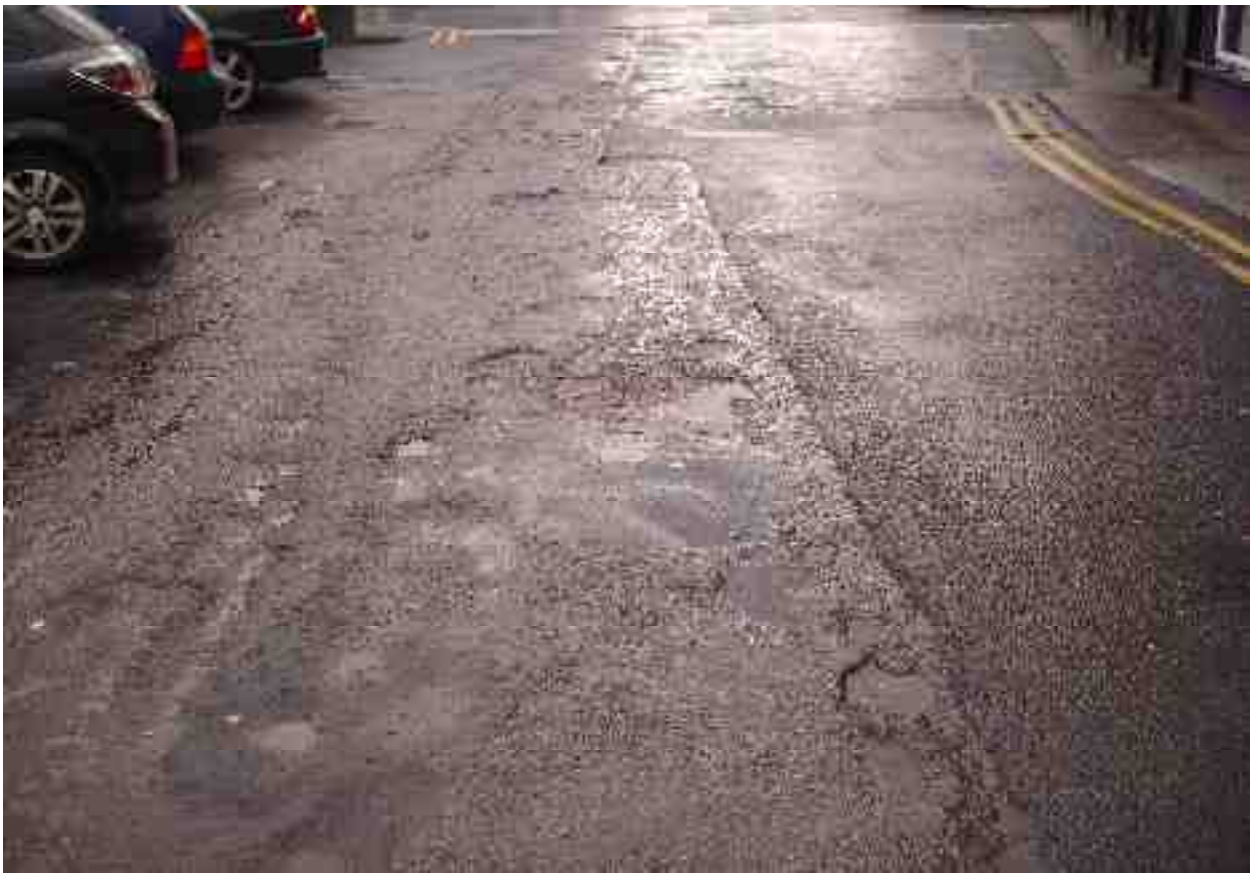
Rating 2

Very Poor – Road Reconstruction

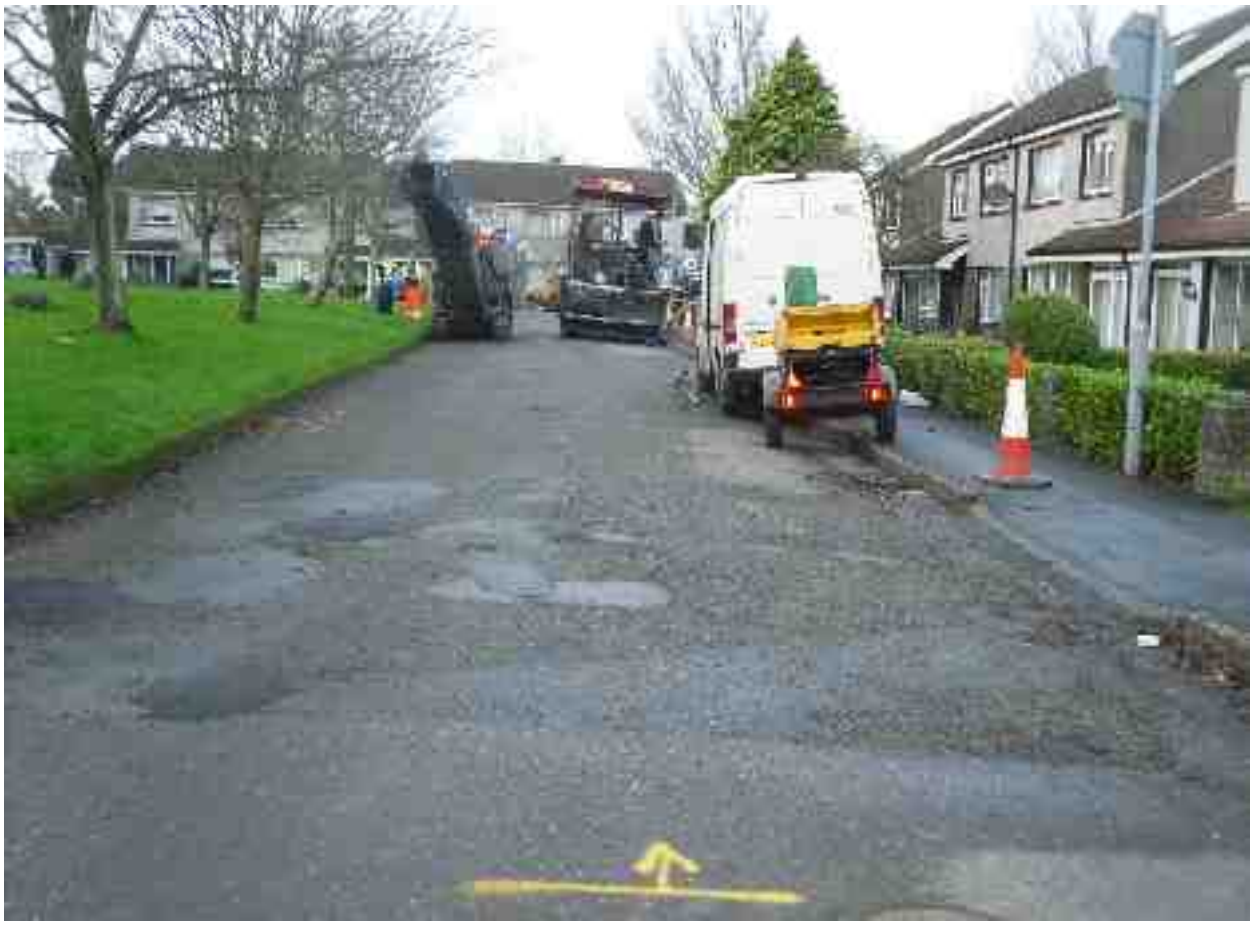
Roads are severely deteriorated and need reconstruction. Very significant quantities of alligator cracking and rutting present (over 50% of surface). Severe rutting (over 50 mm deep). Extensive patching in very poor condition. Many potholes. Very difficult to drive on. Road needs full depth reconstruction with extensive base repair.



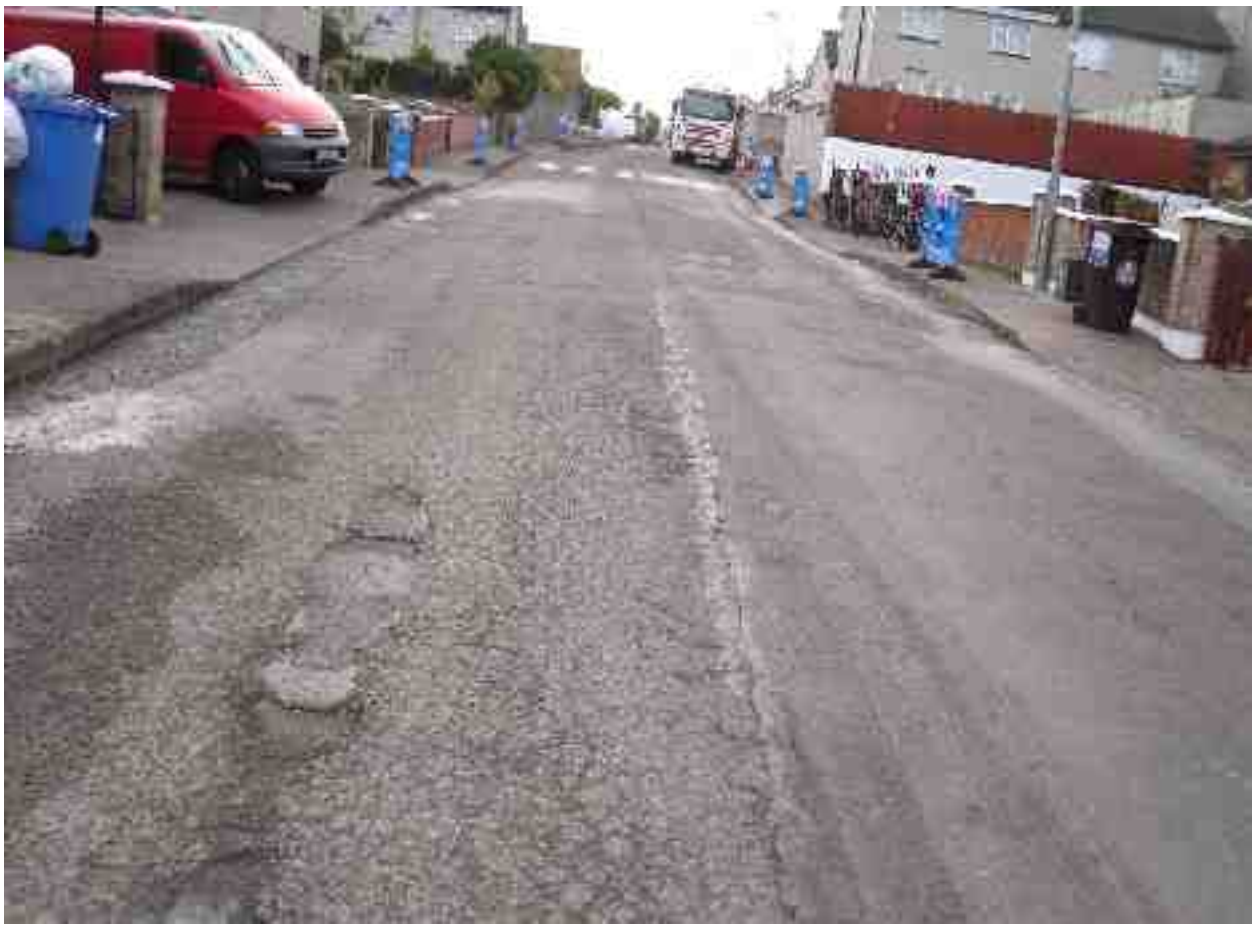
Rating 2: Severe alligator cracking and rutting (> 50mm) evident (> 50% of surface)



Rating 2: Failed pavement surface with very poor patching



Rating 2: Severely deteriorated, extensive patching and structural problems , loss of surfacing in places

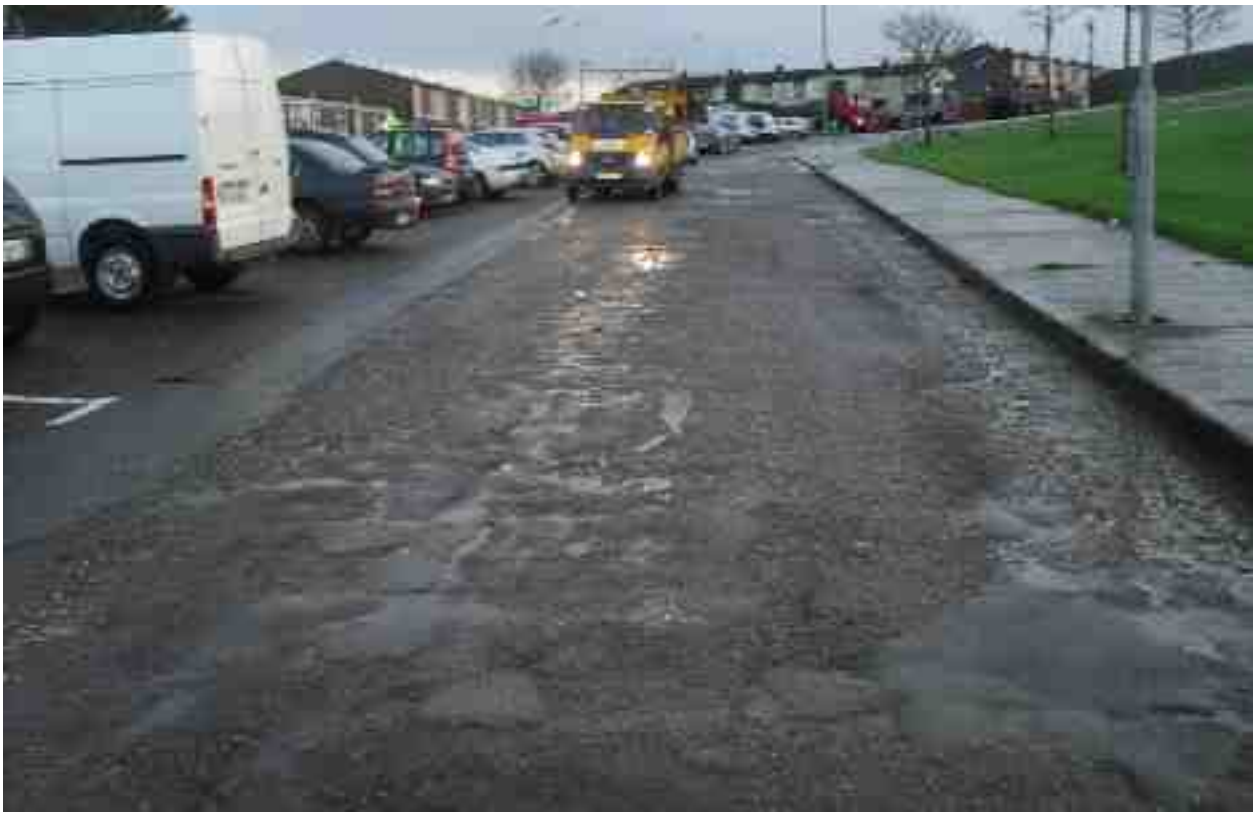


Rating 2: Extensive alligator cracking, very poor patching and potholes present, in very poor overall condition

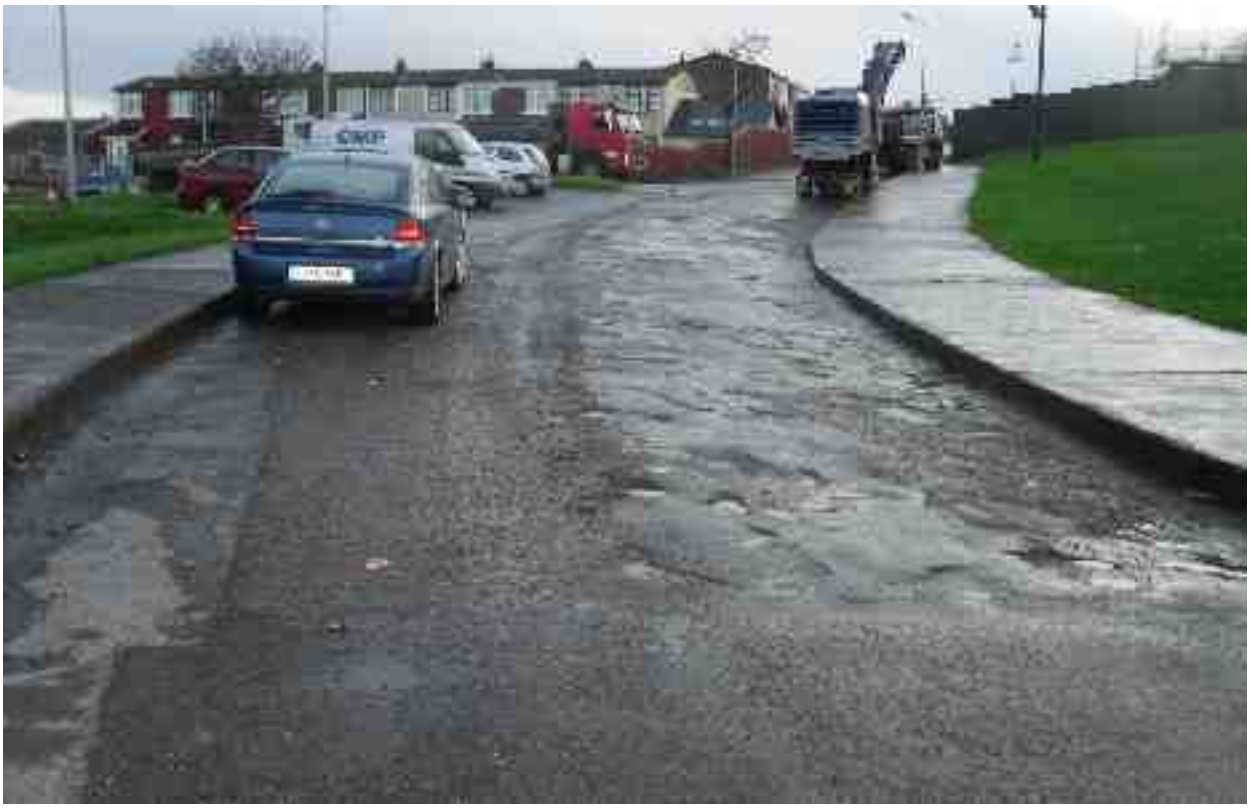
Rating 1

Failed – Road Reconstruction

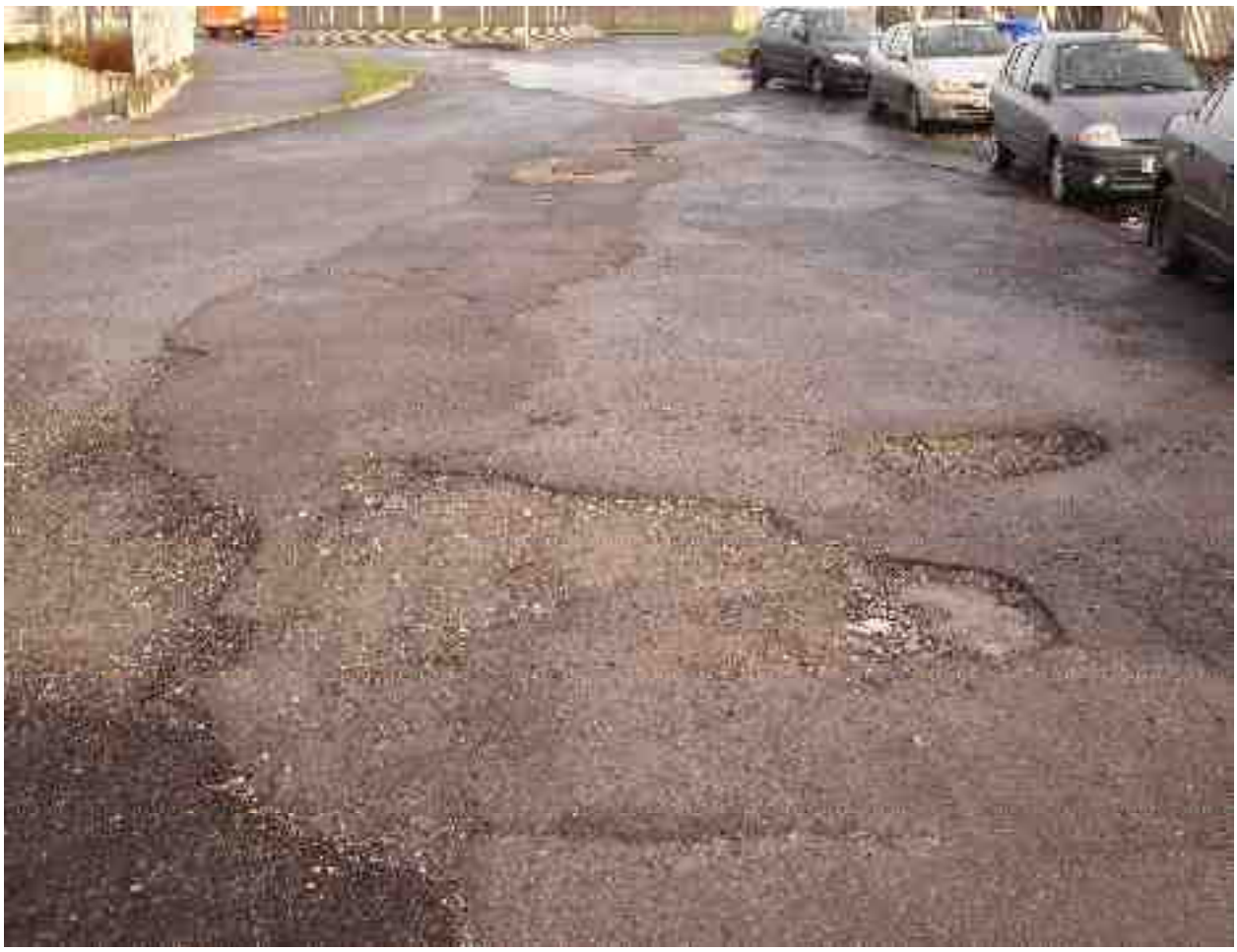
Road layers have completely failed. Severe structural distress with extensive loss of pavement surface. Many large and deep potholes, patching in failed condition. Severe deterioration and virtually un-driveable. Road needs full depth reconstruction with extensive base repair.



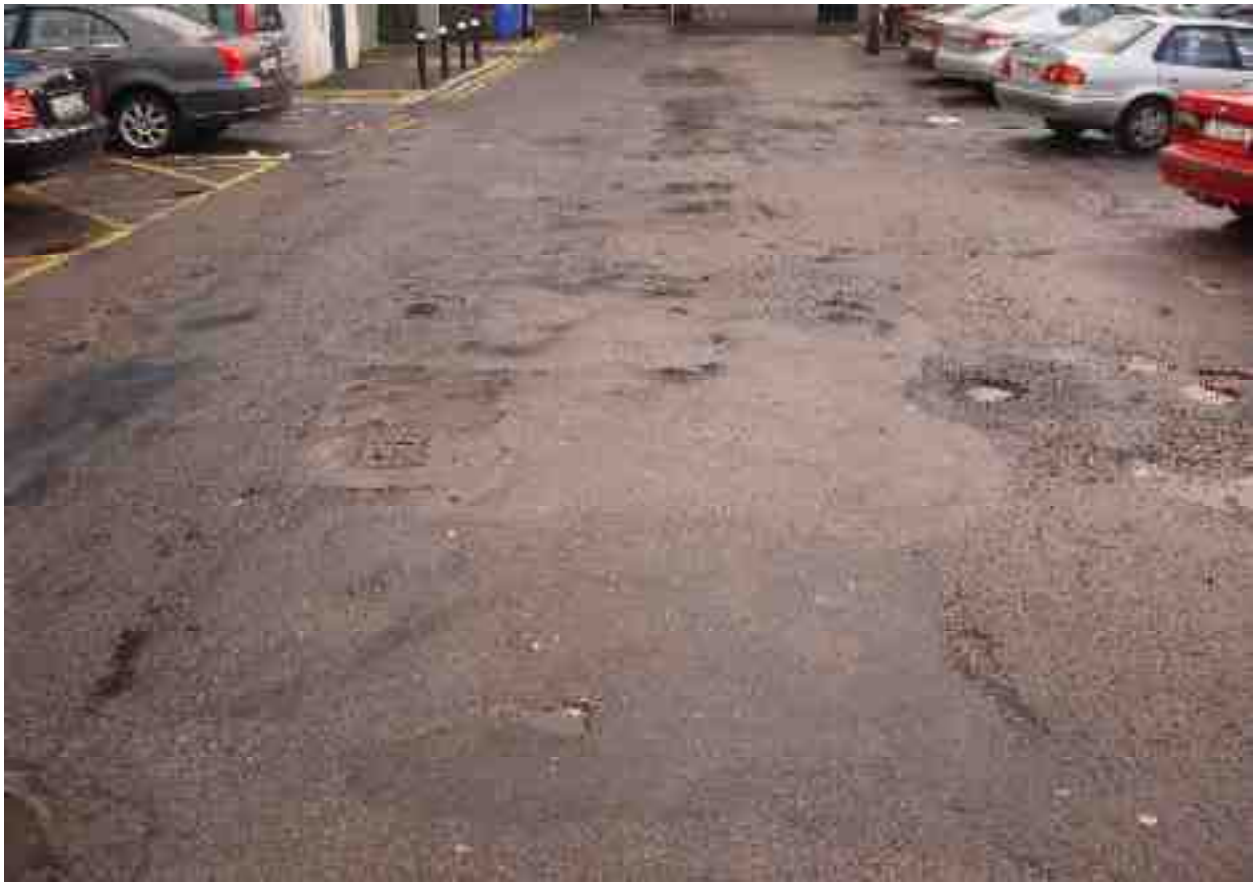
Rating 1: Extensive failed patching with severe deterioration, pavement failure



Rating 1: Extensive failed patching, almost total loss of pavement integrity



Rating 1: Failed pavement with extensive failed patching and large surface openings



Rating 1: Severely deteriorated, extensive patching and structural problems, loss of surfacing in places

Section 4: Practical Advice on Rating Roads

Inventory and Field Inspection

Most agencies routinely observe roadway conditions as a part of their normal work and travel. However, a road network inspection means looking at the entire roadway system as a whole and preparing a written summary of conditions. This inspection has many benefits over casual observations. It can be helpful to compare segments, and rating decisions are likely to be more consistent because the roadway system is considered as a whole within a relatively short time.

Having a written record and objective information also improves your credibility with the public. Finally a written inventory is very useful in documenting changing roadway conditions. Without records over several years it is impossible to know if road conditions are improving, holding their own, or declining.

Annual budgets and long range planning are best done when based on actual needs as documented with a written inventory.

Averaging and Comparing Sections

For evaluation, divide the urban road system into individual segments which are similar in construction and condition. Obviously, no roadway segment is entirely consistent. Also, surfaces in one section will not have all of the types of distress listed for any particular rating. They may have only one or two types. Therefore, some averaging is necessary.

The condition of the full width of the roadway should be rated. The roadway includes the carriageway lane in both traffic directions, and also includes areas with high friction surface and cycle tracks if they form part of the kerb to kerb carriageway surface.

The objective is to rate the condition that represents the majority of the roadway. Small or isolated conditions should not influence the rating. Occasionally surface conditions vary significantly within a short length along the road segment. For example, very short sections (< 20 metres) of good condition may be followed by sections of poor surface conditions. In these cases, it is best to rate the segment according to the worst conditions. It is not necessary to keep track of all changes in road condition if the condition is varying over very short lengths. As a rough guide, a length of at least 50 metres is required to justify recording a change in road condition rating category.

The overall purpose of condition rating is to be able to compare each segment relative to all the other segments in your roadway system. On completion you should be able to look at any two pavement segments and find that the better surface has a higher rating.

Within a given PSCI rating, say 6, not all pavements will be exactly the same. However, they should all be considered to be in better condition than those with lower PSCI ratings, say 5. Sometimes it is helpful in rating a difficult segment to compare it to other previously rated segments. For example, if it is better than one you rated 5 and worse than a typical 7, then a rating of 6 is appropriate. Having all pavement segments rated in the proper relative order is most important and useful.

Section 5: Conclusions and Next Steps

Using Urban road funds most efficiently requires good planning and accurate identification of appropriate rehabilitation projects. Assessing roadway conditions is an essential first step in this process. This Pavement Surface Condition Index (PSCI) rating system in this Urban Flexible Roads Manual has been developed to improve the data collection and quality of visual surveying of non-national roads, and to improve decision making and use of road maintenance funds more efficiently. It can be used directly by urban authority officials and staff in the Republic of Ireland. It may be combined with additional pavement testing and data collection in a more comprehensive pavement management system in planning future budgets and priorities.

The PSCI rating system is based only on visual pavement defects. The impact of surface-related defects, structural-related defects and other defects is identified when applying the overall PSCI rating. The results of the rating system should be relatable to the maintenance treatment categories specified for use on Non-National roads by the Department of Transport, Tourism and Sport. Table 2 on the following page summarises the overall relationships between these factors.

Table 2: Treatment Measures

<table>
<tr><th>Overall PSCI Rating</th><th>Treatment Measures</th><th>Surface</th><th>Structure</th></tr>
<tr><td>10</td><td rowspan="2">Routine Maintenance</td><td colspan="2">Excellent</td></tr>
<tr><td>9</td><td colspan="2">Very Good</td></tr>
<tr><td>8</td><td rowspan="2">Resealing & Restoration of Skid Resistance</td><td>Fair</td><td rowspan="2">Good</td></tr>
<tr><td>7</td><td>Poor</td></tr>
<tr><td>6</td><td rowspan="2">Surface Restoration
–
Carry out localised repairs and treat with surface treatment or thin overlay.</td><td>Fair</td><td rowspan="2">Fair</td></tr>
<tr><td>5</td><td>Poor</td></tr>
<tr><td>4</td><td rowspan="2">Structural Overlay/Inlay
-
Required to strengthen road.
Localised patching and repairs required prior to overlay/inlay.</td><td colspan="2" rowspan="2">Poor Overall</td></tr>
<tr><td>3</td></tr>
<tr><td>2</td><td rowspan="2">Road Reconstruction
-
Needs full depth reconstruction with extensive base repair.</td><td colspan="2">Very Poor Overall</td></tr>
<tr><td>1</td><td colspan="2">Failed Overall</td></tr>
</table>

Section 6: Bibliography

1. PASER Asphalt Roads Manual, Wisconsin Transportation Information Center, University of Wisconsin-Madison (2002).

2. Non-National Road Pavement Condition Study, Distress Catalogue Descriptions and Rating Procedures (2004).