



IPAG

Irish Pavement Asset Group

Pavement Asset Management
Guidance
Section 5.3:
Condition Surveying and Rating -
Drainage

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Document Information

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5.3 Condition Surveying and Rating – Drainage

5.3.1 Overview

Functioning drainage is a pre-requisite of good pavement management. Without adequate drainage, or with drainage facilities that are blocked or broken, water will get into the pavement, and over time, weaken it and accelerate its deterioration. This simple principle is well known to road maintenance engineers. The methods of condition rating included below is intended to assist engineers, to use a structured approach to help manage road pavement drainage on both rural and urban roads. The survey methods enable areas of poor drainage to be systematically identified and investigated.

The types of drainage that exist on rural and urban roads are different and the survey methods reflect this. Rural road drainage is usually made up of ditches and culverts. Urban road drainage comprises of kerbs and channels which feed into positive (piped) drainage systems, either specific stormwater systems or combined sewers. The survey methods can be used to provide an overall assessment of drainage condition of the network, but also to plan for road maintenance improvements. The methods use representative photographs to aid field inspection. Data collection can be undertaken manually. However, it is recommended that data is collected electronically. It is desirable that a software application be developed to aid data collection.

Output from drainage surveys should be compared and combined with other survey data. For example, in combination with data for:

- Roadway Condition; to determine if poor drainage provision is creating structural deterioration of pavements.
- Routine and Reactive Maintenance; to determine if poor drainage provision is leading to call-outs to surface water ponding.
- Collision Data; to determine if areas of poor drainage are potentially contributing to collisions, possibly as a result of loss-of-control skidding.
- Flood Risk Maps; to determine if drainage is functioning poorly in areas that have a high risk of flooding, due to pluvial and fluvial flood risk.

Data from drainage surveys should be stored in a pavement management system or other suitable asset management software that will enable this analysis to take place.

The survey methods deal only with how existing drainage infrastructure is, or is not, operating. It does not take into account wider flood risk or the capacity of the receiving stormwater / sewer system. It is important to appreciate, that a drainage condition survey may only be the first stage, in an investigation of why an element of road drainage is not providing the service required.

5.3.2 Network Level and Project Level Surveys Regime

The recommended drainage survey regime is shown below. It comprises a combination of coarse network level surveys and detailed project level (site) surveys. The methods of rating are described in the following section.

Table 5.3.1:

Network Level: Coarse Visual Network Drainage Survey (Wet Weather Survey)

Rural		Urban	
Driven survey, recording the condition of drainage adjacent of each segment / section of the road as good, fair or poor. (A separate initial survey to record basic topographical / cross-sectional details may be beneficial, see <i>Appendix 5.3.a</i>).		Driven survey recording the condition of each length of road (junction to junction) or lesser lengths, where appropriate. Condition is rated as good, fair or poor, based upon the condition of channels, gullies and other facilities.	
Survey Regime			
Regional Road	Every 3 years	Regional Road	Every 3 years
Local Road	Every 5 years	Local Road	Every 5 years
Project Level: Detailed Visual Drainage Survey (Dry Weather Inspection)			
Site-specific investigation of individual sites where drainage has been identified to be in a poor condition, from the network survey or has been identified by other means (inspector or public notification of problem site). The detailed investigation reviews the condition of the drainage, but also examines where the water is intended to drain to, the adequacy and condition of the ditches receiving the water and other site specifics, that may be affecting the ability of the drainage at that location to function adequately.		Site specific investigation of individual sites and / or streets where the network survey has rated the drainage as poor or sites that have been identified by other means (inspector or public notification of problem site). The detailed investigation reviews the condition of the drainage facilities and will include the jetting of blocked gullies / pipes and testing to see if the issue has been resolved. The investigation should note falls, gully spacings, and should be combined with records of the pipe system that the road drainage feeds into.	
Survey Regime			
A specific regime of detailed inspections is not appropriate. It is recommended that each road authority determines the need for detailed surveys, based upon the results of their network surveys and other relevant records, such as call-outs to surface water ponding / flooding / repeated blockages and inspector / public notification of problem sites. A method of prioritising sites for investigation is provided later in this document.			

Table 5.3.2: Network Level Visual Drainage Condition Rating System

Drainage Condition Rating System				
Rated Condition of Drainage *	Action	Road Condition Rating	Drainage Rating	Description
Poor	Treat drainage when treating road	1-6	Red	Drainage needs improvement, as does the condition of the road. Drainage should be addressed prior to or in conjunction with the road scheme.
Fair	Drainage Improvement		Amber **	Drainage needs improvement, but has not yet affected the road condition.
	Maintain existing drainage (e.g. clean out)		Blue **	Existing drainage needs maintenance.
Good	Routine maintenance.		Green	Continuance of routine cleaning, etc. required.

* Note: collected from wet weather survey.

** The split between Amber and Blue rating will be determined from a subsequent dry weather inspection of the site.

5.3.3 Network Level: Coarse Visual Drainage Condition Rating Method

The network level survey is a coarse visual inspection. It is designed to enable an overall assessment of drainage condition and to enable areas that require more detailed investigation to be identified.

Rural Roads: Driven Survey

The survey should be carried out from a vehicle and the condition recorded for each segment / section of road. If appropriate, the road should be driven in each direction, recording the condition of the nearside drainage and the results of this used to allocate a condition to each segment / section. The condition of the drainage should be recorded as one of the ratings below. Condition rating should be continuous, with the rating changing as the condition changes along the road. The survey produces a linear record of drainage condition of the road.

Table 5.3.3: Drainage Condition Rating Descriptions and Remedial Actions

Condition Rating	Description	Action Required
Good Condition	<ul style="list-style-type: none"> - Drainage appears to be functioning adequately (subject to normal routine maintenance). 	No action required
Fair Condition	Road structure has not been affected: <ul style="list-style-type: none"> - observed or known presence of flowing water on the pavement (with the potential to cause damage); or - observed or known presence of localised ponding or standing water on or adjacent to the pavement; - observed or known drainage system failures including: <ul style="list-style-type: none"> o inadequate drains or gullies; o vegetation growth or narrow verges preventing the free flow of water into the ditch; o some vegetation in the ditch that restricts water flow and creates damage; o some soil sliding from the road side-slope into the ditches and raising the bottom of the ditch. 	Minor or localised repairs, remedial works or improvements are required. Typically clearing vegetation, re-forming ditches, removing detritus in specific areas along the rated segment / section or installing new pipes or gullies.
Poor Condition	Road pavement structure has been affected*, and <ul style="list-style-type: none"> - observed or known presence of fast flowing water on the pavement (that has caused damage); or - observed or known presence of extensive ponding, flooding or standing water; - sub-standard road profile (cross-sectional or longitudinal profile). <p>* Road pavement condition rating of 1-6.</p>	Significant repairs or remedial works or improvement works required. May include ditch excavation, re-forming of banks, cleaning out culverts and, if appropriate, installation of new culverts, inlets, gullies, etc.

The photographs below are typical examples of each condition.

5.3.4 Rural Drainage Condition Rating Examples



Good Condition

Drainage appears to be functioning adequately (subject to normal routine maintenance).



Photographs reproduced with the permission of the ROADEX project.

Good Condition: Requires only routine maintenance.

Fair Condition	
<p>Road structure has not been affected:</p> <ul style="list-style-type: none"> - observed or known presence of flowing water on the pavement (with the potential to cause damage); or - observed or known presence of localised ponding or standing water on or adjacent to the pavement; - observed or known drainage system failures including: <ul style="list-style-type: none"> o inadequate drains or gullies; o narrow verges or vegetation growth, preventing the free flow into the ditch; o some vegetation in the ditch that restricts water flow and creates damage; - Some soil sliding from the road side-slope into the ditches and raising the bottom of the ditch. 	
	
<p>Ditch is overgrown and not functioning, causing weakening of pavement edge.</p>	<p>High verge is preventing flow of water into ditch, retained water is weakening pavement.</p>
	
<p>High verges causing ponding on the pavement.</p>	<p>Ponding along pavement edge.</p>
<p>Fair Condition: Minor or localised repairs or remedial works are required.</p>	

Poor Condition	
<p>Road pavement structure has been affected*, and</p> <ul style="list-style-type: none"> - observed or known presence of fast-flowing water on the pavement (that has caused damage), or observed or known presence of extensive ponding, flooding or standing water; - sub-standard road profile (cross-sectional or longitudinal profile). <p>* Road pavement condition rating of 1-6.</p>	
	
<p>Sub-standard profile causing extensive ponding.</p>	<p>Sub-standard profile causing extensive ponding.</p>
	
<p>Area of flooding.</p>	<p>Ponding water across the full pavement width with signs of pavement deterioration (cracking).</p>
<p>Poor Condition Significant repairs, remedial works or improvement works required.</p>	

Urban Roads: Walked Survey

The survey should be carried out on foot and condition recorded for each segment / section of road between junctions. The survey should be carried out by recording an average rating for each road segment. The condition of the drainage should be recorded as one of the ratings below. The survey produces a rating of the average drainage condition of each segment / section of the road.

Table 5.3.4: Condition Rating Descriptions

Condition Rating	Description*
Good Condition	Some or all of the following are present: <ul style="list-style-type: none"> - Road has adequate cross-fall. - Gullies and channels clean and running. - Kerbs are in good condition. *
Fair Condition	<ul style="list-style-type: none"> - Road cross-fall is questionable. - Some gullies are blocked. - Lengths of channel blocked or broken. - Localised pavement distress from flooding or ponding. - Badly located gullies, e.g. no longer at the low spot.
Poor Condition	<ul style="list-style-type: none"> - Road cross-fall is inadequate. - Numerous gullies are blocked. - Significant lengths of channel blocked or broken. - Significant lengths of broken kerbing. - Pavement distress from localised flooding or ponding. - Deficiencies which, when travelling at the speed limit of the road, are considered to pose a safety risk.

** The items listed are indicative only. They do not all need to be present for a length to be recorded as the condition indicated. They are a guide to aid the selection of the most appropriate condition rating, considering the average condition of the segment and the action required. An adequate cross-fall would typically be 2.5%.*

Reference should be made to the routine maintenance records, prior to carrying out the survey. The routine records should be analysed to identify sites where call-outs have occurred to surface water ponding and / or reactive gully cleansing. The following pages contain photographic examples of drainage in each of the condition categories described above.

5.3.5 Urban Drainage Condition Rating Examples

Good Condition

Road has adequate cross-fall, gullies, channels and kerbs are clean, free running and in good condition.

Good Condition: Routine maintenance only required.

Fair Condition

Some section of the road has a cross-fall that is less than the desirable, some gullies are blocked, lengths of channel are blocked or broken, there is localised pavement distress from flooding or ponding.



Localised ponding caused by low spot or blocked gully.



Localised ponding caused by low spot or blocked gully.



Localised ponding caused by low spot or blocked gully.



Localised ponding caused by low spot or blocked gully.

Fair Condition: Minor or localised repairs or remedial works are required.

Poor Condition

Drainage is in poor condition as a result of one or more of: the road cross-fall is inadequate, numerous gullies are blocked, significant lengths of channel blocked or broken, significant lengths of broken kerbing and / or pavement distress from localised flooding or ponding, in areas where it may cause a safety hazard.



Water ponding in the intersection with a major, high speed road.

Water ponding at a signalised crossing.



Water ponding at a pedestrian crossing on a main city centre street.

Significant ponding at a busy intersection creating potential safety hazard.

Red: Poor Condition Significant repairs or remedial works or improvement works required.

Appendix 5.3.a: Recording Topographical Details

Recent ROADEX¹ research has high-lighted the benefit of understanding the topography of a road when considering its drainage system. This includes an understanding of long-fall and cross-fall and of the cross-section at any given location. Collection of this data is potentially valuable. The data will only need to be collected once and can then be reused in conjunction with subsequent drainage condition surveys.

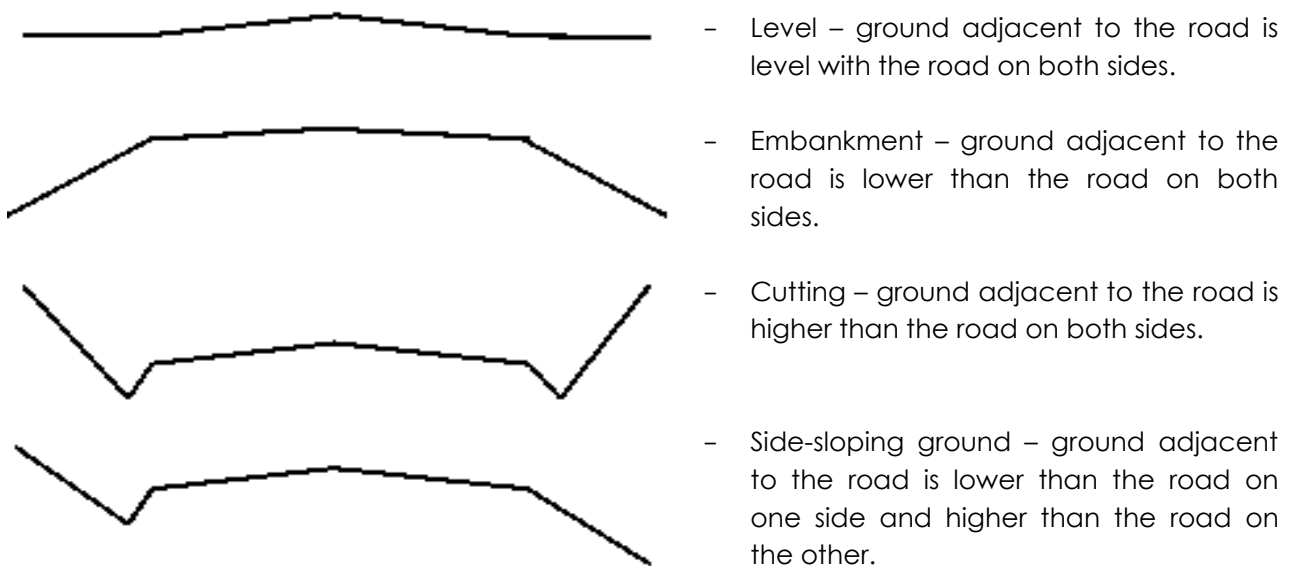
Using Geometry Data from Machine-based Condition Surveys

For roads on which a machine-based roadway condition survey has been carried-out, it may be possible to obtain long-fall and cross-fall data from data stored by the survey machine, during the survey.

Recording Cross-section

Recording of cross-section will, however, require a specific site survey. Cross-section should be recorded as one of the following:

Diagram 5.3.1



¹ This method has utilised many of the results and reports from the ROADEX projects on drainage. Reference should be made to the wealth of relevant and useful information produced under that project and available at the project website: www.roadex.org