IPAG

Irish Pavement Asset Group

Pavement Asset Management Guidance

Section 5.0:

Condition Surveying and Rating - Overview

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Document Information

Title	Pavement Asset Management Guidance, Section 5.0: Condition Surveying and Rating - Overview
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5.0 Condition Surveying and Rating

This section describes the methods to be used for condition surveying and rating. It records the regime of condition surveys that are required. It comprises:

- 5.0: Condition Surveying and Rating - Overview (this document)
- 5.1: [Future]
- 5.2: Condition Surveying and Rating - Footway
- 5.3: Condition Surveying and Rating - Drainage

5.0.1 Condition Surveying

Condition surveys are an essential part of an asset management approach to pavement management. Reliable condition information, that reflects the level of deterioration of pavement can be used to:

- Report condition;
- Calculate funding needs;
- Inform budget allocation;
- Develop works programmes.

To enable all of these important activities to be supported, a regime of regular surveys is required,

5.0.2 Recommended Survey Regime

A regime of regular surveys is required, to enable the changes in condition over time to be monitored and tracked. The regime will comprise a combination of machine-based and visual surveys and is designed to allow pavement asset management to be applied. The following tables set out a survey regime at both network and project / works level.

The regime presumes that a coordinated national procurement of surveys on regional roads be taken and that the data will be supplied to road authorities, to use within a PMS for local planning purposes. All surveys on Regional and Local Roads should conform to an approved specification.

Table 5.0.1: Network Surveys

Asset Type	Machine Survey		PSCI Visual Survey	
	Frequency	**Coverage**	**Frequency**	**Coverage**
Regional Roads (13,121 km – 13%)	Every 5 years (minimum)	100% one direction	Every year	100%
Local Primary (LP) Roads (24,373 km – 25%)	Every second year (minimum)	10% minimum sample of LP network other than pavement works locations	Every second year (minimum)	100%
Local Secondary (LS) Roads (33,222 km – 33%)	Every second year (minimum)	5% minimum sample of LS network other than pavement works locations	Every second year (minimum)	100%
Local Tertiary (LT) Roads (22,878 km – 23%)	Every 5 years (minimum)	5% minimum sample of LT network other than pavement works locations	Every 5 years (minimum)	100%

The coverage of the road survey is subject to the availability of the resources required to undertake the surveys. It is assumed that the visual surveys will all be undertaken by council staff. Training will be required to ensure quality and consistency. Subsequent refresher training is recommended, to ensure that the standards are being consistently applied. Independent auditing and validation is also necessary, for quality control and to achieve as good repeatability as possible.

Where pavement works occur, 'before' and 'after' visual surveys are required for all projects, in addition to 'before' and 'after' machine surveys for works on all regional roads and a sample of local roads as follows:

Table 5.0.2: Works Surveys

Asset Type	Machine Survey (RR, SO and SR works) *		PSCI Visual Survey (All works)	
	Frequency	Coverage	Frequency	Coverage
Regional Roads (13,121km – 13%)	Every year	'Before' & 'After' at 100% of pavement works locations (every year)	Every year	100% of 'Before' & 'After' regional road pavement works locations
Local Primary (LP) Roads (24,373km – 25%)	Every year	10% minimum sample of 'Before' & 'After' LP pavement works locations	Every year	100% of 'Before' & 'After' LP pavement works locations
Local Secondary (LS) Roads (33,222km – 33%)	Every year	10% minimum sample of 'Before' & 'After' LS pavement works locations	Every year	100% of 'Before' & 'After' LS pavement works locations
Local Tertiary (LT) Roads (22,878km – 23%)	Every year	5% minimum sample of 'Before' & 'After' LT pavement works locations	Every year	100% of 'Before' & 'After' LT pavement works locations

** RR = Road Reconstruction, SO = Structural Overlay, SR = Surface Restoration*

Other Surveys

In addition to the surveys included in the table above, road authorities may wish to procure or undertake additional surveys, to aid their understanding and ability to manage their pavement assets. These may include the following:

- **Project Level Assessment or Detailed Visual Inspections (DVIs);** These are in addition to the 'before' and 'after' surveys set out above and are appropriate for lengths of road that the road authority wants to investigate in more detail and typically involved recording the presence and extent of a range of specific defects. They are used at a project level and can aid site and treatment selection. As a relatively labour-intensive survey method, they are typically not appropriate for network-wide surveys.

- **Pavement Condition Index (PCI);** this is a numerical index between 0 and 100 which is used to indicate the general condition of a pavement. It is widely used in transportation civil engineering. It is a statistical measure and requires manual survey of the pavement. PCI surveying processes and calculation methods have been standardised. PCI was developed by the United States Army Corps of Engineers. The method is based on a visual survey of the number and types of distresses in a pavement. The result of the analysis is a numerical value between 0 and 100, with 100 representing the best possible condition and 0 representing the worst possible condition.

- **Deflection Testing (e.g. Deflectometer or Falling Weight Deflectometer (FWD));** deflection testing can be used where the road authority wishes to gain a greater understanding of the strength / structural capacity of the pavement. Such testing has been deployed internationally on motorways and strategic roads for many years. It provides information, that aids both site and treatment selection. Generally, it is not appropriate for local roads. FWD testing is typically deployed at a project level and can be used to assist with treatment selection, i.e. to determine what structural capacity exists within the current pavement and therefore what strengthening may be required.

- **Skid Resistance Testing (e.g. *SCRIM* and *GripTester*);** skid resistance testing is typically deployed on roads where there a significant risk of collisions occurring, due to skidding or a failure to stop. This may be on high-speed, 'major' roads or it may be locations on the network where due to the topography of the road, the consequences of a vehicle losing control warrant investigating and actively managing skid resistance.

- **Other Machine Surveys;** in addition to a regular regime of machine surveys on the roads shown above, road authorities may wish to procure additional machine surveys, for roads where a more detailed data set is considered to be worthwhile. Machine surveys provide a more highly detailed data set that can assist with understanding the mode of failure of a road and thus its appropriate treatment.

5.0.3 Condition Rating

The condition rating schemes in these sections are designed to be simple to understand and implement, by a wide range of survey personnel. No prior experience should be necessary. Training in the methods will be required. There is no internationally-recognised standard for reporting condition. The reporting of condition is often colour banded, to enable more intuitive reporting and presentation of results. For example, the Pavement Surface Condition Index (PSCI) rates between 1 and 10 with a colour banding into Red, Amber, Blue and Green conditions, where the indices and colours equate to various treatment measures. This philosophy is reflected in each of the methods included in *Section 5*. The presentation of survey results in graphical format is encouraged, as it has been shown to greatly assist in providing easily understandable information for decision makers to use.

Appendix 5.0.a: Types of Condition Survey

There are two basic types of condition surveys - machine surveys and visual assessments.

Machine Surveys

Machine surveys use vehicles with sophisticated equipment, capable of collecting data while moving. The vehicles use laser technology to collect a range of data about the road surface and couple this with GPS tracking, to enable the data to be location referenced (geo-referenced) to a network. The network would usually be provided to the survey contractor in advance, to enable this to happen. Machine surveys usually enable the recording and reporting of surface texture (macro texture), cracking, roughness (longitudinal variance) / ride quality, and rutting.

Separate vehicles are used to measure skid resistance and strength (deflection). The machine surveys measure the surface of the road. The measurements they take can then be interpreted to give an indication of the structural condition, as well as the surface condition.

Visual Inspection

Visual assessments take two forms: a coarse inspection and / or a detailed inspection. Coarse surveys are usually used on a network basis, measuring a whole network, or a significant portion of the network, e.g. 40% annually. A coarse survey will typically be undertaken from a moving vehicle, ideally assisted by in-car electronic data capture, using a laptop or similar that tracks where the vehicle is. This leaves the operator to record their observations of road condition, using a predefined scale. This form of survey is often called a Network Level or CVI (coarse visual inspection) of which Pavement Surface Condition Index (PSCI) is an example. Coarse surveys provide an overview of condition and can be used to identify sites for further investigation. They typically involve giving a rating to lengths of road or recording a limited number of defect types.

A detailed inspection involves recording a range of defects and typically noting their extent and severity. They are considerably more time consuming than coarse surveys and because of this, they are more expensive. The time taken to undertake them and their cost generally precludes their use on a network-wide survey basis. However, detailed inspections can be very effective, when investigating sites previously identified via machine or coarse surveys to determine what, if any, treatment is required.

There are advantages and disadvantages in both methods of survey. Road authorities should consider these, when determining an appropriate survey regime for their network. Considerations that may influence these choices are shown below:

Table 5.0.3: Comparison of Machine and Visual Surveys

Issues	Machines	Visual
Safety	Uses vehicles set up for survey which travel at or close to normal traffic speeds. Presents a low safety risk.	Requires staff to drive or walk routes. Has some risk to staff from being on the road.
Cost	More expensive and an external cost, as they have to be bought from an expert contractor.	Cheaper. Can sometimes be undertaken by existing resources.
Resource Implications	Third party survey contractors.	Can be undertaken by council staff, subject to suitable training being provided.
Repeatability	Consider calibration requirements, but otherwise should achieve good repeatability. Use of same vehicle will assist.	Could not match machine survey, but could be adequate for certain roads.
Measures	Rutting, texture, roughness / variance, skid resistance (separate machine), etc.	Can measure the same as machines, but more likely to be a rating, based upon visual assessment of defects, as detailed in other sections.