

# Measurements for Determining Flexible Pavement Condition

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•BEFORE selecting the measurements to make for finding a flexible pavement's condition, the purpose of the survey must be decided; then, how the pavement is used must be considered.

Usually, there are two reasons for making condition surveys: to determine rideability, how well the pavement rides; or to determine structural adequacy, the ability of the pavement structure to carry without failure the traffic using it.

Rideability is a measure of the surface condition of the pavement and it depends on superficial defects that affect the riding quality. The fact that these surface defects may reflect some internal failure in the pavement structure is not considered in the evaluation.

A pavement condition survey method, based on rideability, was developed at the AASHO Road Test. The method, called "present serviceability," is defined by Carey and Irick in HRB Bulletin 250 as "the ability of a specific section of pavement to serve high-speed, high-volume mixed . . . traffic in its existing condition."

Present serviceability is expressed as an index number derived by giving, in a present serviceability index (PSI) equation, various weights to the following measurements: (a) roughness, (b) rut depth, (c) major cracking, and (d) patching.

The PSI, as defined, will not suit the criteria for city streets, secondary roads, or airports without adjustment of the level of acceptability or, possibly, adjustment of the coefficients in the PSI equation to fit the new criteria. This is why pavement usage must be considered as an influence in the condition survey.

Roughness measurements, into which are lumped all types of surface disintegration and distortion, are the biggest influence in the present serviceability concept. Although rut depth, major cracking, and patching are measured, they are given but little weight in the PSI equation.

Present serviceability may tell the engineer that the surface is rough and resurfacing is needed, but it does not tell him whether or not structural repairs are required or why the pavement is performing as it is. For this he must determine the structural adequacy of the pavement. He does it with a structural condition survey.

Structural condition is the ability of a pavement structure, at the time of the condition survey, to carry the traffic using it. Necessarily, then, more detailed measurements of all defects are needed for evaluation than for the present serviceability index. Each defect must be isolated and classified and a knowledge of the causes of the different defects must be used to determine what repairs are needed to make the structure adequate again. This kind of information also is needed to evaluate pavement design, so, in this type of condition survey, cracking, disintegration, and distortion are measured, and they show up in a number of varieties. The following shows varieties of defects and their probable causes:

Cracking. —(a) alligator or map, plastic or resilient foundation; (b) shrinkage, drying out and shrinkage of mix or underlying layers; (c) slippage, lack of bond between the surface and the next layer because of fine dust or moisture, or both; (d) longitudinal, downward and lateral movement of fill or poor construction joint; and (e) transverse, contraction due to temperature or overstress of pavement.

Disintegration. —(a) raveling, insufficient bitumen or action of water; and (b) pot-holes, insufficient bitumen, plastic fines, or action of water.

Distortion. —(a) corrugations, unstable mix or unstable base; (b) pushing or shoving, unstable mix (too much bitumen, rounded aggregate); (c) rutting, densification and

plastic deformation of layers; (d) sags and humps, deep settlement or base distortion; and (e) waves, deep settlement or base distortion.

Another defect that is often measured is skid hazard, usually evidenced by polished aggregate or bleeding bitumen. It affects neither ridability nor structural adequacy of the pavement but it can be bad enough to require a resurfacing.

In airport pavements there are two additional probable causes for localized disintegration or surface erosion of flexible pavements—fuel spillage and jet engine blasts. Fuel spillage is a problem only where aircraft are refueled. Jet blast damage seldom occurs except from certain types of military aircraft whose engines exhaust directly onto the pavement.

In any detailed condition survey of a pavement structure, deflection measurements should be made to help determine the ability of the structure to carry the traffic using it. And, when there is evidence that faulty drainage has caused structural weakness, the drainage system should be examined and its adequacy noted.

A condition survey, then, can be superficial or integral. The present serviceability type of survey can be used preliminary to the detailed type of structural condition survey to eliminate from further study those sections that are performing well. This allows the engineer to concentrate on the sections that need further evaluation before improvements are made.