Glossary

# Road surface condition evaluation index

Refer to “Improvements for commercialization of smart road monitoring” (page 13)

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## 1 What Are the Road Surface Condition Evaluation Indices?

These indices are a set of indicators defined in the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)’s road pavement repair procedure and in the road maintenance standards of various local governments. Major indices include the International Roughness Index (IRI), which indicates road surface smoothness; rut depth, which indicates the depth of ruts; crack rate, which indicates the proportion of cracked surface area; and MCI, which shows a composite of these indicators. These indices quantitatively determine the safety, comfort, and durability of the road surface. In practice, road administrators use them to determine repair priorities and optimize maintenance plans.

### 1. 1 International Roughness Index (IRI)

The IRI was proposed by the World Bank to quantify the unevenness (smoothness) in road pavement surfaces. It is the cumulative value of the vertical displacement of a quarter-car (mono-cycle model) when traveling at 80 km/h. A lower IRI value indicates a smoother road surface and a more comfortable ride. A higher value indicates a rougher road. The unit is expressed in millimeters per meter [mm/m].

### 1. 2 Rut Depth

This index represents the depth of a depression caused by wheel tracks when a vehicle travels over it. It is expressed in millimeters (mm) and is the distance from the reference line to the bottom of the depression in a cross-sectional view of the road.

### 1. 3 Crack Rate

This index represents the proportion of the total area of an arbitrary survey section covered by cracked pavement. Specifically, the road surface is divided into 50 cm x 50 cm grids. Each grid is assigned an area factor value, which is defined according to the types and number of cracks included in the grid. Finally, all area factor values are summed to determine the proportion of the total area, expressed as a percentage [%].

### 1. 4 Maintenance Control Index (MCI)

The MCI provides a comprehensive indication of pavement deterioration on a scale of 0 to 10. This index is used in the MLIT’s pavement inspection procedure, for example. It is determined from major indices of road surface condition, including rut depth, crack rate, and smoothness. A lower value indicates poorer pavement condition.

## 2 Pavement Condition Assessment Based on Road Surface Condition Evaluation Indices

To objectively evaluate the condition of a road’s pavement, it is essential to quantify damage that is difficult to identify through visual inspection, such as cracking and rutting. The MLIT’s pavement inspection procedure specifies three major indices for determining pavement condition: crack rate, rut depth, and IRI (smoothness). The procedure defines clear numerical standards for each index. Road pavement condition can be classified into three levels: (1) healthy (slightly damaged); (2) functional preservation stage (moderately damaged); and (3) repair required (severely damaged) (Table 1).

**Table 1** Pavement Condition Assessment Criteria with road surface condition evaluation indices

| Index | Healthy | Functional Preservation Stage | Repair Required |
|---|---|---|---|
| Crack rate [%] | ≦20 | 20–40 | ≧40 |
| Rut depth [mm] | ≦20 | 20–40 | ≧40 |
| IRI [mm/m] | ≦3 | 3–8 | ≧8 |
| MCI | ≧7 | 4–7 | ≦4 |