***Pavement Condition***

[1] Reference: Guide to Bikeway Pavement Design Construction & Maintenance for South Australia, 2015

**Source:**
https://www.dpti.sa.gov.au/__data/assets/pdf_file/0006/149964/DPTI_Bikeway_Pavement_Guidelines_2.pdf

**Key Information:**

The Guide to Bikeway Pavement Design Construction & Maintenance for South Australia provides excellent guidance on various metrics for evaluating bikeway quality, both functionally and structurally. The guide highlights the need to consider functional aspects such as appearance, roughness, skid resistance and more. Roughness can be measured through the NAASRA Roughness Meter counts and the International Roughness Index (IRI); Skid resistance can be empirically measured using specific instructments, such as the GripTester. Structurally, it is important to consider the "cracking, deformation, potholes" and more. Examples of measures can be inspection for grooves, steps, and visible cracks/potholes.

[2] Reference: National Asphalt Pavement Association

**Source:**https://www.il-asphalt.org/files/2214/4594/9423/NAPA-IS129.pdf

**Key Information:**

The National Asphalt Pavement Association specifies the conditions under which maintenance is necessary for asphalt paved trails. This information provides a reference point for bikeway conditions. For example, it is noted that "Cracks which are less than 1/4 inch wide are con- sidered low severity". Similarly, this article provides guidance on differentiating medium versus high severity conditions, Cracks 1/4 to 1/2 inch in width and Cracks greater than 1/2 inch, respectively. More than the width of individual cracks, it is also important to note the frequency of such cracks.

[3] Reference: Highway Design Manual Chapter 1000 Bikeway Planning and Design

**Source:** https://srcity.org/DocumentCenter/View/7949/Appendix-B-PDF?bidId=

**Key Information:**

The Highway Design Manual Chapter 1000 (2006) introduces key criterias while considering bikeway planning and design. Specifically, in terms of miscellaneous bikeway criteria, the HDM explores bikeway surface tolerances and acceptable finished surface grade. Holistically, it is necessary to consider other factors such as obstruction markings, drainage grates, manhole covers, and driveways in order to account for the general ride experience.

[4] Reference: San Gabriel Valley Regional MP

**Source:** http://www.sangabrielcity.com/DocumentCenter/View/2808/SGV_Design-Guidelines_Draft_20140909-Reduced-File-Size?bidId=

**Key Information:** The San Gabriel Valley Regional Masterpass introduces a framework to structure main points to consider when evaluation conditions of bikeways. The masterplan lays out some of the main maintenance necessary to maintain rider comfort. For example, the San Gabriel Valley authority documents the need for inspections, pavement sweeping/blowings, signage replacement, and tree/shrub plantings and trimmings. All of these are important to maintain a level of comfort and performance for bike users.

[5] Reference: New Jersey DOT

**Source:** https://www.state.nj.us/transportation/about/publicat/pdf/BikeComp/introtofac.pdf

**Key Information:** The New Jersey Department of Transportation Compatible Roadways and Bikeways Planning and Design Guidelines highlights the various elements critical to safe bicycle facilities. With a goal to increase total trips made by bicycling and walking as well as decrease bike-pedestrian collisions, the NJDOT highlights elements from the 1991 AASHTO Guide for the Development of Bicycle Facilities. For example, it is important to not only inspect surface conditions, it is also important to eliminate drop offs from pavement edges, control growth of trees, supply trash and recycling receptacles, and mow areas in vicinity of bike paths.

[6] Reference: New South Wales Transport Roads and Maritime Services

**Source:**https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/test-methods/t182.pdf

**Key Information:** The New South Wales Transport Roads and Maritime Services produced a report in 2012 that documented findings in standardizing road roughness testing. In addition, it introduces key definitions such of NAASRA (AUSTROROADS) Roughness Meter. The report specifices that one NAASRA Roughness Meter count per kilometer can be equivalent to 15.22mm of vertical displacement. This can serve as a good baseline for understanding the equations that govern the NASSRA Roughness counts.

[7] ASTM E303: ASTM Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester

**Source: ????**

**Key Information:** Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester defines the basis for the British Pendulum Tester. This standard allows for better understanding of what is tested during the British Pendulum Test. The British Pendulum Number utilizes a "pendulum impact-type tester that measures the energy loss when a rubber slider edge is propelled over a test surface."

[8] Winter Bike Lane Maintenance

**Source:** https://altaplanning.com/wp-content/uploads/winter-bike-riding-white-paper-alta.pdf
**Key Information:** Alta Planning, private Transportation Design and Planning firm, provides a review of the "National and International Best Practices", as it relates to Winter Bike Lane Maintenance. Through a review of case studies from within the United States, namely Minneapolis, MN, and outside the United States, including Montreal, Canada; Calgary, Canada; Amsterdam, Netherlands; and more, Alta Planning introduces the various practices different places have used to combat winter conditions on bike lanes. The information from different parts of the world serves as valuable comparison and baseline for understanding of varying levels of bicycle path care during the winter times.

***Bikeway Visibility***

[9] Reference: The City of Portland Office of Transportation

**Source:** [https://nacto.org/wp-content/uploads/2011/01/Portlands-Blue-Bike-Lanes.pdf](https://nacto.org/wp-content/uploads/2011/01/Portlands-Blue-Bike-Lanes.pdf)
**Key Information:** The City of Portland Office of Transportation conducted a study on the effects of modified bike infrastructure in 1997 on motor yielding rates, conflict rates, and general modified behaviors. In this study, the Portland Office of Transportation combined the use of blue paint, adjusted signage, and restriping of exiting bike facilities. Through the study, planners and engineers were able to analyze the differences between the before and after behavior of motorist and bicyclist through collection of empirical collision rates and surveys by users. The results show that 49% of motorist and 76% of cyclists feel safer given the changes. In addition, the percentage of motorists who slows/stops for bicyclists increased from 71% to 87%. Overall, this study helps to highlight the potential results of better biking infrastructure.

[10] Reference: NACTO

**Source:**
[https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/colored-pavement-material-guidance/](https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/colored-pavement-material-guidance/)
**Key Information:** The National Association of City Transportation Officials colored pavement material guidance serves as a reference for potential use of colored pavement. NACTO highlights that the implementation of colored pavement has been generally met with positive responses from both bicyclist and motor vehicle drivers. There are many options for use,

including paint, durable liquid pavement markings and thermoplastic. Thermoplastic is currently the most commonly used material. Following Portland's study on blue bike lanes, the Federal Highway Administration has approved intertim experiments utilizing green colored pavements.

| Category/Criteria | **1 (Worst)** | **2 (Average)** | **3 (Best)** |
|---|---|---|---|
| **Functionality** | | | |
| Skid Resistance: Grip number determined by Grip Tester, approximately 0.01 x British Pendulum Number [1] [7] | **≤ 0.30** | **0.30 ≤ x ≤ 0.40** | > 0.40 |
| Roughness: Vertical Displacement on a Specified Point on Test Vehicle over 328.1 ft length (NAASRA) [1][6] | > 0.18 in / 100 ft | 0.14 in/ 100 ft ≤ x ≤ 0.18 in / 100 ft | < 0.14 in / 100 ft |
| **Structurally** | | | |
| Potholes: number of potholes [1][3][4] | **> 3 potholes per block** | **1 ≤ x ≤ 3 potholes per block** | **≤ 1 pothole per block** |
| Cracks: width of cracks [2][3] | > ½ inch wide | ¼ ≤ x ≤ ½ inch wide | < ¼ inch wide |
| **Maintenance** | | | |
| Pavement Color: state of pavement color by visibility from afar, if painted [9][10] | **Not fully visible from 150 feet away** | **Fully visible from 150 feet away** | **Fully visible from 50 feet away** |
| Debris: amount of debris (trash, broken glass, etc) [3][4][5] | **> 5 lb per 2000 sq. ft** | **2 ≤ x ≤ 5 lb per 2000 sq. ft** | **< 2 lb per 2000 sq. ft** |
| Snow Plowing: Description of plowing times and conditions, where applicable during applicable times [8] | Study block is not plowed to standards of other two categories. | Study block is plowed within four hours of 5 cm of snow accumulation and de-icing treatments are applied as needed. Plowing is done before 7AM when snowing at night. | Study block is plowed within four hours of 3 cm of snow accumulation and de-icing treatments are applied before 7AM. Plowing is done before 7AM when snowing at night. |