Development of a Sidewalk Condition Assessment Rating System for Municipalities

Leanne Whiteley-Lagace, Gabe Cimini, Fadi Jadoun, Allan Venema
Stantec Consulting Ltd.
Hamilton, ON
leanne.whiteleylagace@stantec.com

Paper prepared for the session Beyond Pavement and Bridges: Addressing Gaps in Asset Management
2026 Transportation Association of Canada (TAC) Conference & Exhibition
Winnipeg, Manitoba

Abstract

Sidewalks constitute an essential component of municipal transportation infrastructure, supporting pedestrian mobility and community accessibility. Despite their importance, sidewalks frequently receive limited investment compared with larger high-profile assets such as roads and bridges. A 2022 jurisdictional scan of North American municipalities found that only one-third of respondents had established formal sidewalk management systems, highlighting a significant gap in the asset management practice.

Within the broader framework of infrastructure asset management – which encompasses design, maintenance, renewal, and replacement – the condition of the asset is a critical input for effective decision-making. A comprehensive and reliable condition assessment approach enables the evaluation of current performance, prediction of future deterioration, and identification of appropriate maintenance and rehabilitation strategies.

To address this need, a standardized sidewalk condition assessment protocol has been developed to evaluate slab-based concrete sidewalks. The protocol evaluates a range of distresses, incorporating both severity and extent. It also includes other components of value to asset managers such as catch basin locations and other contextual information.

Assessment results are used to calculate a Sidewalk Condition Index (SCI), facilitating integration into network-level asset management reporting and capital planning. Detailed distress data also supports operational-level program development.

Case studies will demonstrate how the collected data can be used to produce project-level distress maps, network-level condition maps, and targeted maintenance and rehabilitation plans to address identified deficiencies.

Introduction

Background

Sidewalks are the most basic form of pedestrian infrastructure, used by the public, including transit users accessing stops and stations as well as motorists and bicyclists travelling between parked vehicles and destinations. Compared with other transportation assets, sidewalks often lack basic data, planning and funding.[1] A 2022 jurisdictional scan of sidewalk management practices across North America found that fewer than one-third of respondents had a formal sidewalk management plan.[2]

As municipalities expand asset management planning and data-driven decision-making, a clear and repeatable sidewalk condition assessment approach is needed. Standards such as ASTM D6433, *Standard Practice for Roads and Parking Lots Pavement Condition Surveys*[3] can be applied to asphalt pathways and trails; however, the methodology is difficult to translate to concrete sidewalks because the analysis is based on slab counts within an area (density).

Most participating municipalities also lacked calibration and acceptance criteria for sidewalk condition data; consequently, few have developed a sidewalk condition rating system or performance index. This can result in unclear treatment triggers and inconsistent decision-making.[2] The data and findings presented in this paper provide a reference for municipalities seeking to benchmark and strengthen sidewalk management practices.

Scope

Sidewalk networks may include, but are not limited to, the following surface materials:

- Asphalt
- Concrete
- Segmental (Interlocking Pavers)
- Combination of the above

Sidewalk condition programs may also include related assets, such as pedestrian ramps and curbs, Asphalt sidewalks, trails, and pathways which can be assessed in accordance with ASTM D6433.[3] Segmental (paver/brick) sidewalks and walkways can be assessed using ASTM E2840 Standard Practice for Pavement Condition Index Surveys for Interlocking Concrete Roads and Parking Lots.[4] This paper focuses on the condition assessment of concrete sidewalks.

Purpose

The objective of this work is to develop a systematic sidewalk condition assessment that supports both overall sidewalk condition reporting and defensible maintenance and rehabilitation recommendations based on available data.

As with other municipal assets, sidewalk treatment selection and prioritization depend on factors such as location, functional use, pedestrian volumes, and proximity to schools, hospitals, and other community-sensitive areas. A consistent condition assessment framework supports transparent, data-driven decision-making.

Concrete Sidewalk Condition Assessment

Based on over two decades of experience conducting sidewalk condition assessments, several distresses and attributes are collected as part of the concrete sidewalk condition assessment. These distresses and attributes are shown in Table 1, where:

- A = Attribute
- D = Distress
- % = percentage
- # = number (count)
- H = height
- W = width
- L = length

Table 1. Concrete Sidewalk Distresses, Attributes and Measurements

Hazard ranking	Category	Distress / Attribute	Measure by
1	Excessive Grade	D	H
2	Hazard Faulting	D	H
3	Missing Slab	D	%
4	Faulting	D	H
5	Heave	D	H
6	Settlement	D	H
7	Grinding	D	H
8	Surface Roughness	D	H
9	Gap	D	W
10	Chipped slab (Joint Spalling/Corner Break)	D	L
11	Broken Slab	D	W
12	Cracking (L, T, D, C)	D	W
13	Reverse Crossfall	D	%
14	Asphalt (AC) Patching	D	#
15	Concrete (PCC) Patching	D	#
16	Manhole	A	H
17	Utility Box or Valve	A	H
18	Obstruction	A	W
19	Obstruction - Temporary	A	W
20	Catch Basin	A	Condition
21	Pedestrian Ramp	A	H

Concrete Sidewalk Distress Types and Severities

The concrete sidewalk distress types and severities are subsequently presented. The data is recorded based on severity and slab count.

Excessive Grade

An area of sidewalk that has an abrupt change in longitudinal grade of more than 13% over a short distance that can compromise the ground clearance of footrests or antitipping devices of wheelchairs or mobility devices. This hazard can only be categorized as a high severity.

Severity	Description	Photo Example
High	Excessive grade is greater than 13% (76 mm (3”) change in height over a 59 cm (23 in) distance.	

Hazard Faulting

Hazard faulting is the difference in elevation across any joint or crack. This rating can only be categorized as high severity.

Severity	Description	Photo Example
High	Difference in elevation of joint or crack is greater than 9 mm (0.75 in).	

Missing Slab

An area of sidewalk that has a hole resulting from a missing concrete panel or portion of the panel. More that 1/3 of the slab is gone. This hazard rating can only be categorized as high severity.

Severity	Description	Photo Example
High		

Faulting

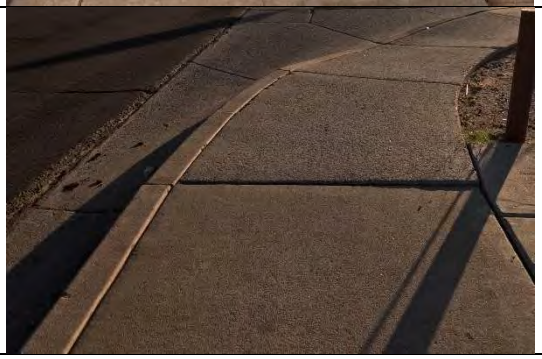
Faulting is the difference in elevation across a joint. Some of the common causes of faulting are settlement due to weak subgrades; pumping or loss of material from underneath the slab; and tree roots lifting slabs

Severity levels are defined by the difference in elevation across the joint. If there are varying elevations across a slab, the highest difference in elevation will be considered for rating.

Severity	Description	Photo Example
Low	Difference in elevation of joint or crack is less than 5 mm.	
Medium	Difference in elevation of joint or crack is between 5 mm and 10 mm.	
High	Difference in elevation of joint or crack is 10 mm or above.	

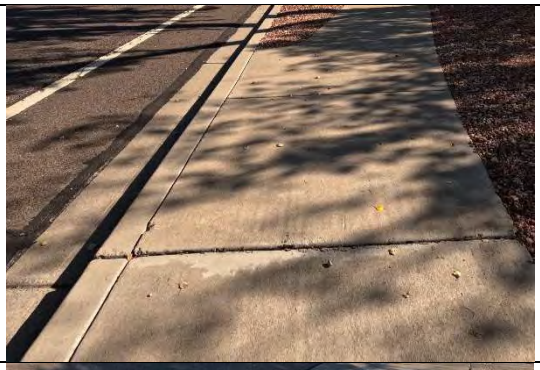
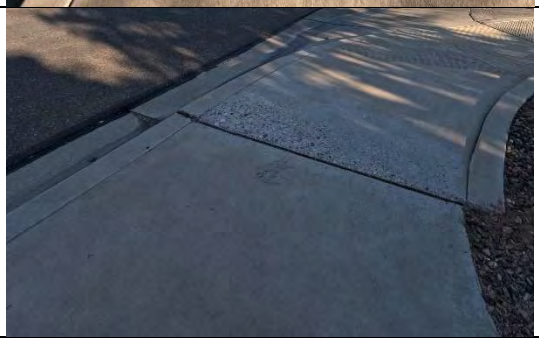
Heave

Location of upward slab displacement that poses a potential tripping hazard. A low severity is when the maximum change in elevation is measured at less than 5 mm, medium severity when it is between 5 to 10 mm, and high severity when the distress is greater than 10 mm.

Severity	Description	Photo Example
Low	The maximum change in elevation is measured at less than 5 mm.	
Medium	The maximum change in elevation is measured between 5 to 10 mm.	
High	The maximum change in elevation is measured at greater than 10 mm.	

Grinding

An area where a grinding or horizontal sawcut repair has been applied to a sidewalk surface.

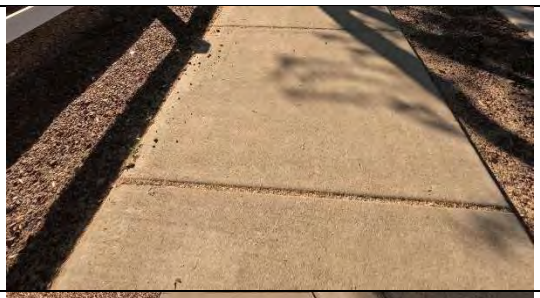
Severity	Description	Photo Example
Low	The change in height between concrete slabs is measured at less than 5 mm.	
Medium	The change in height between concrete slabs is measured between 5 to 10 mm.	
High	The change in height between concrete slabs is measured at greater than 10 mm.	

Surface Roughness

Surface roughness is the loss of surface material and is typically caused by freeze thaw attack on insufficiently air entrained mixtures, and salt attack caused by de-icing salts. Surface roughness can also be caused by poor construction practices, including inadequate curing or over finishing of the surface. Surface roughness is characterized by flaking or peeling of the finished concrete surface.

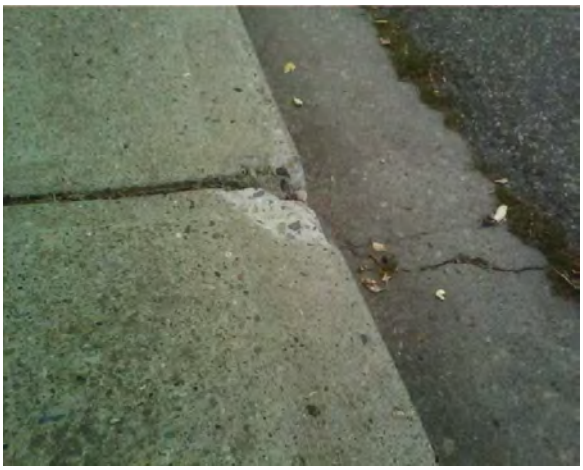
Gap

Linear opening within a sidewalk at a joint or within a grate. It does not include control joints or other surface scoring constructed according to design standards or grates that are not intended for pedestrian use.

Severity	Description	Photo Example
Low	The maximum width of the gap is measured at less than 5 mm.	
Medium	The maximum width of the gap is measured between 5 to 10 mm.	
High	The maximum width of the gap is measured at greater than 10 mm.	

Broken/Chipped Panel

A Broken/ Chipped Panel is the breakdown (chipping or fraying) of the slab within 0.6 m of the corner.

Severity	Description	Photo Example
Low	Spalling pieces are tight and cannot easily be removed. Width and length of affected area is less than 100 mm.	
Medium	Spalled pieces are loose and some can be removed. Removed pieces are less than 100 mm in width.	
High	Most spalled pieces are missing and have a width of 100 mm or greater.	

Broken Panel

Slabs are divided by cracks into multiple pieces due to overloading and/or inadequate support.

Severity	Description	Photo Example
Low	Slab contains one (1) to two (2) cracks.	
Medium	Slab contains two (2) to five (5) cracks.	
High	Slab contains more than five (5) cracks.	

Cracking

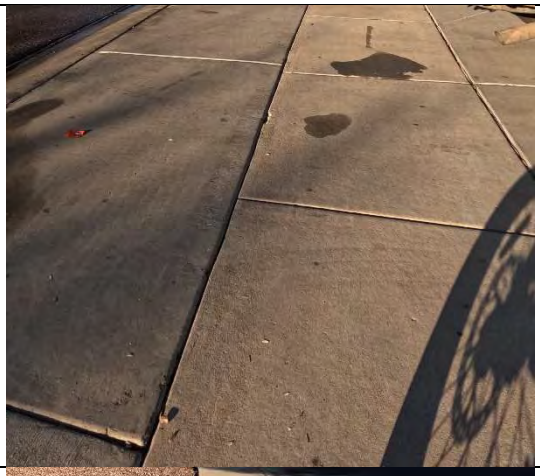
Cracking consists of longitudinal, transverse, diagonal, and corner cracks. These cracks, which divide the slab into two (2) or three (3) pieces, are typically caused by a combination of deficient jointing (pattern or construction); thermal gradient curling; and repeated freeze thaw cycles.

If there are varying crack widths across the slab, the crack width most representative of the slab will be used to identify the severity.

Severity	Description	Photo Example
Low	Non-filled cracks less than 5 mm in width, without crack-sealing and no faulting exists within cracks.	
Medium	Non-filled crack with a width between 5 mm and 10 mm.	
High	Non-filled crack with a width greater than 10 mm.	

Reverse Crossfall

Area where the sidewalk surface is not graded towards the roadway or drainage feature and therefore is a potential location for ponding. Does not apply to crowned sidewalks.

Severity	Description	Photo Example
Low	The crossfall is measured to be less than 0 %.	
Medium	The crossfall is measured to be between 0 to 10 %.	
High	The crossfall is measured to be greater than 10 %.	

Asphalt Patching

A patch is an area where the original material has been removed and replaced by a filler material or additional material applied to the surface after original construction.

Severity	Description	Photo Example
Low	Patch has low severity distress of any type and no measurable faulting or settlement.	
Medium	Patch is moderately deteriorated. Patch material can be dislodged with considerable effort.	
High	Patch is badly deteriorated. Original distress is evident.	

Concrete Patching

A patch is an area where the original material has been removed and replaced by a filler material or additional material applied to the surface after original construction.

Severity	Description	Photo Example
Low	Any distress that is less than 0.5 m^2 (~20%) of slab	
Medium	Any distress that is 0.5-1.0 m^2 (~40%) of Slab.	
High	Any distress that is greater than 1.0 m^2 (40%) of Slab.	

Manhole

A gap or vertical change in elevation of a manhole within a sidewalk surface.

Utility Box or Valve

A gap or vertical change in elevation of a utility box or valve within a sidewalk surface.

Obstruction

An object is blocking or reducing the available width of sidewalk for pedestrians that is a permanent installation such as a pole, guidewire, post or utility cabinet.

Obstruction - Temporary

An object is blocking or reducing the available width of sidewalk for pedestrians that is a temporary installation.

Sidewalk Condition Index

Once the sidewalk condition assessment is complete, the data is converted to a Sidewalk Condition Index (SCI). The SCI indicates the overall condition of a sidewalk. The SCI ranges in value from Zero (0) to 100. An SCI of zero indicates a sidewalk in the worst possible condition and 100 indicates a sidewalk in the best possible condition. The SCI calculation involves the following steps.

1. Distress scores are calculated for each of the distress types by multiplying the number of slabs affected by each distress type and severity combination by a weighting factor. Weighting factors could vary by municipality to reflect local conditions and objectives. A sample of the weighting factors is provided in Table 2. Temporary factors such as Temporary Obstacles, have been given a zero (0) weight so that they do not affect the calculated SCI score.

Table 2. Distress Weighting Factors

Distress	Low Severity Weighting Factor	Medium Severity Weighting Factor	High Severity Weighting Factor
Asphalt Patch	25	50	100
Broken/Chipped Panel	25	50	100
Broken Panel	0	100	100
Catch Basin	0	0	0
Concrete Patch	25	50	100
Cracking	25	50	100
Excessive Grade	0	0	100
Faulting	25	50	100
Hazard Faulting	0	0	100
Gap	25	50	100
Grinding	25	50	100
Heave	25	50	100
Manhole	25	50	100
Missing Panel	0	0	100
Obstruction	25	50	100
Obstruction - Temporary	0	0	0
Reverse Crossfall	50	75	100
Settlement	25	50	100
Surface Roughness	10	50	100
Utility Box or Valve	25	50	100

2. The distress scores for each distress type are totaled to determine an “overall score” for each sidewalk section.

3. A “normalization factor” is calculated for the sidewalk section. The default normalization factor is “TOTAL”, which represents the total number of individual slabs within the sidewalk section.

4. The “overall score” is converted to a “normalized score” by dividing the “overall score” by the “normalization factor” from step 3 above.

5. The SCI scores are determined based on the category that the “normalized scope” fits within. A sample of the Performance Indices is shown in Table 3.

Table 3. Sample of SCI Performance Indices

Normalized Score		Sidewalk Condition Index (SCI)
Lower Score (≥)	**Upper Score (<)**	
0	0.1	100
0.1	0.2	98
0.2	0.3	96.2
0.3	0.4	94.6
0.4	0.5	93.1
0.5	0.6	91.7
0.6	0.7	90.3
0.7	0.8	89.1
0.8	0.9	87.9
0.9	1	86.8

Based on the calculated SCI scores, a performance distress rating is assigned. The distress rating ranges used are presented below in Table 4 and graphically in Figure 1. The performance rating is a simplified version of the ASTM D6433[3] rating table which consists of seven (7) categories instead of the five (5) categories shown below.

Table 4: Sidewalk Performance Rating

Performance Rating	SCI Range
Very Poor	SCI < 40
Poor	40 ≤ SCI < 55
Fair	55 ≤ SCI < 70
Satisfactory	70 ≤ SCI < 85
Good	SCI ≥ 85

Figure 1: Performance Rating Comparison

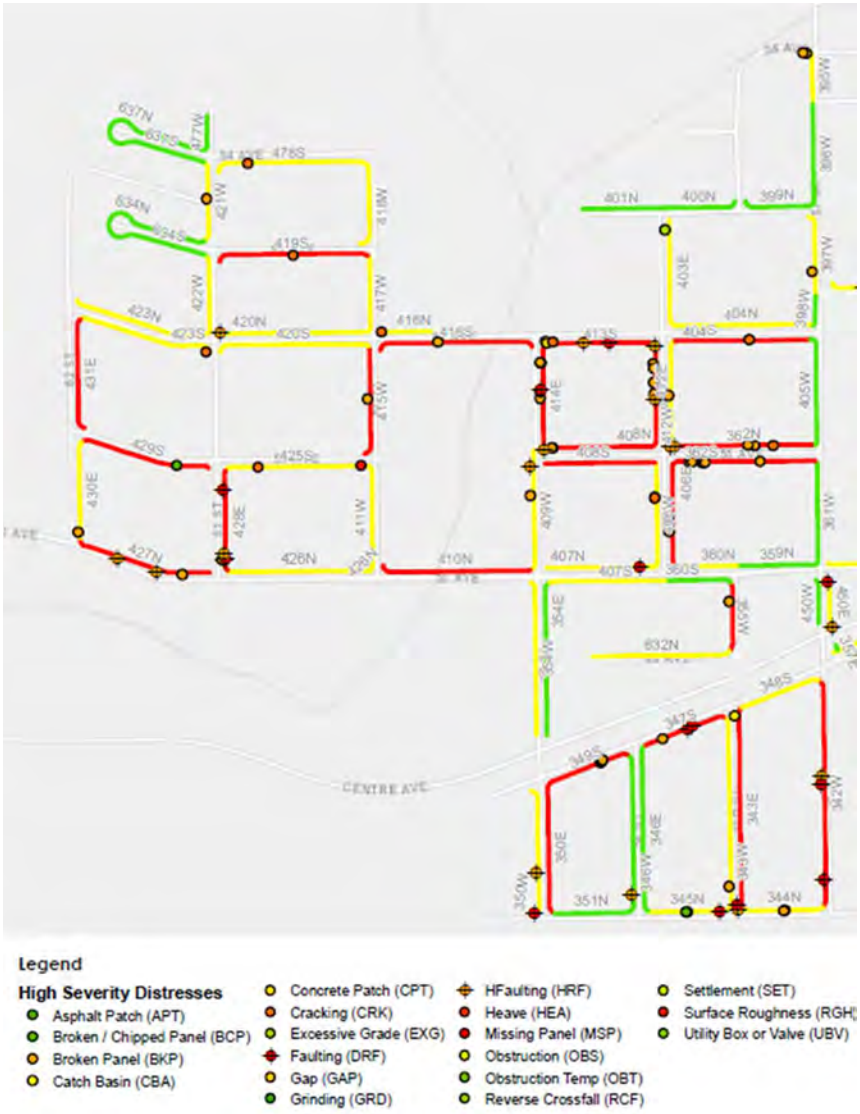


Case Study Results

The following case study examples are meant to demonstrate how the sidewalk condition assessment can be used from an asset management planning perspective.

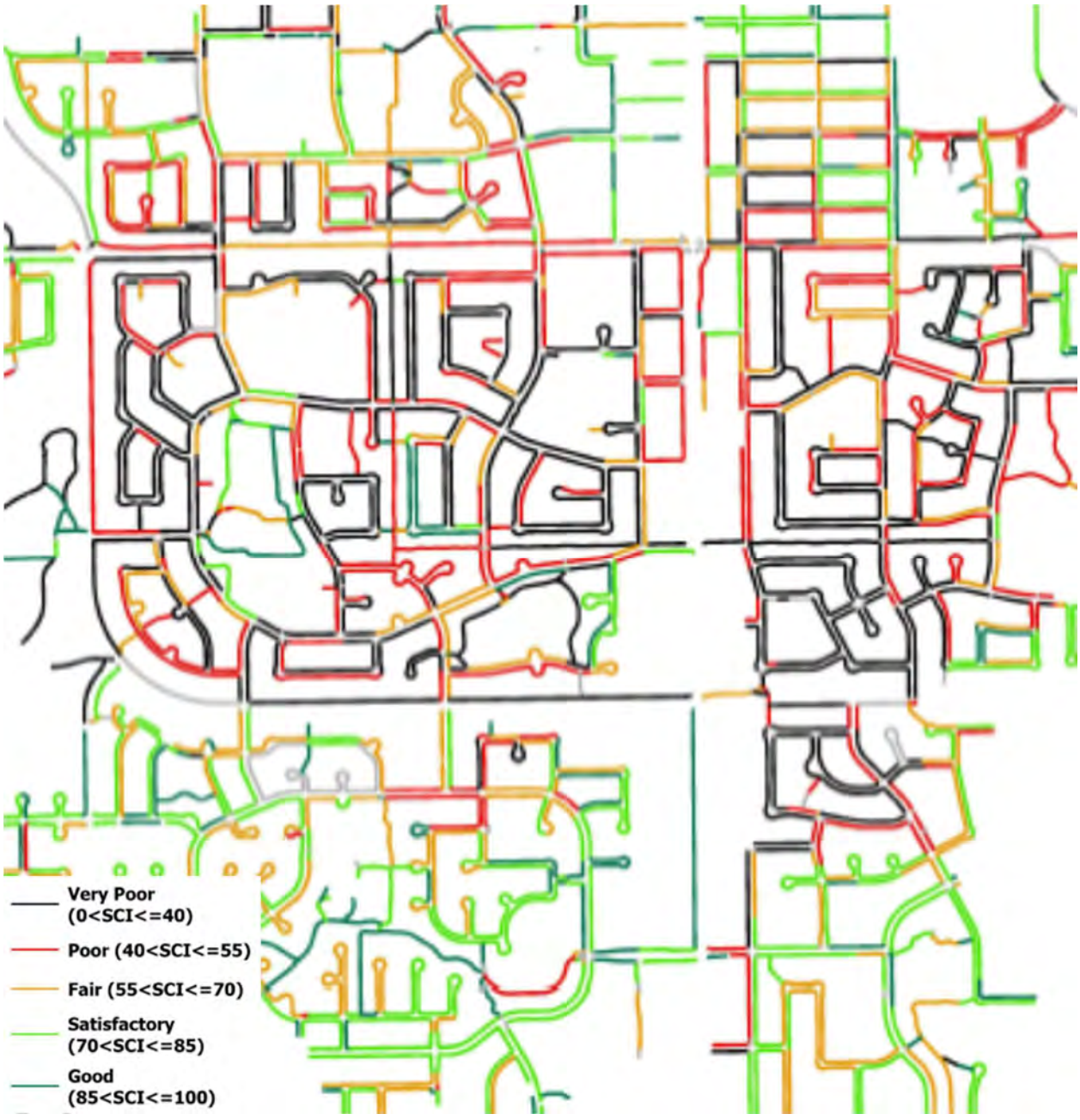
A sample project-level distress map is provided in Figure 2. These types of maps can be used to highlight problems areas and support short-term operational maintenance rectifications.

Figure 2. Sample Project-Level Distress Map



A sample network-level SCI map is provided in Figure 3. These types of maps are useful for describing the current state of the sidewalk inventory.

Figure 3. Sample Network-Level SCI Map

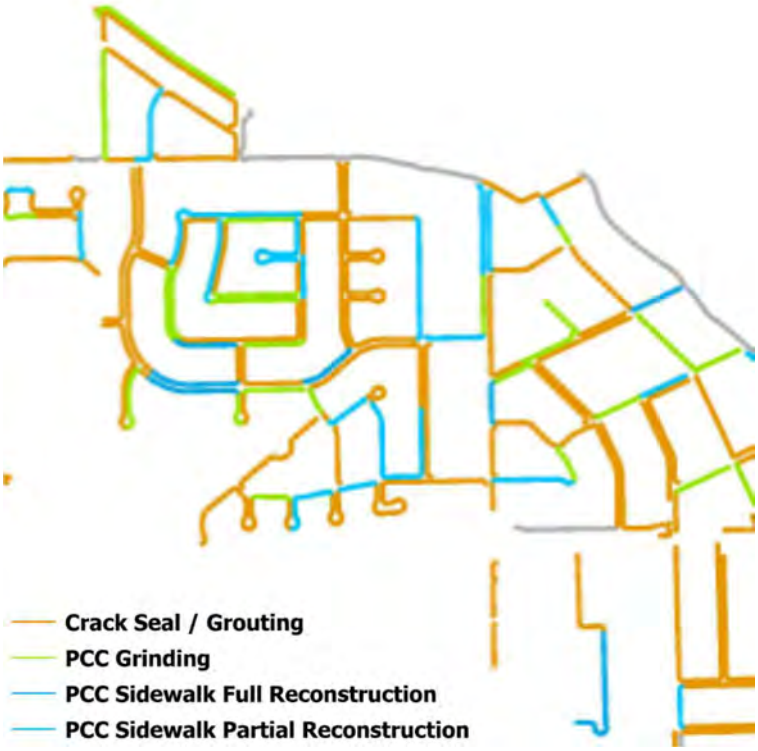


With decision matrices, like the sample shown in Table 5, corrective measures can be developed for each distress. A sample network-level maintenance and rehabilitation planning map is provided in Figure 4. These types of maps and associated data can be used to identify both short-term and long-term needs and support data-driven decision making.

Table 5: Sample Concrete Sidewalk Decision Matrices

Distress Name	PCC Sidewalk Treatment Recommendation		
	Low Severity	**Moderate Severity**	**High Severity**
Asphalt Patch	Concrete Patching	Concrete Patching	Concrete Patching
Broken/Chipped Panel	Concrete Patching	Concrete Patching	Concrete Patching
Broken Panel	Precision Cutting	Concrete Patching	Concrete Patching
Catch Basin	Do Nothing	Precision Cutting	Precision Cutting
Concrete Patch	Concrete Patching	Concrete Patching	Concrete Patching
Cracking	Crack Seal	Crack Seal	Crack Seal
Excessive Grade	Precision Cutting	Slab Jacking	Slab Replacement
Faulting	Diamond Grinding	Diamond Grinding	Diamond Grinding
Hazard Faulting	Do Nothing	Do Nothing	Diamond Grinding
Gap	Concrete Patching	Concrete Patching	Concrete Patching
Grinding	Diamond Grinding	Diamond Grinding	Slab Replacement
Heave	Diamond Grinding	Diamond Grinding	Slab Replacement
Manhole	Diamond Grinding	Diamond Grinding	Slab Replacement
Missing Panel	Slab Replacement	Slab Replacement	Slab Replacement
Obstruction	Do Nothing	Do Nothing	Do Nothing
Obstruction - Temporary	Do Nothing	Do Nothing	Do Nothing
Reverse Crossfall	Slab Jacking	Slab Replacement	Slab Replacement
Settlement	Diamond Grinding	Slab Jacking	Slab Jacking
Surface Roughness	Do Nothing	Do Nothing	Concrete Patching
Utility Box or Valve	Do Nothing	Do Nothing	Do Nothing

Figure 4. Sample Network-Level Sidewalk Maintenance & Rehabilitation Map



Conclusions

This paper presents a standardized condition assessment protocol for slab-based concrete sidewalks and a corresponding Sidewalk Condition Index (SCI) framework to support municipal asset management. The protocol captures a consistent set of distress types and severities at the slab level, along with contextual attributes (e.g., catch basins and surface features), addressing a common gap identified in current sidewalk management practice.

The SCI method converts detailed distress observations into a single, scalable performance measure that can be integrated into network-level reporting and capital planning while retaining sufficient detail to inform operational maintenance programs. The framework is configurable through municipality-specific weighting factors and performance bands, enabling agencies to align condition ratings with local objectives, risk tolerance, and service expectations.

The case study examples demonstrate practical applications of the collected data, including project-level distress mapping, network-level condition mapping, and the use of decision matrices to translate observed distresses into targeted maintenance and rehabilitation actions.

References

1. Litman, T. (2023). Completed Sidewalk Networks: Benefits and Costs. *Tranportation Research Board (TRB) Annual Meeting Paper TRBAM S-23-07012.* Washington, DC.

2. Zhao, G., Riaz Ahmed, Leanne Whiteley-Lagace, Edmund Surette(2023). Jurisdictional Scan of Sidewalk Management Practices from North American Municipalities. *Transportation Association of Canada Conference and Exhibit.* Ottawa, ON: Transportation Association of Canada.
3. American Society for Testing & Materials. (2024). D6433−24. *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*.
4. American Society for Testing and Materials. (2024). *E2840-11.* Standard Practice for Pavement Condition Index Surveys for Interlocking Concrete Roads and Parking Lots..
5. Laberee, K., & Winters, M. (2024). *Can-Walk: Creating a Canadian Framework for Classifying Pedestrian Infrastructure.* CHATR Lab and HICC.