Designation: E2840 – 11 (Reapproved 2019)

Standard Practice for Pavement Condition Index Surveys for Interlocking Concrete Roads and Parking Lots[1]

This standard is issued under the fixed designation E2840; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice is used to assess the condition of roads and parking lots surfaced with interlocking concrete pavement through visual surveys using the Pavement Condition Index (PCI) method of quantifying pavement condition.

1.2 The PCI for roads and parking lots was developed by the U.S. Army Corps of Engineers (**1, 2**).[2] It is further verified and adopted by DOD and APWA. This standard is an adaptation of the PCI method for interlocking concrete pavements.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *additional sample, n*—a sample unit inspected in addition to the random sample units to include nonrepresentative sample units in the determination of pavement condition index. This includes very poor or excellent samples that are not typical of the section and sample units. If a sample unit containing an unusual distress is chosen at random, it should be counted as an additional sample and another random sample unit should be chosen. If all sample units are inspected, then there are no additional samples.

2.1.2 *interlocking concrete pavement, n*—discrete, hand-sized paving units with rectangular or dentated shapes manufactured from concrete and conforming to ASTM C936. Either type of unit shape is placed in an interlocking pattern with various jointing and bedding materials over an unbound or bound base layer.

2.1.3 *pavement branch, n*—a branch is an identifiable part of the pavement network that is a single entity and has a distinct function. For example, each roadway or parking area is a separate branch of a pavement network.

2.1.4 *pavement condition index (PCI), n*—a numerical rating of the pavement condition that ranges from 0 to 100, with 0 being the worst possible condition and 100 being the best possible condition.

2.1.5 *pavement condition rating, n*—a verbal description of pavement condition as a function of the PCI value that varies from "failed" to "excellent" as shown in Fig. 1.

2.1.6 *pavement distress, n*—external indicators of pavement deterioration caused by loading, environmental factors, construction deficiencies, or a combination thereof. Typical distresses include depressions, damaged pavers, horizontal creep, and faulting. Distress types and severity levels detailed in Appendix X1 must be used to obtain an accurate PCI value.

2.1.7 *pavement sample unit, n*—a sample unit is a subdivision of the pavement section. Each pavement section is divided into sample units for the purpose of pavement inspection. The sample units for inspection shall be 2500 ft^2 ± 1000 ft^2 (225 m^2 ± 90 m^2).

2.1.8 *pavement section, n*—a contiguous pavement area having uniform construction, maintenance, usage history, and condition. A section should have the same traffic volume and load intensity.

2.1.9 *random sample, n*—a sample unit of the pavement section selected for inspection by random sampling techniques.

3. Summary of Practice

3.1 The pavement is divided into branches that are then divided into sections. Each section is divided into sample units. The type and severity of pavement distress is assessed by visual inspection of the pavement sample units. The quantity of distress is measured as described in Appendix X1 and Appendix X2. The distress data is used to calculate the PCI for each

[1] This practice is under the jurisdiction of ASTM Committee E17 on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee E17.42 on Pavement Management and Data Needs.

Current edition approved Dec. 1, 2019. Published December 2019. Originally approved in 2011. Last previous edition approved in 2015 as E2840 – 11 (2015). DOI: 10.1520/E2840-11R19.

[2] The boldface numbers in parentheses refer to a list of references at the end of this standard.

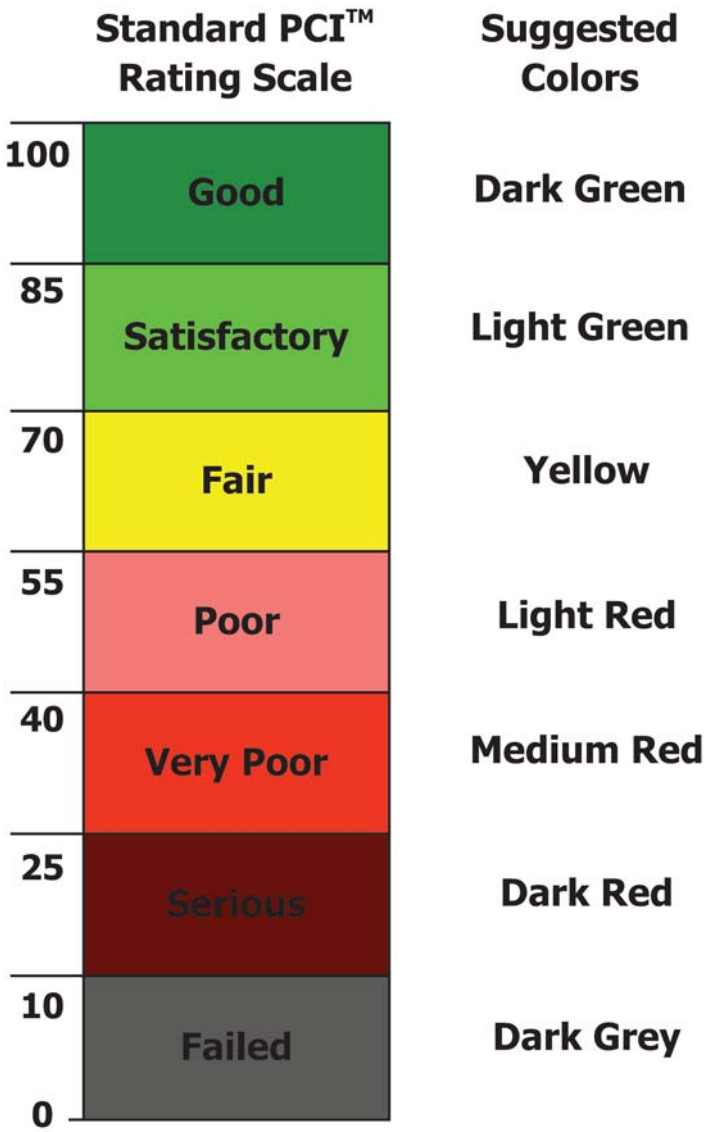

FIG. 1 Pavement Condition Index (PCI), Rating Scale, and Suggested Colors

sample unit. The PCI of a pavement section is determined based on the PCI of the inspected sample units within the section.

4. Significance and Use

4.1 The PCI is a numerical indicator that rates the surface condition of the pavement. The PCI provides a measure of the present condition of the pavement based on the distress observed on the surface of the pavement, which also indicates the structural integrity and surface operational condition (localized roughness and safety). The PCI does not measure structural capacity nor does it provide direct measurement of skid resistance or roughness. It provides an objective and rational basis for determining maintenance and repair needs and priorities. Regular monitoring of the PCI is used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs. The PCI can also provide feedback on pavement performance for validation or improvement of current pavement design and maintenance procedures.

4.2 The PCI procedure for interlocking concrete pavements was developed by surveying many sample units. Additional verification of the accuracy and repeatability of the PCI procedure for interlocking concrete pavements remains to be performed.

5. Apparatus

5.1 *Data Sheets*, or other field recording instruments that record the date, location, branch, section, sample unit size, distress types, severity levels, quantities, and names of surveyors. Example data sheets are shown in Figs. 2 and 3.

5.2 *Hand Odometer Wheel*, that reads to the nearest 0.1 ft (30 mm).

5.3 *Straightedge or String Line*, 10 ft (3 m).

5.4 *Scale*, 12 in. (300 mm) that reads to 1⁄16 in. (1 mm). An additional 12-in. (300-mm) ruler or straightedge is needed to measure faulting.

5.5 *Layout Plan*, for network to be inspected.

6. Hazards

6.1 Traffic is a hazard, as inspectors may walk on the pavement to perform the condition survey.

7. Sampling and Sample Units

7.1 Identify branches of the pavement with different uses such as roadways and parking on the network layout plan.

7.2 Divide each branch into sections based on the pavement type, construction history, traffic, and condition.

7.3 Divide the pavement sections into sample units.

7.4 Individual sample units to be inspected should be marked or identified in a manner to allow inspectors and quality control personnel to easily locate them on the pavement surface. Paint marks along the edge and sketches with locations connected to physical pavement features are acceptable. It is necessary to be able to accurately relocate the sample units to allow verification of current distress data, to examine changes in condition with time of a particular sample unit, and to enable future inspections of the same sample unit if desired.

7.5 Select the sample units to be inspected. The number of sample units to be inspected may vary from the following: all of the sample units in the section, a number of sample units that provides a 95 % confidence level, or a lesser number.

7.5.1 All sample units in the section may be inspected to determine the average PCI of the section. This is usually precluded for routine management purposes by available manpower, funds, and time. Total sampling, however, is desirable for project analysis to help estimate maintenance and repair quantities.

7.5.2 The minimum number of sample units (n) that must be surveyed within a given section to obtain a statistically adequate estimate (95 % confidence) of the PCI of the section is calculated using the following formula and rounding n to the next highest whole number (see Eq 1).

INTERLOCKING CONCRETE PAVEMENT
ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET FOR SAMPLE UNIT

BRANCH _____ **DATE** _____

SECTION _____ **SAMPLE UNIT** _____

SURVEYED BY _____ **SAMPLE AREA (ft^2, m^2)** _____

DISTRESS NUMBER AND TYPE

1. Damaged Pavers
2. Depressions
3. Edge Restraint
4. Excessive Joint Width
5. Faulting
6. Heave
7. Horizontal Creep
8. Joint Sand Loss/Pumping
9. Missing Pavers
10. Patching
11. Rutting

DISTRESS/ SEVERITY	QUANTITY				TOTAL	DENSITY (%)	DEDUCT VALUE

SKETCH

NOTES: _____

FIG. 2 Blank Interlocking Concrete Pavement Condition Index Sheet