

American Society of Civil Engineers

Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways

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STANDARDS

In 2003, the Board of Direction approved the revision to the ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by the Society. All such standards are developed by a consensus standards process managed by the Society's Codes and Standards Committee (CSC). The consensus process includes balloting by a balanced standards committee made up of Society members and nonmembers, balloting by the membership of the Society as a whole, and balloting by the public. All standards are updated or reaffirmed by the same process at intervals not exceeding five years.

The following standards have been issued:

- ANSI/ASCE 1-82 N-725 Guideline for Design and Analysis of Nuclear Safety Related Earth Structures
- ASCE/EWRI 2-06 Measurement of Oxygen Transfer in Clean Water
- ANSI/ASCE 3-91 Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs
- ASCE 4-98 Seismic Analysis of Safety-Related Nuclear Structures
- Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-02) and Specifications for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02)
- ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures
- SEI/ASCE 8-02 Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members
- ANSI/ASCE 9-91 listed with ASCE 3-91
- ASCE 10-97 Design of Latticed Steel Transmission Structures
- SEI/ASCE 11-99 Guideline for Structural Condition Assessment of Existing Buildings
- ASCE/EWRI 12-05 Guideline for the Design of Urban Subsurface Drainage
- ASCE/EWRI 13-05 Standard Guidelines for Installation of Urban Subsurface Drainage
- ASCE/EWRI 14-05 Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage
- ASCE 15-98 Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)
- ASCE 16-95 Standard for Load Resistance Factor Design (LRFD) of Engineered Wood Construction
- ASCE 17-96 Air-Supported Structures
- ASCE 18-96 Standard Guidelines for In-Process Oxygen Transfer Testing
- ASCE 19-96 Structural Applications of Steel Cables for Buildings
- ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations
- ANSI/ASCE/T&DI 21-05 Automated People Mover Standards—Part 1
- ANSI/ASCE/T&DI 21.2-08 Automated People Mover Standards—Part 2
- ANSI/ASCE/T&DI 21.3-08 Automated People Mover Standards—Part 3
- ANSI/ASCE/T&DI 21.4-08 Automated People Mover Standards—Part 4
- SEI/ASCE 23-97 Specification for Structural Steel Beams with Web Openings
- ASCE/SEI 24-05 Flood Resistant Design and Construction
- ASCE/SEI 25-06 Earthquake-Actuated Automatic Gas Shutoff Devices
- ASCE 26-97 Standard Practice for Design of Buried Precast Concrete Box Sections
- ASCE 27-00 Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
- ASCE 28-00 Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction
- ASCE/SEI/SFPE 29-05 Standard Calculation Methods for Structural Fire Protection
- SEI/ASCE 30-00 Guideline for Condition Assessment of the Building Envelope
- SEI/ASCE 31-03 Seismic Evaluation of Existing Buildings
- SEI/ASCE 32-01 Design and Construction of Frost-Protected Shallow Foundations
- EWRI/ASCE 33-01 Comprehensive Transboundary International Water Quality Management Agreement

STRUCTURAL DESIGN OF INTERLOCKING CONCRETE PAVEMENT

- EWRI/ASCE 34-01 Standard Guidelines for Artificial Recharge of Ground Water
- EWRI/ASCE 35-01 Guidelines for Quality Assurance of Installed Fine-Pore Aeration Equipment
- CI/ASCE 36-01 Standard Construction Guidelines for Microtunneling
- SEI/ASCE 37-02 Design Loads on Structures during Construction
- CI/ASCE 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data
- EWRI/ASCE 39-03 Standard Practice for the Design and Operation of Hail Suppression Projects
- ASCE/EWRI 40-03 Regulated Riparian Model Water Code
- ASCE/SEI 41-06 Seismic Rehabilitation of Existing Buildings
- ASCE/EWRI 42-04 Standard Practice for the Design and Operation of Precipitation Enhancement Projects
- ASCE/SEI 43-05 Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities
- ASCE/EWRI 44-05 Standard Practice for the Design and Operation of Supercooled Fog Dispersion Projects
- ASCE/EWRI 45-05 Standard Guidelines for the Design of Urban Stormwater Systems
- ASCE/EWRI 46-05 Standard Guidelines for the Installation of Urban Stormwater Systems
- ASCE/EWRI 47-05 Standard Guidelines for the Operation and Maintenance of Urban Stormwater Systems
- ASCE/SEI 48-05 Design of Steel Transmission Pole Structures
- ASCE/EWRI 50-08 Standard Guideline for Fitting Saturated Hydraulic Conductivity Using Probability Density Functions
- ASCE/EWRI 51-08 Standard Guideline for Calculating the Effective Saturated Hydraulic Conductivity
- ASCE/SEI 52-10 Design of Fiberglass-Reinforced Plastic (FRP) Stacks
- ASCE/G-I 53-10 Compaction Grouting Consensus Guide
- ASCE/EWRI 54-10 Standard Guideline for the Geostatistical Estimation and Block-Averaging of Homogeneous and Isotropic Saturated Hydraulic Conductivity
- ASCE/SEI 55-10 Tensile Membrane Structures
- ASCE/T&DI/ICPI 58-10 Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways

FOREWORD

Interlocking concrete pavers can provide a durable and effective pavement system, but, as with any pavement, proper design, construction, and maintenance procedures are required. This standard guideline has been prepared by the ASCE/T&DI Structural Design of Interlocking Concrete Pavement Standards Committee. It establishes guidelines for developing appropriate pavement structures for various traffic and subgrade conditions. The overall goal of this standard guideline is to assist the industry and public by establishing structural design standards for interlocking concrete pavements.

It is recognized that the trend in North America is towards the development and implementation of mechanistic-empirical design protocols. While efforts are underway by the interlocking concrete pavement industry to move towards adopting a mechanistic-

empirical design procedure, the required data to implement such a procedure is not yet available and therefore this standard guideline was developed based on the 1993 AASHTO *Guide for Design of Pavement Structures* (AASHTO 1993).

The development of this standard guideline is a result of a partnership between the Transportation and Development Institute of ASCE and the Interlocking Concrete Pavement Institute. The organizations jointly encouraged expert volunteers to become a part of the standards committee that developed the standard guideline and supported the efforts of that committee. This committee comprises individuals from many backgrounds, including consulting engineering, research, design and manufacturing, education, government, and private practice.

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1 GENERAL

1.1 SCOPE

The provisions of this Standard Guideline establish the procedures for the structural design of interlocking concrete pavements. This Standard applies to paved areas subject to applicable permitted axle loads and trafficked up to 10 million 80-kN (18,000-lb)-equivalent single axle loads (ESALs). A minimum 80-mm ($3\frac{1}{8}$ -in.) thick paver is used in the standard guideline as this is the minimum thickness recommended for municipal roadways. This Standard Guideline applies to roadways with a design speed of up to 70 kph (45 mph). Many of the design considerations herein require a working knowledge of soil mechanics, traffic loading, and pavement materials. Such knowledge is necessary for the application of this Standard Guideline.

This Standard Guideline applies only to the design of new pavement structures surfaced with interlocking concrete pavers. The Standard Guideline includes structural design guidelines for untreated, asphalt-treated, and cement-treated bases. Asphalt concrete (hot mix asphalt) bases are considered on a limited basis for high traffic, low subgrade strength conditions as a means to reduce the overall thickness of the pavement.

The Standard Guideline does not include provisions for inclusion of interlocking concrete pavers on a portland cement concrete (PCC) base. This Standard Guideline does not address aspects such as project-specific details, specifications, construction, and

maintenance practices that are critical to the successful performance of the pavement. Other references should be consulted for the design of these pavement systems.

1.2 REFERENCED STANDARDS

In addition to provincial, state, and local pavement design procedures and guidelines having jurisdiction, the provisions of this Standard Guideline's References should be considered where they apply and where noted.

1.3 DEVIATIONS FROM THIS STANDARD GUIDELINE

Use of proprietary, new, and/or improved interlocking concrete pavement, materials, evaluation techniques, and installation methods are not prohibited, as long as the design and installation of the pavement are shown to comply with or exceed these Standard Guidelines.

1.4 ENGINEER REQUIRED

Work covered by this Standard Guideline should be carried out under the guidance of a Professional Engineer with a background in the design of pavement systems. The Professional Engineer is hereinafter referred to as the Engineer.