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Permeable Interlocking Concrete Pavement

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PREFACE

Permeable pavements typically consist of pervious concrete, porous asphalt, or interlocking concrete paver units over an open-graded base or subbase layer(s). Permeable pavements are designed to infiltrate stormwater, reduce peak flows, improve stormwater quality, and promote groundwater recharge. They have become an integral part of low-impact development, sustainable design, green infrastructure, and best management practices for stormwater management. In order to be effective within municipal road networks, permeable pavements must be designed to provide sufficient structural capacity to accommodate the anticipated vehicle loadings while managing stormwater flows into and out of the permeable pavement.

Although there have been many well designed and constructed permeable pavements, this is a relatively new technology compared to conventional pavements, and there have been some performance concerns. These concerns include pavement surface rutting caused by loads exceeding the pavement structural design, settlement caused by improper base and/or subbase gradations, and insufficient compaction of the base or subbase. A common concern is clogging of the pavement surface from sediments tracked onto the pavement or transported by water run-on from adjacent surfaces.

This standard was written to address these concerns and more. It provides design, construction, and maintenance guidance for permeable interlocking concrete pavement to achieve stormwater management goals while providing a structurally adequate pavement section to accommodate the anticipated vehicular loading in a cost-efficient manner.

Introduction

Permeable interlocking concrete pavement (PICP) can provide a durable and effective pavement and stormwater management system. As with any pavement and stormwater management practice, proper design, construction, and maintenance procedures are required. To better address these needs, this standard was prepared by the ASCE Permeable Interlocking Concrete Pavement Committee. This publication establishes guidelines for developing appropriate pavement structures for various stormwater drainage, traffic, and subgrade conditions as well as providing guidance on construction and maintenance.

This standard is written with the intent of being adopted in whole or in part for use by national, provincial, state, and local stormwater and road agencies for the consistent and effective design, construction, and maintenance of permeable interlocking concrete pavement systems. The overall goal is assisting design professionals, civil engineers, the industry, public stormwater and transportation agencies, and the wider public by establishing design standards for permeable interlocking concrete pavements. The document provides

- Definitions of terms common to permeable pavements;
- Methods for structural design to accommodate incidental and frequent vehicular use;
- Methods for hydrologic design to accommodate water infiltration and flow into, within, and out of the pavement system;
- Construction and inspection procedures;
- Guide construction specifications; and
- Maintenance procedures for the permeable pavement system.

PICP may help achieve compliance with many national, provincial, state, and local regulations, as well as transportation agency design requirements for the control of stormwater runoff. Requirements may include the following:

- Compliance with federal, provincial, state, and local transportation design standards;
- Compliance with pavement structural design and construction requirements;
- Compliance with vehicular and pedestrian safety and access requirements;
- Transportation asset management compliance, including lifecycle cost analysis and lifecycle assessment of environmental impacts;
- Stormwater runoff controls and regulatory compliance;
- Compliance with groundwater protection requirements;
- Postconstruction runoff volume and pollutant control for new development and redevelopment;
- Reductions in impervious cover (i.e., roofs and pavements) and resulting runoff;
- Runoff volume storage and/or infiltration to reduce overflows, especially combined sewer overflows, as well as reduction of flooding for a more resilient infrastructure;
- Compliance with total maximum daily load (TMDL) requirements for receiving waters;
- Management of water quality and/or quantity storm events; and
- Compliance with local building code requirements.

Permeable interlocking concrete pavements may assist in achieving regulatory program and policy compliance. Examples include the Great Lakes Protection Act, Species at Risk Act, National Pollutant Discharge Elimination System (NPDES), Canadian Federal Fisheries Act, U.S. Clean Water Act, U.S. Environmental Protection Agency (US EPA) Stormwater Assessment Program, Source Water Protection Plans, CALGreen in California, the International Green Construction Code, ASHRAE Standard 189.1, and stormwater utility fee credits or other codes that require compliance with Leadership in Energy and Environmental Design (LEED) or similar sustainable design and construction rating systems.

Nonregulatory drivers that influence PICP use include the following: economics that often make PICP a lower-cost alternative to conventional drainage and stormwater management system designs, and project owner preference for conformance to sustainable rating systems for roads and transportation infrastructure. Examples include the Green Business Certification, Inc.'s Sustainable SITES Initiative, the Institute for Sustainable Infrastructure's Envision evaluation system, Greenroads, GreenPave, and the Federal Highway Administration's Infrastructure Voluntary Evaluation Sustainability Tool (INVEST).

Finally, other nonregulatory drivers include product, system, or project lifecycle analysis (LCA) of environmental impacts in the manufacture, construction, use, and end-of-life phase. Product Category Rules (PCRs) for segmental concrete paving products used in PICP are available from ASTM. These rules provide a useful framework for conducting a LCA, as well as for providing environmental product declarations for paving products.

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