Design, Construction and Maintenance of Pervious Concrete Pavement
University of Waterloo

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Outline

- Introduction
- Field Investigations
- Laboratory Research
- Results
- Recommendations

CPATT at University of Waterloo

- Centre for Pavement and Transportation Technology (CPATT) at University of Waterloo, Waterloo, Ontario
- Director Dr. Susan Tighe
- Field and laboratory research of flexible and rigid pavements
- Test site throughout Canada
- Extensive laboratory facilities including walk in freezer, Material Testing System, Hamburg Wheel Rut tester
Introduction

Canada wide project between industry members, Cement Association of Canada and Centre for Pavement and Transportation Technology at University of Waterloo

Development of a Design, Construction and Maintenance Guide for the Use of Pervious Concrete Pavement in Canada

Field Investigation

- Parking lots, driveways, carpool lots
- 5 field sites - British Columbia, Ontario and Quebec
- Pervious Concrete 175 mm to 300 mm
- Reservoir Base 200 mm to 600 mm
- Pavement structures
- Construction methods
Field Site Performance
- Permeability
- Surface distress
- Permeability renewal maintenance
- Winter maintenance
- Subsurface instrumentation

Laboratory Research
- Sample preparation methods
- Inclusion of recycled concrete aggregate
- Winter maintenance treatments
- Freeze-thaw durability

Field Results - Permeability

<table>
<thead>
<tr>
<th>Permeability Rate (cm/sec)</th>
<th>Maximum Rainfall Rate</th>
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<tbody>
<tr>
<td>Site 1</td>
<td>Site 2</td>
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<tr>
<td>Site 3A</td>
<td>Site 3B</td>
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<tr>
<td>Site 3C</td>
<td>Site 5A</td>
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<tr>
<td>Site 4A</td>
<td>Site 4B</td>
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<tr>
<td>Site 4C</td>
<td>Site 5B</td>
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<tr>
<td>Site 5A</td>
<td>Site 5C</td>
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</tbody>
</table>
Field Results – Surface Condition

- Surface distresses not observed as a result of freeze-thaw
- Surface distresses observed:
  - Sealed surface – construction, materials
  - Slight cracking – construction
  - Raveling – construction, materials
  - Aggregate failure – materials

Field Results – Winter Maintenance

- Snow removal with conventional equipment
- Use of sand on surface

Field Results – Instrumentation
Laboratory Results – Winter Maintenance

Laboratory Results – Freeze-Thaw

Recommendations

- **Design and Materials**
  - Stormwater and pavement infrastructure – optimize site and structure
  - Site layout and application
    - Users
    - Drainage
  - Void distribution through pervious concrete related to type and size of aggregate
  - Smaller voids (generated from smaller aggregate) provide more stability for the material
  - Fine aggregate
Recommendations

- Construction
  - Source
  - Placement
  - Compaction
  - Joints
  - Curing

- Compaction is necessary
- Slight cracking without joints
- Organize curing resources

Recommendations

- Permeability Maintenance
  - Use available resources
  - Minimum twice yearly
    - Spring to remove winter maintenance debris
    - Fall to remove debris (leaves, etc.)

- Winter Maintenance
  - Conventional equipment can be used successfully
  - Sand or salt can be used without compromising permeability
  - Use as needed

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- Rempel Brothers Concrete (Larry Sunnus, Mike Carter, Brian Ball, Doug Blender)
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- Centre for Pavement and Transportation Technology