Advances in Porous Pavement: Modular Precast Porous Concrete
Traditional Porous Pavement Options

- Permeable Interlocking Concrete Pavers
- Porous Concrete
- Porous Asphalt
Negative *Perceptions* of Porous pavement in the Marketplace

**Durability**

Installation is labor intensive

Difficult to produce - Inconsistency in mix from batch to batch

No access to subgrade (utilities)

Weather dependent (can’t install when too cold/hot)

Difficult to maintain and Repair

**HIGH RISK!!!**
Plugging Issues due to “run-on”
At the time of this photo, the porous asphalt was 1 month old.
Durability Issues
Bad Batch
Poured in Place Porous Concrete

NYC Porous Gutter Section
Curing is Critical to Porous Concrete Success
First 4’ - 6’ plugged from “run-on”

Fall 2012
Flow Path (by-passing storage)
Vote of no confidence shown by the engineer
New Advancement Porous Concrete

Modular Precast
Porous Concrete Stormwater System
MODULAR
Each precast porous segment is **REMOVABLE** and **REUSABLE**

Modular Precast Porous Concrete Stormwater System
Quality Control
Target Mix: 125 lbs/ft³
(2,083 lbs.)

This slab is < 1% from theoretical weight – Pored in place specs allow +/- 5% variation
Manufacturing
Cured Covered Indoors

Outdoor Curing
Each Slab is labeled with cast date and weight (i.e. density)
Installation
Typically 3 man crew
Applications
Modular Precast Porous Concrete Gutter System
The radius was cut and set in 1.5 hours
Modular Precast Porous Concrete Gutter

- Stormcrete™
- Expansion Joint
- Leveling Course +/- 2” - 3” of 3/8” Stone
- Reservoir Course +/- 24” of ¾” Stone
- Infiltration

* Depth of Reservoir course varies based on engineered storage / treatment goals.
Modular Precast Porous Concrete
Modular Precast Porous Concrete Gutter System

Bangor, ME
Storage Volume: +/- 5 CF / LF

Sub-Base / Filter

RESET OR RETAIN EXISTING CURB
* CURB AFTER PANEL INSTALLED
3" L LUMBER PANEL (REMOVE LATER)

3" STONE CHOKER COURSE

12" IN FILTER MEDIA
NDOT 703.02 TYPE B BUT WITH 48-IN PASSING 200

12" IN FILTER MEDIA
WASHED, ANGULAR STONE

NEW 2% UNDERDRAIN, TYPE B

5-IN STORM-CRETE PANEL
(4-FT WIDE)

NEW FLUSH Precast concrete curd
4" IN PAVEMENT, MAINTAIN GRADE OF EXISTING PARKING LANE

Saw cut existing pavement to create clean vertical joint

REPLACE WITH EXISTING MATERIAL

POLY AROUND CONCRETE CURB FOOTING

EXISTING TELEPHONE CONDUIT
6" FROM CURBS (TYP.)

INSTALL MIRAFIL SOIL FABRIC AROUND EXCAVATION SIDES AND BOTTOM

PERVIOUS PANEL SECTION DETAIL

Porous panel maintenance:
- Remove leaves & organic debris as needed.
- Vacuum sweep porous pavement 2 - 4 times/year or when clogging is observed.
- Porous panel areas may not be used for snow storage.
Modular Precast Porous Slab Sections

Sand Filter Design

**Stormcrete™**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Material</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leveling Course</td>
<td>3/8” stone</td>
<td>2-3”</td>
</tr>
<tr>
<td>Reservoir Course</td>
<td>3/4” stone</td>
<td>Varies *</td>
</tr>
<tr>
<td>Sand or Filter Course</td>
<td>(if required)</td>
<td>(6” minimum)</td>
</tr>
</tbody>
</table>

*Depth of Reservoir course varies based on engineered storage / treatment goals.

Optional Under Drain

Infiltration

(if existing conditions permit)
Retrofit’s for Failed Porous Concrete

Before the “winter” of 2014

After the “winter” of 2014

Replaced failed pored in place porous concrete

UNH Parking Lot
Water Quality Retrofit – Underdrain Filter
Water Quality

Under drain

Filter

Under-Drain
Baltimore, MD

“Green Alley” Design

- PRECAST POROUS CONCRETE PAVING SLAB, 5" THICK
- MIN. 3" #8 STONE AGGREGATE, WASHED
- 14" #57 STONE, WASHED
- 16" CLEAN WASHED ASTM C33 FINE AGGREGATE (SAND)

EXISTING SUBGRADE; SCARIFY 6" DEEP

SIDE SLOPE 4% TYP., MIN 1%

USE EXISTING CONCRETE FOR EDGE RESTRAINT MIN. SLOPE 0.5%
EXISTING GROUND

SAWCUT EXISTING CONCRETE AT EDGE OF EXCAVATION

EXISTING CONCRETE SUB-BASE

8" PERFORATED PIPE MIN. 1' COVER 2' STONE BEDDING BELOW LOCATION VARIES

GEOTEXTILE, MD CLAS FE, TYPE III, NONWOVEN LINING INNER SIDES OF EXCAVATION

EPDM WATERPROOFING GEOMEMBRANE LINING OUTER SIDES OF EXCAVATION
SIDEWALK
E. Lyme, CT
Modular Precast Porous Slab Sections

Parking Lots
“Your panels looked to work great. It was raining hard and they looked “dry”, no precipitation was leaving the site.”

Bernard T. Gagnon, PE
Trudell Consulting
07-24-13
Porous Pavement Maintenance

Can be vacuum “swept” with standard equipment

Proper Equipment Selection is Criticale
Inspection / Maintenance Frequency

Inspection and Sweeping should be performed 2 times per year

Detailed inspection should:

• Confirm “good house keeping” practices are in place.

• Inspect for spalling and surface deterioration.

• Surface should be checked for signs of ponding.

• Voids should be checked for accumulation of fine material.

• Check for accidental or illicit spillage.

• A log should be kept detailing annual inspection and maintenance activities.
Gutter Broom’s are inappropriate for porous pavement and act to drive sediment into pores.
Sweeper Types

Mechanical Sweepers

They effectively remove gross pollutants and large debris (i.e. appropriate for spring clean-up), dirt and fine particles are actually forced into cracks by the broom head. The broom also tends to “push” the finer particles creating large amounts of dust. Mechanical broom sweepers are not typically recommended for porous surfaces.

Vacuum Sweepers

Vacuum sweepers utilize a windrow broom to push debris over to a vacuum suction nozzle. Only a small area is actually vacuumed, the majority of the pass is swept with a broom (creating the potential for dust). Vacuum sweepers are acceptable for use on porous surfaces.

Regenerative Air Sweepers

A controlled jet of air is directed into the cracks to dislodge dirt and fine particles. At the same time, a debris pick-up head vacuums particle across the entire length of the pass. Because there are no internal brooms and they utilize a closed loop system, dust is minimized. Regenerative Air sweepers are an acceptable method for sweeping porous surfaces.
Mechanical Broom Sweepers

“Spring Clean-Up”
Mechanical Vacuum Sweeper
Regenerative Air VACUUM Sweeper
Back Pack Blower

Effective during construction
Focused Cleaning
Each precast porous segment is **REMOVABLE** and **REUSABLE**

Modular Precast Porous Concrete Stormwater System
Slab replacement
Maintenance

Can be removed and backwashed to “regenerate” and **REUSE**
Modular Precast Porous Concrete

When it rains...it’s Porous™