

Pervious Pavement

Advanced Design Seminar

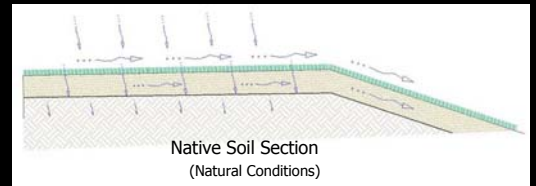


Chris Webb and Associates, Inc., PS
www.christopherjwebb.com
 Bellingham, WA, USA

POROUS PAVEMENTS

Impervious Surface Reduction Strategies

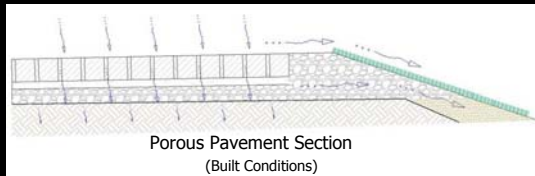
Mimicking Natural Conditions...



POROUS PAVEMENTS

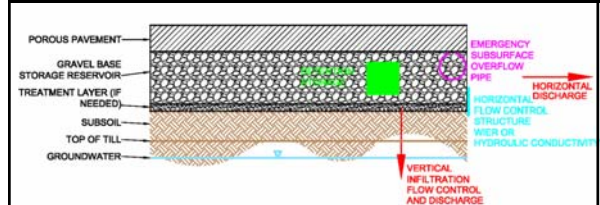
Impervious Surface Reduction Strategies

Mimicking Natural Conditions...



POROUS PAVEMENTS

Conceptual Summary Section



Concepts shown, not all will be present on each design...

POROUS CONCRETE PAVEMENT

Impervious Surface Reduction Strategies

DESIGN CRITERIA

- Soil
 - ✓ Soil's infiltration rate
 - ✓ Soil's structural capacity (CBR rating)
 - ✓ Soil's susceptibility to swelling
 - ✓ Site location (slope stability)
- Applications
 - ✓ High or low traffic
 - ✓ Sources of contamination (i.e. industrial)
 - ✓ Maintenance
- Mix Design
 - ✓ Strength of section

POROUS CONCRETE PAVEMENT

Design Options

- Aggregate
 - No. 8 and 89, well graded (current standard mix)
 - 3/8" - No. 4, poorly graded ("shopping cart Friendly"), (not always available)
- Color
- Proprietary products
 - Stonecrete
 - Percocrete
- Thickness of pavement and base
- Edge detailing options
 - Channelization issues
 - Prevent contamination from landscaping materials

POROUS CONCRETE PAVEMENT

Base Design

- Base acts as drainage reservoir and structural support
- Typically washed large Chipped rock (3/4" – 1½")
- Need long term soil infiltration rate and design storm intensity
- ~6" – ~8" (~10"?) depending on site conditions
- Fabric may be used with some sub-grades
- Under-drains may be needed...



POROUS CONCRETE PAVEMENT

Pavement Thickness Design

- Need:
 - Soil Strength
 - Anticipated loading
 - Assumptions about Modulus of Rupture of Pavement
- Portland Cement Concrete Pavement Association method
- Florida Concrete Products Association method
- Typical Results
 - ~ 4" residential driveways
 - ~ 6" parking lots and very low volume streets
 - ~ 7-8" streets low volume streets
- Thickened Edge



PERVIOUS CONCRETE PAVEMENT

Testing and Verification

- The verification of specified design parameters is a recognized problem
- ASTM tests do not yet exist for pervious concrete pavement
- Some proxy values are used
 - Unit weights from cores
 - Aesthetics (uniformity of surface, etc.)
- Test panels



PERVIOUS CONCRETE PAVEMENT

Site Prep and placement of the base rock



PERVIOUS CONCRETE PAVEMENT

Placement Movie 1: delivering, screeding, and raking



PERVIOUS CONCRETE PAVEMENT

Placement Movie 2: floating



PERVIOUS CONCRETE PAVEMENT

Placement Movie 3: finishing



PERVIOUS CONCRETE PAVEMENT

Cover and Protect



PERVIOUS INTERLOCKING PAVERS

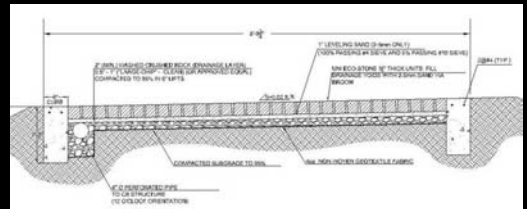
Pavement Design Considerations

- Edge Restraint
 - Concrete curbing
 - Plastic angle edging
- Shape of area / edges
- Base thickness (hydraulics and soil strength)
- Infill materials
 - Grass
 - Course sand (3-5mm)



INTERLOCKING CONCRETE PAVERS

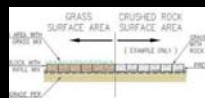
Example Project – Typical Section



REINFORCED GRASS PAVING

Pavement Design Considerations

- Slope
- Vehicle loading
- Traffic volume
- Base thickness (hydraulics and soil strength)
- Grass Mix
- Establishment of grass & watering
- Likelihood of Maintenance



PERVIOUS PAVEMENT

Construction Considerations

- Protect the subgrade
 - Excavation timing
 - Construction vehicle loading & compaction issues
 - Subgrade contamination
 - Staging of materials
- Protect the installed crushed rock base
 - Sacrificial wearing course?
- Protect the installed pavement
 - Landscaping
 - Erosion Control

PERVIOUS PAVEMENT

Some thoughts on modeling...

- This will not be an engineering design presentation
- The modeling of pervious pavements is an emerging field, much is not known yet
- There are flow control credits (approved modeling assumptions) available in various jurisdictions
 - 50% grass / 50% impervious as an example
- Depends heavily on soil type and other design parameters
- Using pervious pavements *should* reduce the required detention by *some* amount on *most* projects...

PERVIOUS PAVEMENT

APPROXIMATE relative costs for Comparison

- Pervious Concrete pavement, in place
 - \$4 – \$5 / sf plus base and site prep.
- Pervious Interlocking concrete pavers
 - \$5 – \$6 / sf plus base and site prep.
- Reinforced Grass Paving
 - \$4 – \$6 / sf plus base and site prep.
- Reinforced gravel
 - ?? Kathy ?