Highland Crest Campus Concrete Experience

Matt Jeffers - Concrete Paving Association of TN
• Pervious background

Dave Brewer - City Engineer Springfield, TN
• Highland Crest Campus Case Study/Experiences
Pervious Concrete
Parking Lots & Pavements: Environmental Considerations

- Almost Total Runoff
- Public Water Needed for Vegetation
- Valuable Water Resources are Wasted
- Runoff Has Chemical Pollutants, Requiring Treatment
- Runoff is Hotter, Damaging Ecosystems
- Rapid, High Volume Runoff Requires Larger Public Drainage Facilities
- Hot Parking Lots Add to Urban Heat Island Effects
ACI 522 – Pervious Concrete

- ACI 522R – 06: Report on Pervious Concrete
- ACI 522.1 – 08: Guide to Specification
- Performance specification
- Provides Guidelines for
  - Quality Assurance
    - Materials
    - Testing
  - Placement
What is Pervious Concrete?

- GREAT Idea for Stormwater Management
- A No-Fines Concrete Mix, meaning less sand
  - Coarse Aggregate
  - Portland Cement
  - Water
- Intended for use as an open-graded drainage material
Typical Pervious Concrete Mix Design

- 550 – 650 lbs. Portland Cement
  - Fly Ash / Slag Cement substitute acceptable at standard rates
- 27 ft$^3$ Coarse Aggregate
  - Aggregate size will affect drainage rate
- Viscosity Modifier, HRWR, Hydration Stabilizer
- 0.25 – 0.35 W/C Ratio
  - Sufficient water to display a wet, metallic sheen on the aggregate
Pervious Concrete Properties

- Pervious concrete: 4-6 inches typical
- Open-graded stone subbase: determined by local hydrologic conditions
- Geotex prevents movement of fines into stone bed
- Perforated pipe to capture water & let it drain (optional)
Water drains through pavement into stone bed and infiltrates slowly into underlying soil mantle

- 0.1 – 0.5 in/hr acceptable
- Total drawdown time should not exceed 5 days
Cost Considerations

Savings to Owners/Developers

- Eliminates need for detention ponds & other costly stormwater management practices
- Provides for more efficient use of land development

Shelter Systems, Inc. Westminster, MD

7 ½ Acre parking lot

Saved $400,000 in underdrain construction

Eliminated 1 ½ Acre detention pond
Designing for Special Considerations: Freeze-Thaw Resistance

- Depends on saturation level
- Avoid critical saturation
  - Design
    - Infiltration System
    - Secret of success is to provide the water a place to go
  - Maintenance
    - Cleaning, as needed, in severe climates
What About Clogging?

- Conventional pavement sweeper/vacuum equipment can also be used.
What About Clogging?

Cleaning can restore 90+% of original permeability.
So why should I as an engineer consider something different like concrete, pervious or conventional?

• Asphalt materials grow increasingly expensive.
• Retention or detention ponds are expensive, ugly and take away land from the owner.
• Environmental concerns (heat island, stormwater, no harmful sealcoats, overlays).
• Getting the longest life out of our investment is a priority for owners and the environment.
• Pavement decisions are no longer about initial cost even though both materials are competitive initially with asphalt.
• The parking lot is the often overlooked welcome mat to the owners business.
• It literally takes 5 minutes to run a design.
• In a competitive design world we must show our project owners that we are trying to give them the best value. This will lead to repeat business!
• We have a duty as engineers and professionals of materials and design to provide our owners with the most environmentally effective, longest lasting, and cost effective solutions and options.

Let’s hear Dave Brewer’s Experience on Highland Crest