PERVIOUS CONCRETE: MAINTENANCE AND CLEANING FOR LONG-TERM PERFORMANCE

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Do Storm Water Systems Need Maintenance?

Do Pervious Pavements Need Maintenance?

NRMCA Maintenance & Operations Guide (click here)

First Steps

- Designs should be checked to see if they are maintenance-friendly
- Assure/Verify a quality installation, including soil characteristics, gravel layer, and pervious
- Require certified installers and REQUIRE initial infiltration testing (C1701)
- Provide owner with Maintenance/Operations Guide

Next (Three) Steps

Step One: Routine Maintenance

- Periodic Visual Inspection
- Leaf blower or similar as needed
- Sweeping (for entire lot) as needed
- Spot maintenance – more intensive as needed to prevent more severe clogging

Next (Three) Steps

Step Two: Periodic Maintenance

- Often PRIOR to onset of winter, always when routine maintenance isn't enough
- Should start with sweeping or dry vacuum process – get all loose material off. Measure (weigh) if possible.
- May require pressure wash and vacuum at same time

Next (Three) Steps

Step Three: Deep Cleaning

- When infiltration rate drops by more than 25%, or under 100 inches per hour.
- Will require simultaneous application of pressurized water and significant vacuum – specialized equipment.

Winter Time Notes

- 1st winter is more critical – same as for conventional concrete
- De-icing chemicals NOT recommended
- Calcium treated sand (after 1st winter) or plain COARSE sand may be used – pavement must be vacuumed at end of winter
- Plow with caution

Results from the Field

- McCabe Park
- Nashville Area Driveways
- Tennessee Parks & Greenways Office
  - Pervious Inspection and Condition Report
  - C1701 Infiltration Report

McCabe Park Pervious

- One of our first cleaning efforts
- Cleaning necessary due to lack of protection (no silt fence, etc.)
- No baseline infiltration data
- Proved that cleaning was effective
- Method of cleaning (vacuum excavator) made it difficult (impossible) to measure how much material was removed

Nashville Area Driveways

- New construction but not protected during closeout and completion
- 4 driveways – various pavement conditions and various sources of contamination
- Did not have initial infiltration data
- Data on amount of material removed was kept

TPGF Parking Lot

- Baseline data was available
- Parking lot is heavily used
- Several sources of contamination
- 2 years from install to 1st cleaning
  - Probably too long given adjacent construction activity and adjacent trees
  - No routine maintenance by owner
- Collected good data and had baseline for comparison

TPGF Parking Lot Initial Info

	C 1688 Unit Weight (Lbs/CF)	C 1747 Samples (% Loss)	C 1747 on Cores (% Loss)	Compressive Strength(PSI) Avg of 3 cores	C1701 Results (IN/HR)
Producer 1		16.9%		n/a	951 in/hr
					704 in/hr
Producer 2	135.08 lb/cf	23.5%	58.75%	n/a	263 in/hr
Composite					218 in/hr

TPGF Parking Lot Before and After

	Initial C1701 Results (new)	C1701 Results Before Cleaning	Pounds Removed – Dry Vacuum	Pounds Removed – Wet Vacuum	C1701 Results After Cleaning
Normal Pervious	951 in/hr 704 in/hr	12 in/hr 69 in/hr	19 pounds (from both) – about 1100SF	12 lbs (filter) 75 lbs (can)	224 in/hr 82 in/hr
Small Stone Pervious (both layers)	218 in/hr	12 in/hr 25 in/hr	See Above	15 lbs (filter) 74 lbs (can)	81 in/hr 81 in/hr

Lessons Learned (So far...)

- Design matters
- Installation matters
  - Baseline data needs to be collected
- Education needed for GC's, subs & owners
  - Maintenance/Operations Guide now available
- Routine maintenance will preserve infiltration
  - Inexpensive, but not being done
- Clogged Pavements can be restored
  - Best results when pavements are cleaned early

Thanks for Your Attention!

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ASTM Standards for Pervious

- C-1688 – Fresh Unit Weight
- C-1701 – Hardened Infiltration
- C-1747 – Raveling Potential
- C-1754 - Hardened Density and Voids

ASTM C 1688

- Closest thing to a ‘slump test’ for pervious – used to check the ready mix producer’s consistency
- Also provides important information to the installer and the testing lab or owner
- Current range of +/- 5 lbs/cf
- Voids and density will vary based on local materials, application requirements and installer’s method of placement.
- In-place voids and density will be different!

ASTM C-1701

- Used to check infiltration rates of hardened pervious
- Not intended for acceptance
- Will produce results with a wide variance in individual test locations – best to look at averages
- Useful for determining loss of infiltration rate over time – IF test is run immediately after placement and before service to set a baseline
- Best use may be to determine when cleaning or other maintenance is needed

ASTM C-1747

- More important than compressive strength for pervious (my opinion…)
- Samples are molded per the standard and then tumbled (LA Abrasion) 500 cycles (no steel shot)
- Mass loss is measured – lower loss should mean tougher, more durable pervious
- Early in the data gathering game, not yet sure what constitutes good mass loss
- Not intended for use with cores

ASTM C-1754

- Can be performed on either cores or molded specimens
- Most likely to be used with cores (my opinion)
- Density and voids obtained with C-1754 are not expected to match density and voids obtained with C-1688
- Over time, one would expect a correlation between C-1688 and C-1754 for the same concrete