Catch Basin Inserts for Ohio Roadways

Prepared for and in cooperation with the Ohio Department of Transportation
NPDES Construction General Permit

1. Post-Construction BMPs
2. Manufactured Systems Allowed for ODOT
3. ODOT L&D has testing criteria
Manufactured Systems

Cartridge/Membrane/Media Filters: Physical filtering

Hydrodynamic Separators: Settling and some screen filtering

Catch Basin Inserts: Filtering at catch basin
Testing: Particle Size Distribution

Sediment Particle Distributions

- NJDEP Test
- US Silica OK110
- US Silica F110

80% TSS Removal

Particle Size (µm)

Percent Finer

- Sand: 2.00-0.05 mm
- Silt: 0.05-0.002 mm
- Clay: Less than 0.002 mm
Various Vendor Claims

- Easy Installation
- Easy Maintenance
- Affordable
- Reusable
- No Tools Required
- 100% Pollutant Capture
- Exceeds 80% Sediment Removal Efficiency
- Field and Laboratory Tested with up to 86% Removal of TSS
- Captures and Treats over 80% of the First Flush
- Meets NPDES Permit Requirements
- EPA Approved
- DOT Approved
ODOT Research
Catch Basin Inserts for Ohio Roadways Research and Results

1. CBI Selection

2. Field Testing
   - Site Selection
   - Installation and Inspection
   - Maintenance and Removal

3. Lab Testing
   - Testing
   - Results

4. Conclusion
CBI Selection

Product must meet:

1. 80% sediment retention

2. Fit a standard ODOT Catch Basin Type 3A
Catch Basin Inserts for Ohio Roadways Research and Results

1. CBI Selection
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4. Conclusion
CBI Selection – The Most Likely to Succeed

- Adsorb-It™
- DrainPac™
- Flo-Gard Plus®
- WQS
- FlexStorm® Inlet Filters
- Gullywasher©
- Storm Sentinel®
- Triton™
Catch Basin Inserts for Ohio Roadways Research and Results

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Site Selection

Site 1
• Allen County Fairgrounds on SR 117.
• Fairground and agricultural land uses

Site 2
• SR 81 west of I-75.
• Commercial and retail land uses
Installation
Site one CBI distribution
Installation

Site two CBI distribution
Installation

• Installed in accordance with manufacturer’s recommendations
• Most CBIs required “throat block”
• Some CBIs slightly modified to allow for installation
Installation

Throat Block

- Curb opening blocked to direct all stormwater into the grate
- 7 of 8 CBIs required throat block
Installation

Potential Issues During Installation

- Imperfect catch basin construction
- CBI frame
- Intrusion of catch basin conduits
Monthly Inspection

- Inspected without removal of CBI
- Six inspections conducted within 24 hours of a runoff event
- Looking for standing water or sediment/debris accumulations
Maintenance

- Minimum of 3 maintenance events
- Maintenance required for standing water or half full of debris
- Maintenance Activities
  1. Vacuum
  2. Backflushing
Maintenance Activity

Debris removal and measurement

Backflush with water

CBI Reinstalled
Removal

• Removed if standing water observed after CBI has been maintained

• 5 CBIs remained installed for the duration of the study

• 9 CBIs removed within the first 7 months
Field Test Conclusions

• Only 1 CBI installed without modification to standard CB-3A
• CBIs with rigid frames may need modification to fit
• CBIs profile/depth may conflict with pipes inside catch basin
• Maintenance required every 2-5 months
Catch Basin Inserts for Ohio Roadways Research and Results

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Lab Testing

• Large-scale CBI testing apparatus was constructed

• Meets ODOT L&Dv2 requirements

• Testing conditions
  1. Influent flow rates
  2. Soil types
Lab Testing
Schematic of CBI Testing Apparatus
Testing Flow Rate

Water Quality Flow (WQf)

\[ WQ_f = CI A \]

Water Quality Volume (WQv)

\[ WQ_v = \frac{PAC_q}{12} \]

<table>
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<tr>
<th>Drainage Area Size</th>
<th>Drainage Area (acre)</th>
<th>Flow Rate (ft³/s)</th>
<th>Volume (ft³)</th>
<th>Duration (min)</th>
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ORIGINAL CONFIGURATION
Flow enters inlet but goes around device.

Flow Bypasses Found Between Catch Basin Frame and CBI
MODIFIED FOR DIRECT DISCHARGE
Performance Testing

- Low, medium, and high flow rates
- TARP sandy loam and OK110 soil types
- Sediment retention measured to determine CBI performance
<table>
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<th>Sheet Flow</th>
<th>Direct Discharge</th>
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Performance Testing Results

• Two products met 80% sediment retention
  1. Adsorb-It™
  2. DrainPac™

• Sediment retention decreased with flow rate increase

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<thead>
<tr>
<th>Product Name</th>
<th>Sediment Retention OK110 Silica Sand</th>
<th>Sediment Retention TARP Sandy Loam Soil</th>
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<td>Adsorb-It™</td>
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Longevity Testing

• Low flow rate tested with each soil type

• Consecutive testing on CBIs until failure
  1. Cumulative sediment retention below 80%
  2. Structural failure
Longevity Testing

- Low flow rate tested with each soil type
- Consecutive testing on CBIs until failure
  1. Cumulative sediment retention below 80%
  2. Structural failure
Longevity Testing Results

- Performance degraded with multiple simulated storm events
- 6 of the 8 CBIs did not justify testing past 2 tests with OK110 sand
- 2 CBIs fell below 80% sediment retention after 3rd or 4th test (OK110)
- None of the units met 80% retention for more than 1 test with sandy loam

### Longevity Testing Sediment Retention

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<td>76.7%</td>
<td>77.0%</td>
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Lab Test Conclusions

• 6 CBIs below 80% sediment retention on all tests
• 2 CBIs met 80% on certain tests
• CBIs met 80% sediment retention for maximum of 3 consecutive events
• Leak between CB frame and CBIs
Catch Basin Inserts for Ohio Roadways Research and Results

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Conclusions Summary

• No units met both requirements
  1. DrainPac™ and Adsorb-It™ met sediment retention requirement
  2. Triton™ met installation into CB-3A requirement
• Note: Sandy Loam is more representative of Ohio runoff.

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<th>Product Name</th>
<th>Installed in CB Without Modification</th>
<th>80% Sediment Retention OK110 Silica Sand</th>
<th>80% Sediment Retention Sandy Loam Soil</th>
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Conclusions Summary

- Adsorb-It™ *might* work as a post-construction BMP if:
  - No more than 0.1 acres per catch basin
  - Install one catch basin filter in every catch basin to meet treatment requirements
  - Add filter to safely cover inlet throat
  - Clean/Replace each filter about every month, and more often if there has been more than 1.5 inches of precipitation, grass cutting, leaf litter, or snow and ice.
  - Maintain forever
None of the Catch Basin Inserts Could Be Post-Construction BMPs for ODOT

Adsorb-It™

DrainPac™

Flo-Gard Plus®

WQS

FlexStorm® Inlet Filters

Gullywasher©

Storm Sentinel®

Triton™
Various Vendor Claims

- Easy Installation
- Easy Maintenance
- Affordable
- Reusable
- No Tools Required
- 100% Pollutant Capture
- Exceeds 80% Sediment Removal Efficiency
- Field and Laboratory Tested with up to 86% Removal of TSS
- Captures and Treats over 80% of the First Flush
- Meets NPDES Permit Requirements
- EPA Approved
- DOT Approved
Various Vendor Claims

- Easy Installation
- Easy Maintenance
- Affordable
- Reusable
- No Tools Required
- 100% Pollutant Capture
- Exceeds 80% Sediment Removal Efficiency

- Most
- Not if maintained every 2 weeks
- Many
- Most
- Most
- Captured in filter, but not held
- Depends on the Sediment
Various Vendor Claims

- Depends on the Sediment
- Depends on the Sediment
- Not for Post-Construction BMPs
- Not for Post-Construction BMPs

- Field and Laboratory Tested with up to 86% Removal of TSS
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- EPA Approved
- DOT Approved
Thanks to the Research Team:

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• Davey Resource Group

Full Report Available on ODOT’s Research Website
Questions?

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