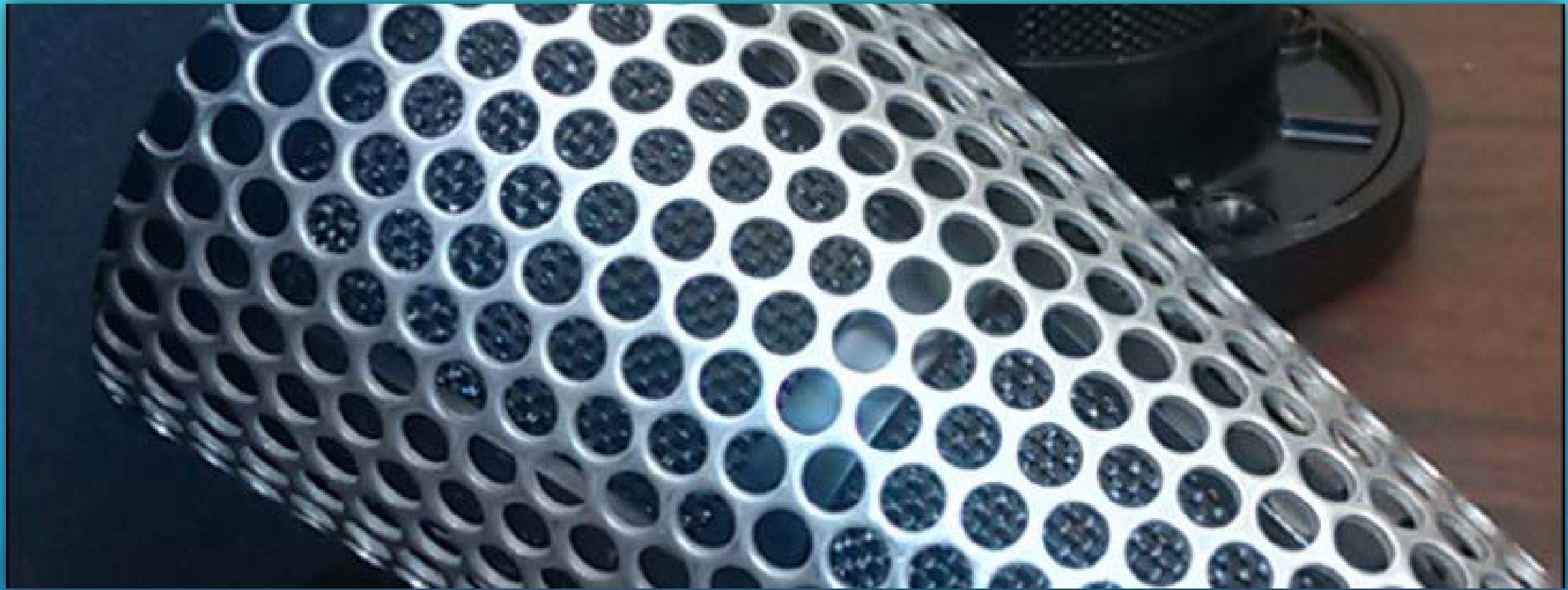
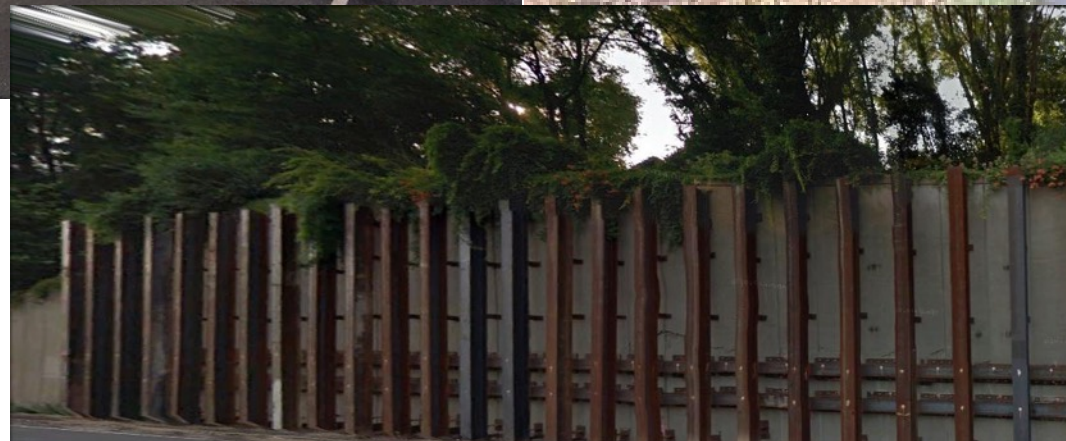


Maintainable Weep Hole Drains



**"There is not enough money to do all that you need to do"
George Conner ALDOT**

WALL FAILURES



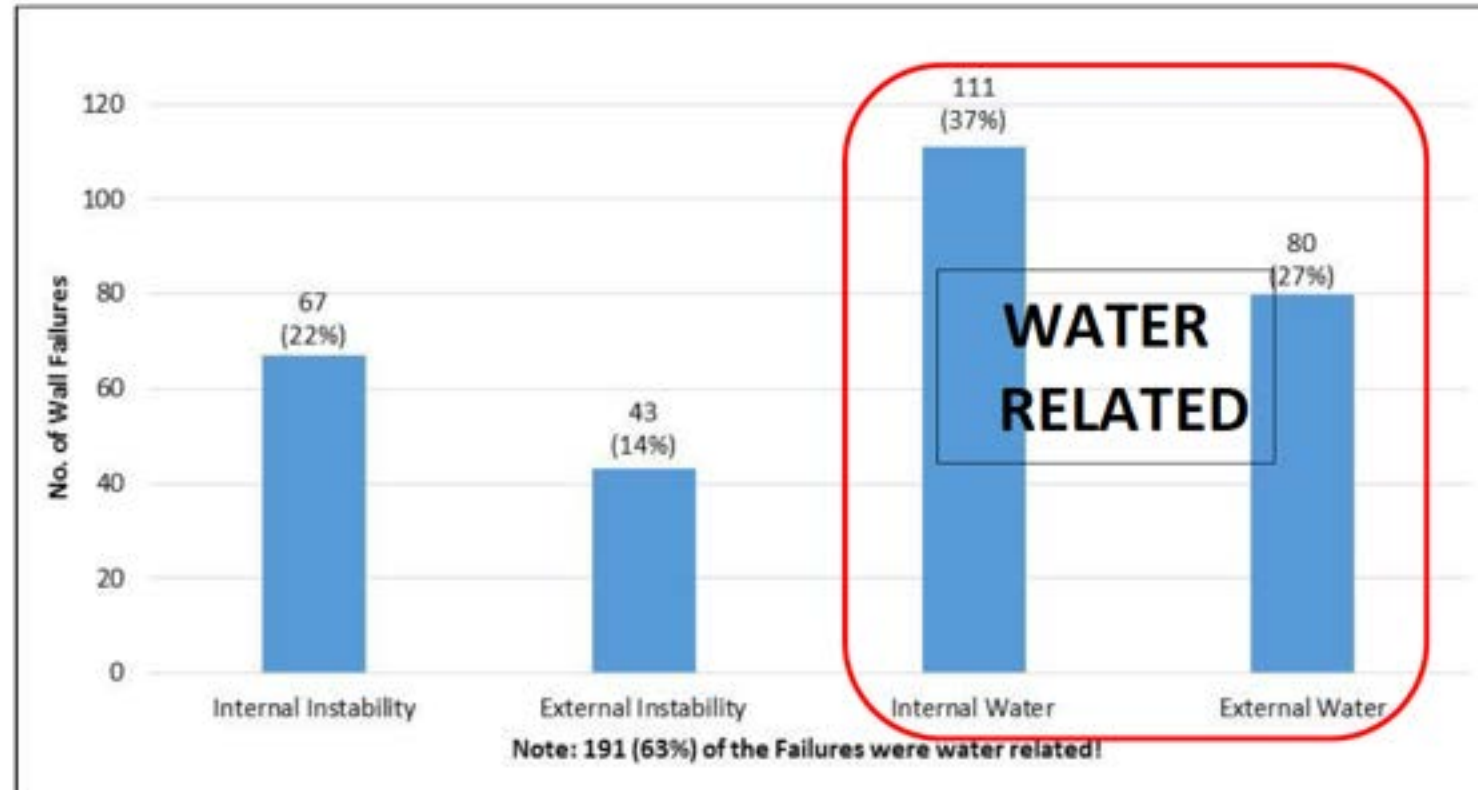
"Failure" of a retaining wall does not necessarily mean total collapse, but rather signs of impending collapse.

SIGNS OF FAILURE



Fortunately, retaining walls are quite forgiving, nearly always displaying telltale signs of trouble.

ANALYSIS OF MSE WALL FAILURES



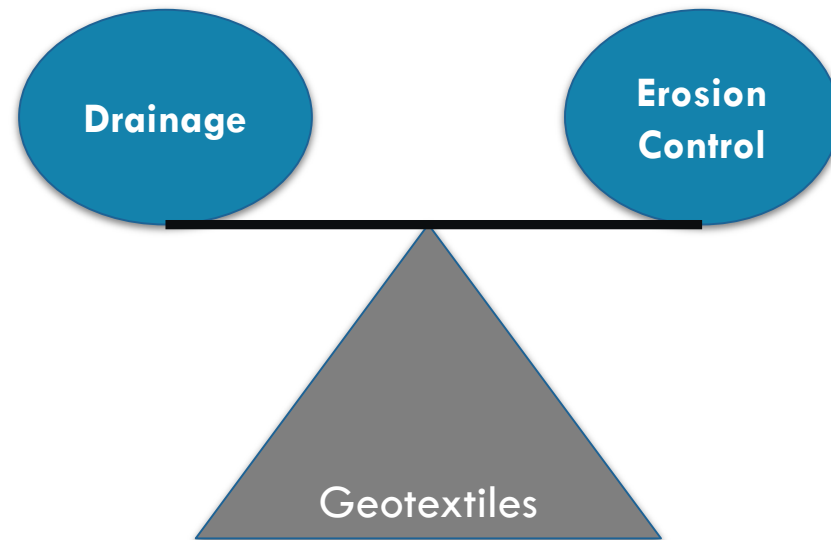
Water related failures accounted for 63% of total failures.

GEOTEXTILE SELECTION PARADIGM



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

PRACTICES WE CAN NOT AFFORD TO DEFER

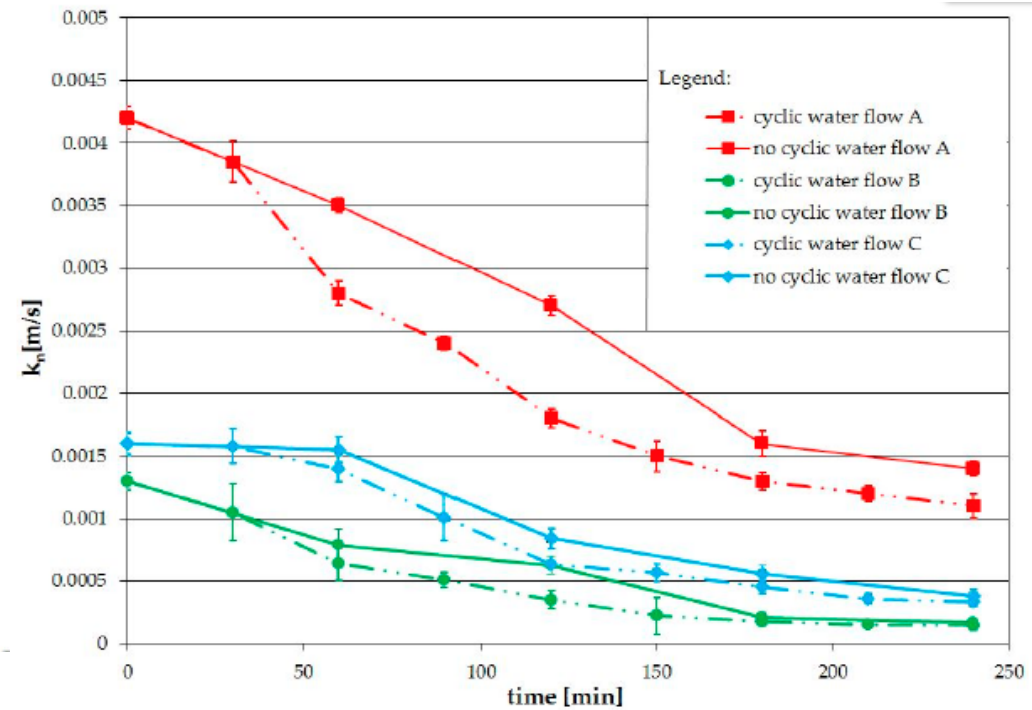
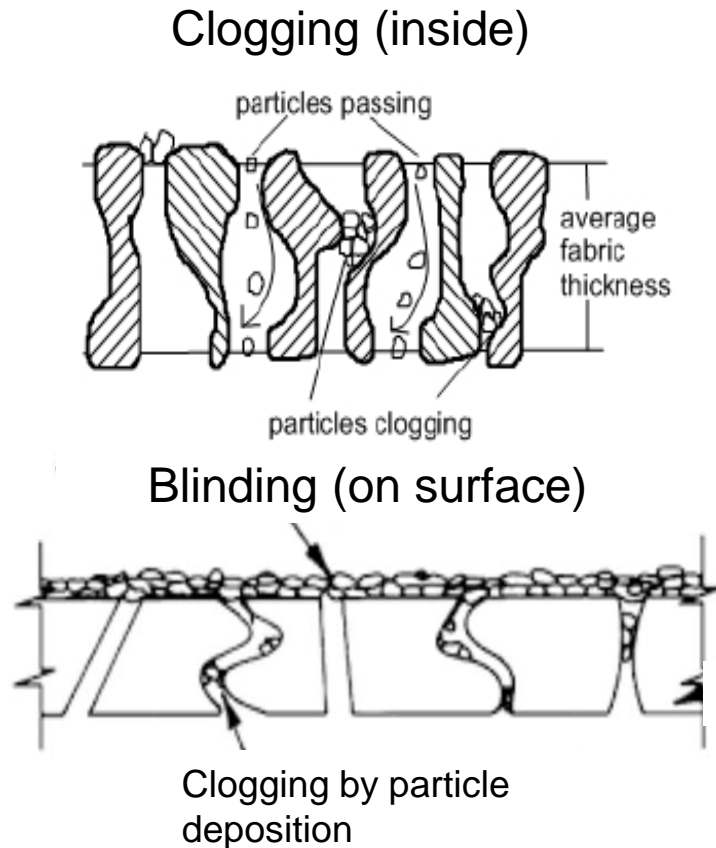


Typical Selection Characteristics

- Strength
- Tear & Puncture resistance
- Apparent Opening Size
- Permittivity
- Permeability
- Flow Rate
- UV Resistance

Geotextile selection: a balance between Drainage & Erosion Control

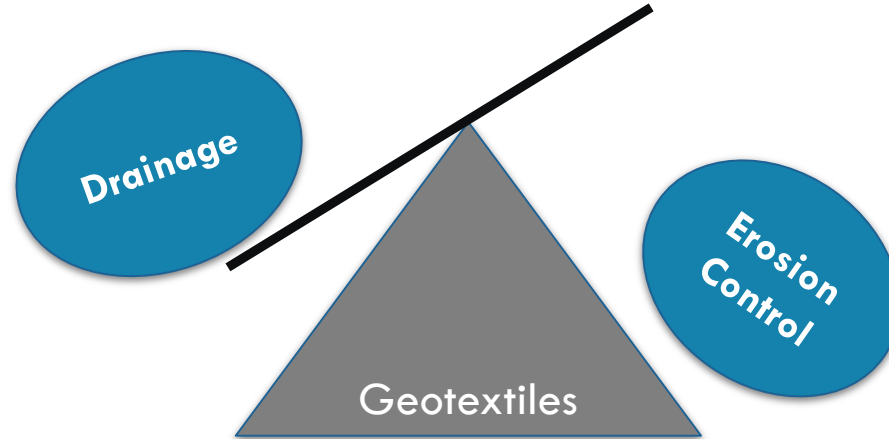
DECREASING OF WATER PERMEABILITY COEFFICIENTS WITH TIME



Testing 3 Nonwoven Geotextiles

Effectiveness quickly begins to decline; cyclic water flow declines faster.

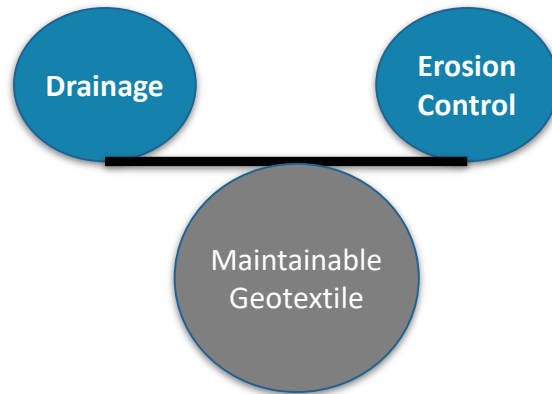
USE A WRENCH NOT A BACKHOE



Fixing traditional drainage systems that have failed requires costly excavation to rip up, replace and rebuild. Can run tens of thousands of dollars or more.

With traditional systems, the balance between drainage & erosion control is not sustainable.

PARADIGM SHIFT IN THE WEEP HOLE



A “maintainable drain”:

- installs from the front of the wall
- contains a cleanable/replaceable filter
- improves drainage



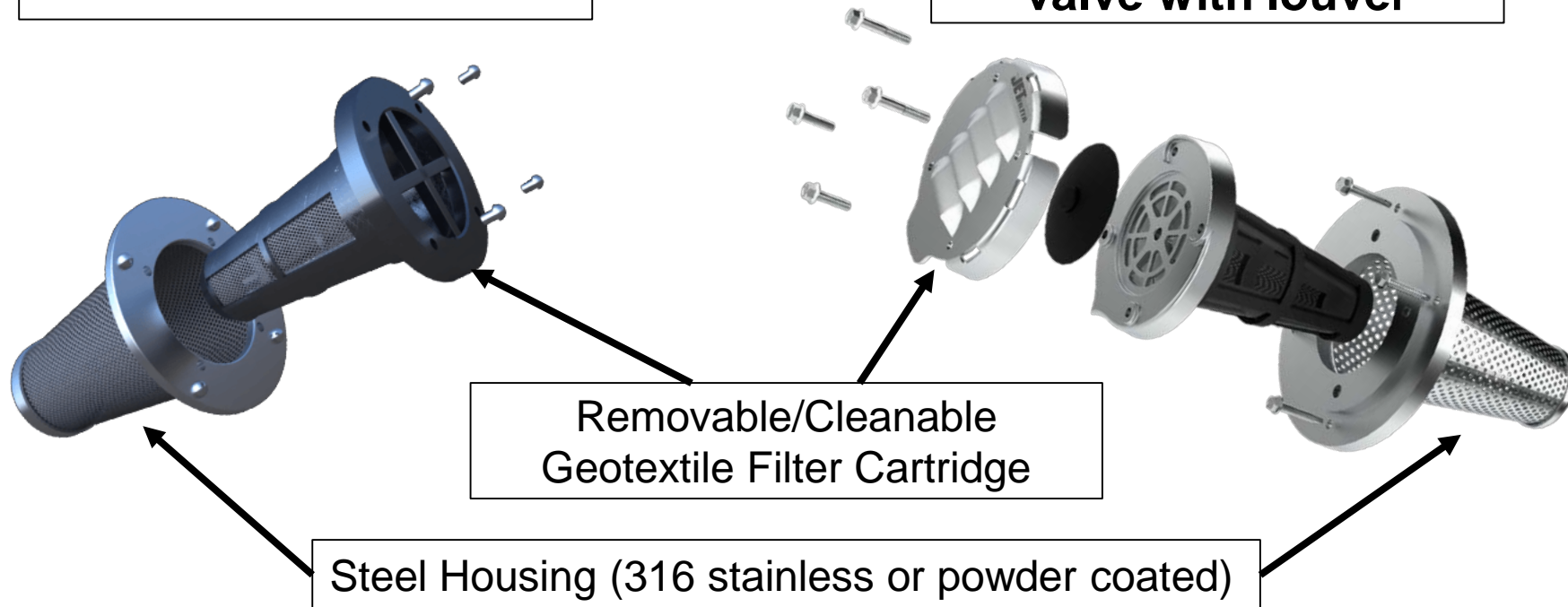
“Inspect and maintain the wall drainage system and ground around the wall on a regular basis.”*

*MBIA *Build Maryland*, Sept/Oct 2015 Ravi Malviya, P.E.

MAINTAINABLE DRAINS

Open End – Free Flow

Closed End - One-way
valve with louver



Maintainability allows a sustainable balance between
drainage and erosion control

HYDRO HELICAL - WALL APPLICATION



CORE DRILL 10" HOLE THROUGH WALL (SEAL AROUND WEEPHOLE EXTENSION WITH 30000 PSI MIN. GROUT)

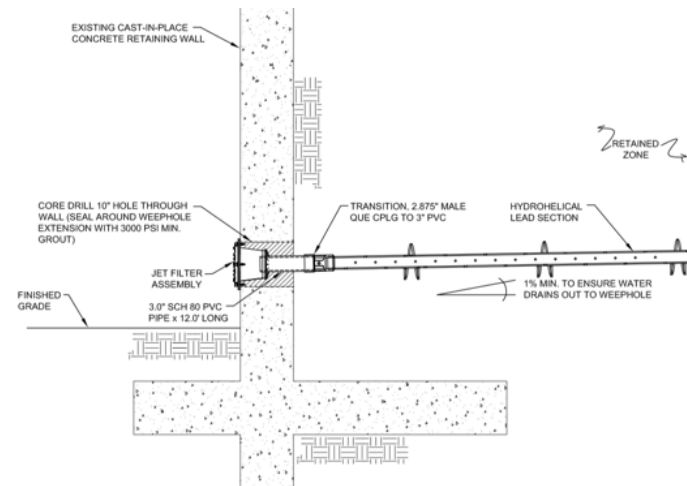
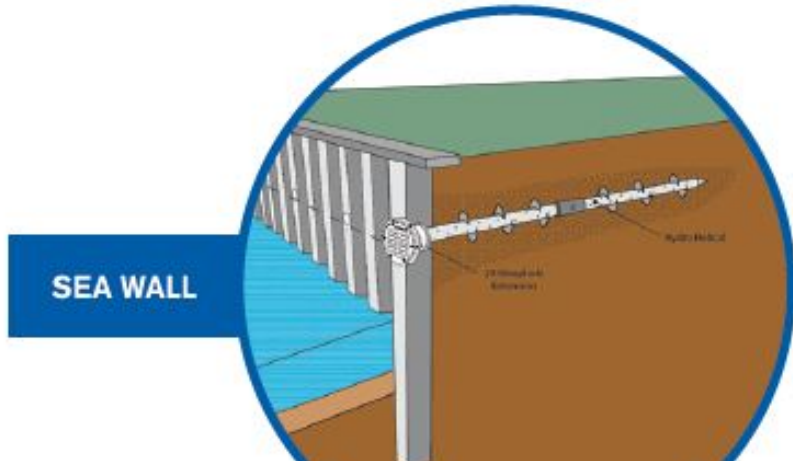
FINISHED GRADE

JET FILTER ASSEMBLY
3.0" SCH 80 PVC PIPE

TRANSITION 2.875" MALE QUE CPLG TO 3" PVC

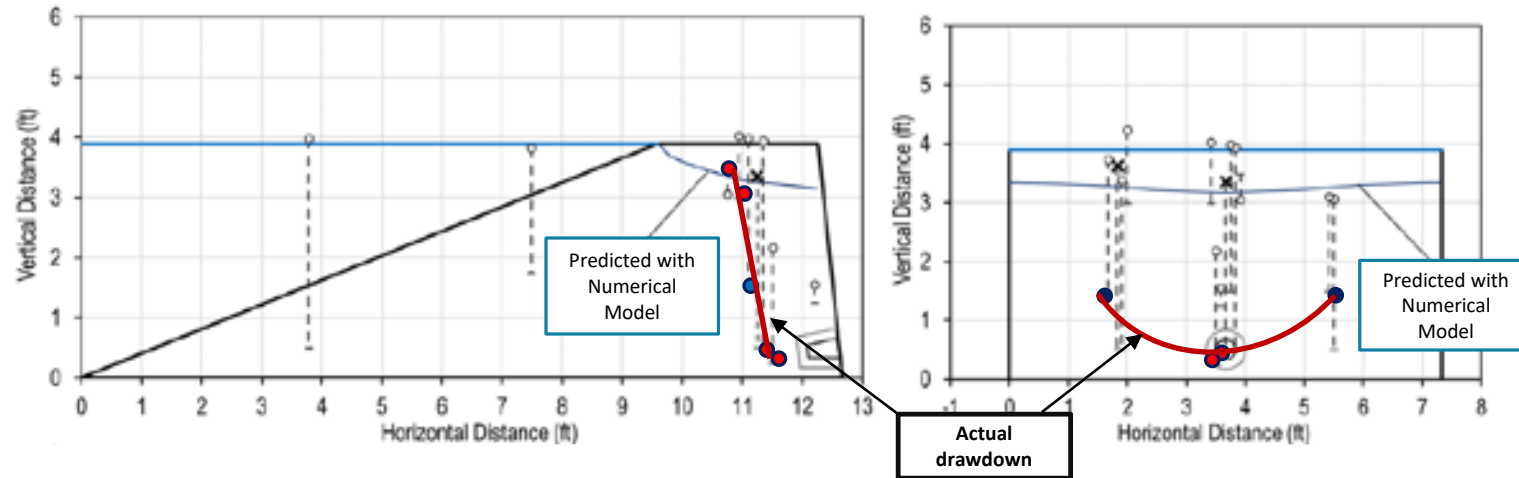
HYDROHELICAL LEAD SECTION

1% MIN. TO ENSURE WATER DRAINS OUT TO WEEPHOLE



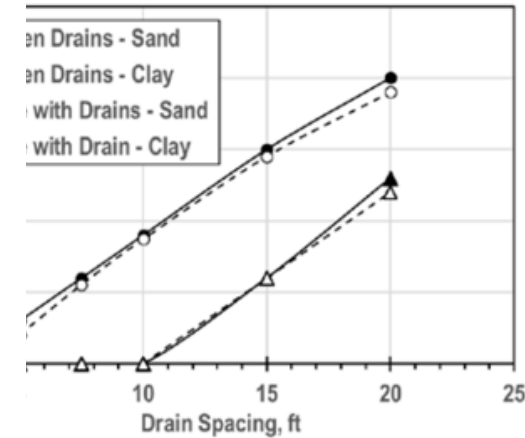
The Hydrohelical reduces pressure at the wall and drains water heading toward the wall

UNIVERSITY OF MISSOURI - TESTING



Comparison Maintainable Drain vs. A Weep Hole of the same size			
Diameter	6"	4"	2.5"
Estimated Flow Rate Improvement	270%	210%	50%
Physical Model Test* Flow Rate Improvement	220%	200%	110%

* Physical Test performed on 6" & 2.5". Four inch was modeled



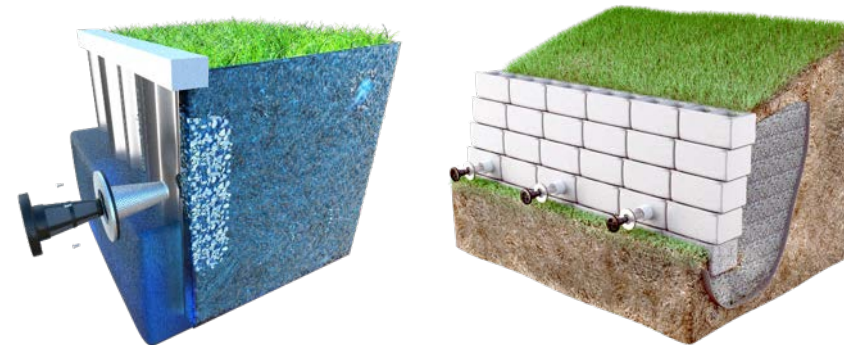
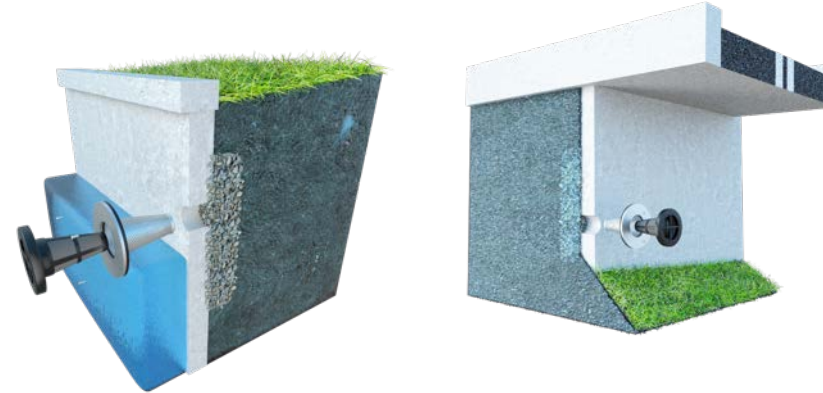
In constant groundwater testing the 4" Maintainable Drain reduced in-line pressure significantly more than predicted with numerical modeling.

APPLICATION SUMMARY

TRANSPORTATION • MARINE • ENVIRONMENTAL Highways/Roads • Marinas/Ports • Rail Lines • Culverts/Tunnels

- ✓ Bridge Abutments
- ✓ Wing Walls
- ✓ Seawalls
- ✓ Retaining Walls
- ✓ Concrete Detention Basins
- ✓ Underground Parking Garages

- ✓ Concrete
- ✓ MSE
- ✓ Steel Sheet Piling
- ✓ Vinyl Sheet Piling
- ✓ Wooden Bulkheads
- ✓ Aluminum/Composite Sheet Piling



Installs in 15-20 minutes, maintained in 3-5 minutes every few years.

STEEL SHEET PILE COST EXAMPLE



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PRACTICES WE CAN NOT AFFORD TO DEFER

Assumptions:

- 10' high wall
- 2' water depth a low tide
- 1' water pressure with Jet Filters
- 8' water pressure without Jet Filters



David Borger, P.E., *Engineering Manager*

Maintainable Drains	
Sheet Pile:	AZ14-770
Length:	30 feet
Deflection at Top of Wall:	1.6 inches
Bending Moment:	25.9 kft/ft
Material Cost per foot	\$475.65

Traditional Drainage	
Sheet Pile:	AZ26-700
Length:	40 feet
Deflection at Top of Wall:	3.2 inches
Bending Moment:	74.6 kft/ft
Material Cost per foot	\$903.00

Some might consider the AZ26-700 is not big enough and want to upgrade it to another sheet pile thus increasing the cost to ~\$1,150/ft.

Adding and maintaining JET Filters can reduce wall steel cost between \$428 - \$657 per foot.

GEORGE WASHINGTON MEMORIAL PARKWAY



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PRACTICES WE CAN NOT AFFORD TO LOSE

Location: Arlington County, VA

Owner: Federal Highway Administration, Parks

Issue: Soil eroded through weep holes under the bridge causing a sinkhole, 5' x 10' and 30' deep, to open under approach.

Solution: Installed 4" P.C. Open-End maintainable drains to stop future erosion

Date: 2014



NATCHEZ TRACE PARKWAY



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

PRACTICES WE CAN NOT AFFORD TO LOSE

Location: Various locations, Mississippi, , Transportation

Owner: Federal Highway Administration, Parks

Issue: 400+ overpass & bridges of various ages, many with signs of distress. Limited budget and need to focus resources on the most critical projects.

Solution: 4" powder coated steel units in concrete abutments

Results: Extended life of current walls and allowed teams to focus on more critical projects.

Date: Ongoing



ST. LOUIS OVERPASS RETAINING WALL



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PRACTICES WE CAN NOT AFFORD TO LOSE

Location: Berry Rd/I-44 St. Louis, Missouri

Owner: Missouri Dept. of Transportation

Issue: Tall retaining wall stressed by pressure. Cracks, seam splitting, wall movement.

Solution: Installed 20, 4" S.S Open-End units into concrete retaining wall.

Results: Completed Successfully with dye test showing water flow.

Date: 2015



OTHER DOT INSTALLATIONS

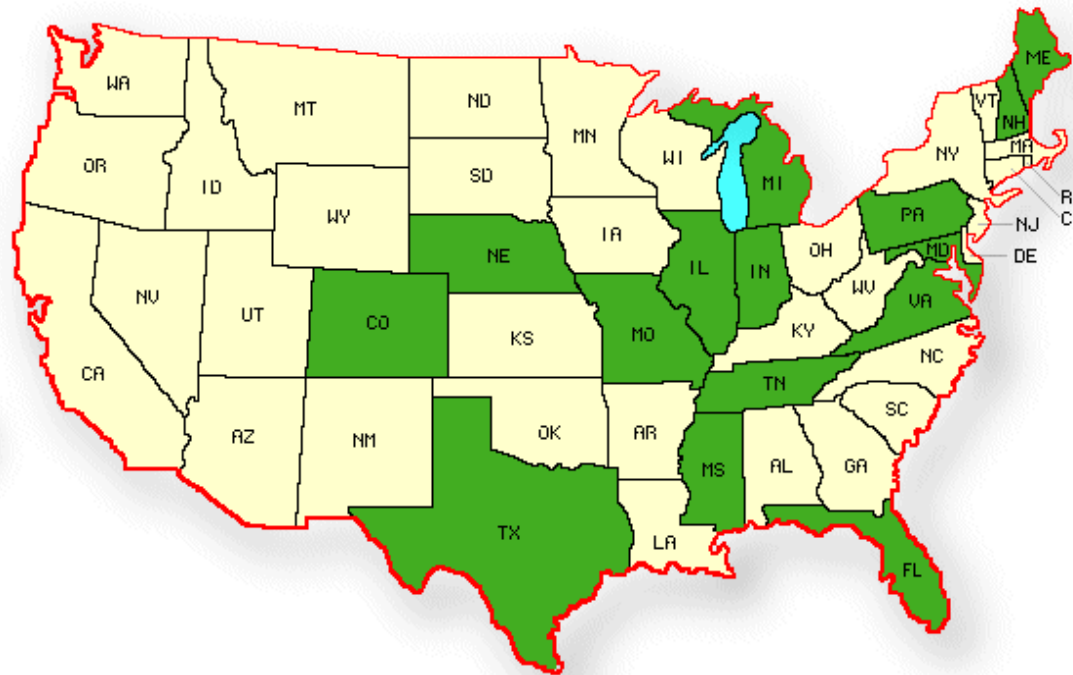
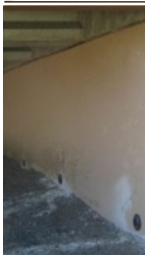


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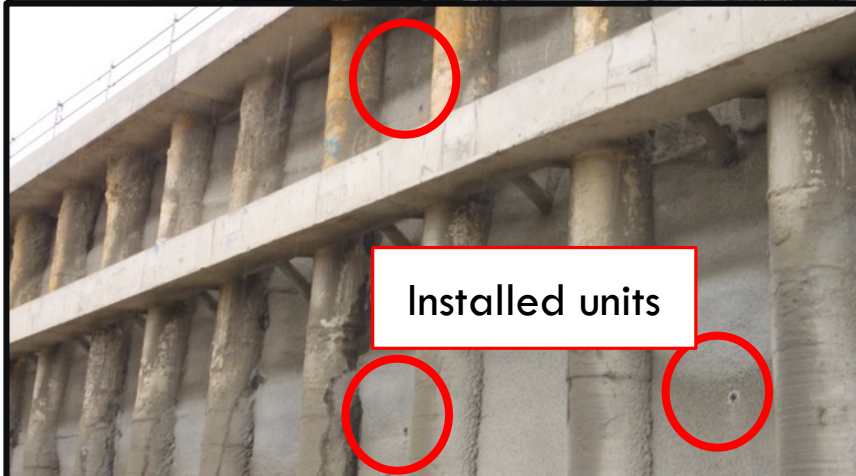
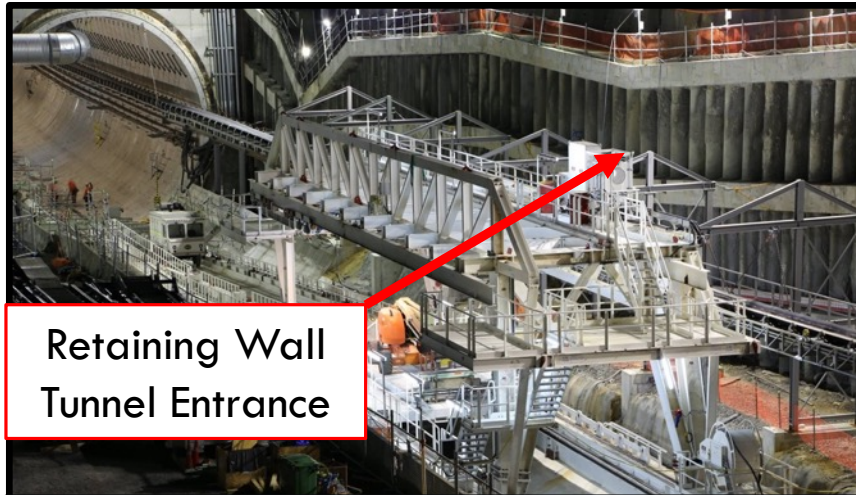
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INTERNATIONAL PROJECTS

**Waterview Tunnel Project, Auckland,
New Zealand. NZ Transport Agency**
230 2 1/5" units



Kings Hwy 7 & 404 Markham Project, Canada
Ontario Ministry of Transportation
20 4" units



SANTA ANA RIVER CHANNEL REACH 9

Location: Orange, Riverside & San Bernardino Counties, CA

Owner: US Army Corps of Engineers

Issue: Flood protection - channel widening, bank armoring, slope stabilization and environmental restoration

Solution: Two phases 160 - 6" PC units in Steel Sheet Pile

Result: Completed successfully.

Date: 2013 - Phase 1, 2016 - Phase 2, 2018 – Phase 5



HARLINGEN IRRIGATION DISTRICT

Location: Cameron County, TX (Rio Grande Valley)

Owner: US Department of Agriculture Natural Resources Conservation Service

Issue: Meet 100-year flood control requiring 2,900 In. ft. of **Drainage Channel Slope Stabilization**

Solution: Vinyl Sheet Pile with 400 - 2.5" ABS units every 6'

Result: "Now, excess runoff flows through the coarse gravel and the weep hole filters into the channel sediment-free."

Date: 2013



AESTHETIC COATINGS - CONCRETE RETAINING WALLS



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

PRACTICES WE CAN NOT AFFORD TO LOSE

Location: Tunnel B4, 1700 Buena Vista Blvd, The Villages, FL

Owner: The Villages

Issue: Hydrostatic pressure bleeding through seams caused continuous **peeling of aesthetic coatings**

Solution: 4" S.S. Open-End maintainable drains installed on wing walls.

Result: After 1st year success, installed more maintainable drains in other locations. **No sign of wall damage** or peeling, drains working as intoned.

Dates: 2016-2017



BLOCK, STEEL & POURED-IN-PLACE

**Block Wall Stabilization
Pottstown, PA**



**Steel Sheet Bridge Repair
Washakie County, WY**



**Wall Repair
Maryville, TN**

EXAMPLE CUSTOMERS/PROJECTS



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PRACTICES WE CAN NOT AFFORD TO LOSE

- Missouri Dept. of Transportation
- Alaska Dept. of Transportation
- Indiana Dept. of Transportation
- Nebraska Dept. of Transportation
- Michigan Dept. of Transportation
- Colorado Dept. of Transportation
- Texas Dept. of Transportation
- Illinois Dept. of Transportation
- Maine Dept. of Transportation
- Florida Dept. of Transportation
- Pennsylvania Dept. of Transportation
- New Hampshire Dept. of Transportation
- Federal Highway Administration
- National Park Service
- Army Corps of Engineers
- USDA/NRCS
- Florida Power & Light
- North Carolina Wildlife Resources Commission
- NAVFAC MID-ATLANTIC
- Southwest Florida Water Management District
- US Bureau of Reclamation
- St. Johns River Water Management District
- Pinellas County FL Utilities Dept. of Solid Waste
- Tennessee Valley Authority
- Walt Disney Golf Courses
- Port of Houston Texas
- North Carolina Wildlife Resources Commission
- Waterview Connection New Zealand
- Imperial Oil
- Exxon Oil
- Mosman Council Sydney Australia
- Canada Bridge King's Highway 7/401
- Michigan City Port Authority
- City of Lake Park Florida
- City of Salisbury Maryland
- City of Orlando Florida
- City of Jacksonville Florida
- City of Ft. Lauderdale Florida
- City of New Port Richey Florida



Over 130,000 installed!

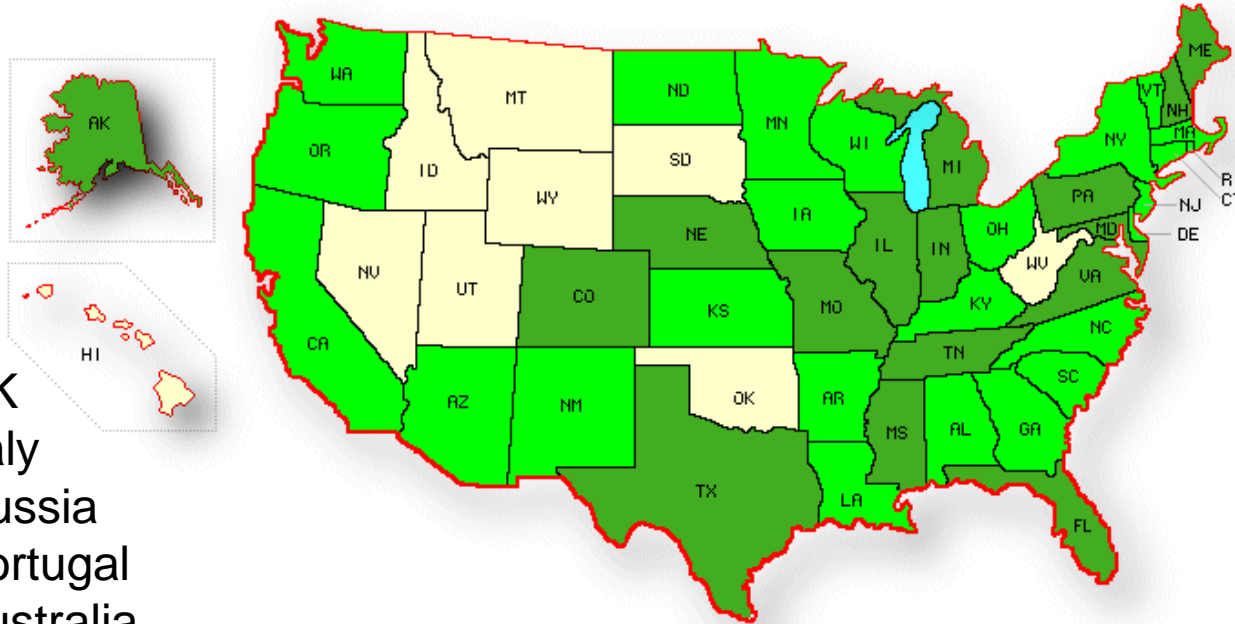
PRODUCT INSTALLATION MAP



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

PRACTICES WE CAN NOT AFFORD TO LOSE

-  - Installations
-  - DOT, FHWA, FLH Installations



World-wide Sales:

- Canada
- Mexico
- Belize
- Bahamas
- BVI
- Trinidad
- Columbia
- Mozambique
- UK
- Italy
- Russia
- Portugal
- Australia
- New Zealand
- Saudi Arabia

Sales in 41 states and 16 countries in 5 continents.

JET FILTER SYSTEM, LLC



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PRACTICES WE CAN NOT AFFORD TO LOSE

Working to create innovative weep hole filtration solutions since 2005.

14 North Central Avenue
Post Office Box 31
Casey, Illinois 62420
United States

Telephone: (800) 475-2029
Fax: (800) 475-2136
E-mail: info@jetfiltersystem.com
Web: www.jetfiltersystem.com

US PAT#: 7,615,148

MADE IN THE USA

[Maintainable Wall Drain Study](#)

