



Stormwater Management Operation & Maintenance Manual

PRC Hightstown

Tract A: Block 21; Lots 1-14, 20 & 26

Tract B: Block: 30; Lots: 1-7 & 10-13

Tract C: Block 8; Lot 12

Borough of Hightstown, Mercer County, New Jersey

August 2020

Prepared For

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Red Bank, NJ 07701

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TIDEFLEX™ OPERATION AND MAINTENANCE MANUAL



STORMWATER MANAGEMENT MAINTENANCE PLAN

The Owner will oversee the operation and maintenance of the stormwater management systems. Maintenance procedures for stormwater management facilities should follow the operation and maintenance procedures outlined below from the New Jersey Stormwater Best Management Practices Manual. This manual will be provided to the Owner to be kept on file. The owner is:

3PRC LLC
141 West Front Street
Suite 410
Red Bank, NJ 07701

INSTRUCTIONS FOR RESPONSIBLE PARTY

The party responsible for the maintenance of the stormwater management collection system shall follow through and abide by the following instructions in accordance with the NJDEP Stormwater Management Rules:

1. If there is a change in ownership, copies of this maintenance plan shall be provided to the future owner and operator of the stormwater management collection system.
2. The responsible party shall provide the local and county mosquito control or extermination commission a copy of this maintenance manual upon request.
3. The title and date of this maintenance plan and the name, address, and telephone number of the party responsible for the maintenance of the stormwater management collection system must be recorded on the deed of the property on which the facilities are located. Any change in this information due, for example, to a change in property ownership, must also be recorded on the deed.
4. The party responsible for the maintenance of the stormwater management collection system must evaluate this maintenance plan for effectiveness at least annually and revise as necessary.



5. A detailed written log of all preventative and corrective maintenance performed at the stormwater management collection system must be kept, including a record of all inspections and copies of maintenance-related work orders.
6. The person responsible for the maintenance of the stormwater management collection system should retain and, upon request, make available this maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

TRACT A

Stormwater management measures for Tract A consists of two manufactured treatment devices to provide water quality for runoff generated from vehicular surfaces. The manufactured treatment devices selected were the PerkFilter™ fabricated by Old Castle Infrastructure. Each MTD in Tract A utilizes a Tideflex® valve at the outlet pipe to provide backflow prevention and flooding protection. Tideflex® valves are unibody, rubber check valves which means they are not affected by rust, corrosion or UV light. The valves should be inspected after large storm events to confirm the valve can still operate as intended. The valve should be free of debris that would cause bypass. If debris exists, it needs to be removed and disposed of correctly. Mud, soil, or debris of any type must be cleared away from the valve. Bolts, clamps and any other fastening hardware should be inspected, complete, tightened, and otherwise in good working condition. A valve that does not seal after corrective maintenance has been conducted needs to be repaired or replaced.

The primary function of the MTDs is to filter out and retain pollutants to prevents them from entering Rocky Brook. In order to keep the system functioning as intended, the devices will periodically need to be inspected and cleaned to remove the build-up of sediment and other pollutants. Site conditions greatly influence maintenance frequency. Maintenance cleaning of the MTD should be performed by a service provider with experience in cleaning storm sewer catch basins, and whose personnel are trained in confined space entry procedures. An experienced service provider will understand the dangers posed by decomposing organic matter. **Odorless, toxic gases may be released when the chamber is serviced and pumped down.** Maintenance



procedures are outlined in the PerkFilter™ Operation and Maintenance Manual supplied in the appendix.

There are no stormwater detention measures proposed for Tract A.

TRACT B

Stormwater management measures for Tract B is similar to Tract A. Tract B consists of one manufactured treatment device to provide water quality for runoff generated from vehicular surfaces. The manufactured treatment device selected was the PerkFilter™ fabricated by Old Castle Infrastructure. Also similar to Tract A, the MTD utilizes a Tideflex® valve at the outlet pipe to provide backflow prevention and flooding protection.

The primary function of the MTD is to filter out and retain pollutants to prevents them from entering Rocky Brook. In order to keep the system functioning as intended, the devices will periodically need to be inspected and cleaned to remove the build-up of sediment and other pollutants. Site conditions greatly influence maintenance frequency. Maintenance cleaning of the MTD should be performed by a service provider with experience in cleaning storm sewer catch basins, and whose personnel are trained in confined space entry procedures. An experienced service provider will understand the dangers posed by decomposing organic matter. **Odorless, toxic gases may be released when the chamber is serviced and pumped down.** Maintenance procedures are outlined in the PerkFilter™ Operation and Maintenance Manual supplied in the appendix.

There are no stormwater detention measures proposed for Tract B.

TRACT C

Stormwater management measures for Tract C consists of a pervious pavement system, a closed underground detention system containing four (4) 120-foot lengths of 42” ADS pipe and an outlet control structure at the downstream end of the underground system to attenuate flows. The



pervious pavement system is designed to treat runoff from the Tract C parking lot before the runoff is collected and discharged into the underground detention system.

Proper care and attention to the long-term maintenance of the pervious pavement system is critically important to its effectiveness and design life. The Owner should avoid sealing or repaving with impervious material. In particular, never use asphalt or other tar-type sealers on pervious pavement. The pervious pavement system should be periodically, visually inspected to ensure that it is clear of debris and sediments and de-waters between storms.

The structural components of the underground detention basin must be inspected, at least once annually, for cracking, subsidence, spalling, erosion and deterioration. The components of the basin which are expected to receive and/or trap debris must be inspected for clogging at least twice annually. Sediment removal should take place when the basin is thoroughly dry. Disposal of debris, trash, sediment and other waste material must be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste and regulations.

PREVENTIVE MAINTENANCE PROCEDURES

The purpose of preventative maintenance is to assure that the stormwater management collection system remains operational and effective at all times, while minimizing the need for corrective maintenance. The preventative maintenance plan for the stormwater management collection system associated with this project should comply with the following schedule.

A. Removal and Disposal of Trash and Debris

A regular scheduled program of debris and trash removal from the stormwater management collection system will reduce the chance of structures from becoming clogged and inoperable during storm events. All components of the system expected to receive debris and trash must be inspected for clogging and excessive accumulation at least four times annually as well as after every storm exceeding 1 inch of rainfall. Disposal of debris, trash, and other waste material should be done at suitable disposal/ recycling sites and in compliance with all applicable local, state, and federal waste regulations. Only suitable disposal and recycling sites will be utilized.



B. Sediment Removal and Disposal

Accumulated sediment will be removed before it threatens the operation of the stormwater management collection system. All components of the system expected to receive sediment must be inspected for clogging and excessive sediment accumulation at least four times annually as well as after every storm exceeding 1 inch of rainfall. Usually sediment accumulation will be small enough to remedy with a shovel and a wheelbarrow. However if the amount of sediment is too large to be removed using a shovel and wheelbarrow, the owner must hire a sub-contractor to remove the sediment with a vacuum truck.

Disposal of sediment and other waste material should be done at suitable disposal/ recycling sites and in compliance with all applicable local, state, and federal waste regulations. Only suitable disposal and recycling sites will be utilized.

C. Inspection

Regularly scheduled inspections of the facilities will be performed at least four times annually as well as after every storm exceeding 1 inch of rainfall. The primary purpose of the inspection is to ascertain the operational condition and safety of the facilities. Inspections will also provide information on the effectiveness of regularly scheduled preventative and aesthetic maintenance procedures, and will help to identify where changes in the extent and scheduling of the procedures are warranted. Finally, the facilities inspections will also be used to determine the need for, and timing of, corrective maintenance procedures.

D. Reporting

The recording of all maintenance work and inspections provide valuable data on the facilities condition. Review of this information will also help to establish more efficient and beneficial maintenance procedures and practices. A written log should be kept of the work performed during inspections. An annual maintenance report should be prepared summarizing the work performed during that calendar year, current condition of the system and any improvements proposed for the upcoming year.



CORRECTIVE MAINTENANCE PROCEDURES

Corrective Maintenance may be required on an emergency or non-routine basis to correct problems or malfunctions and to restore the intended operation and safe condition of the stormwater management collection system.

E. Removal of Debris and Sediment

Sediment, debris and trash, which threaten the discharge capacity of the stormwater management collection system, will be removed immediately and properly disposed of in a timely manner. Equipment and personnel must be available to perform the removal work on short notice. Disposal of debris, trash, sediment, and other waste material should be done at suitable disposal/ recycling sites and in compliance with all applicable local, state, and federal waste regulations. Only suitable disposal and recycling sites will be utilized.

F. Structural Repairs

Structural damage to the stormwater management facilities from vandalism, flood events or other causes must be repaired promptly. Equipment, materials and personnel must be available to perform these repairs on short notice. The immediacy of the repairs will depend upon the nature of damage and its effects on the safety and operation of the facilities. The analysis of structural damage, design and performance of structural repairs shall only be undertaken by qualified personnel. The industry standard for life expectancy of precast concrete structures is 40 years.

G. Snow and Ice Removal

Accumulations of snow and ice can threaten the functionality of a stormwater management collection system, particularly at the inlets. Structures will be inspected after major storm events or extended periods of cold weather. Providing the equipment, materials and personnel necessary to monitor and remove snow and ice from these areas is critical to the continued functioning of the facility during the winter months.



ENFORCEMENT

It is the responsibility of the Borough to enforce the maintenance program on the owner. If the required maintenance is not performed, the Borough has the right to contract the work to be done, in which case, the responsible party will be back-charged or tax levied to recuperate the associated fees.

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APPENDIX

STORMWATER FACILITIES MAP

MAINTENANCE AND INSPECTION CHECKLISTS

PERKFILTER™ OPERATION AND MAINTENANCE MANUAL

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STORMWATER FACILITIES MAP

POROUS PAVEMENT

UNGROUND BASIN

STORMWATER
OUTFALL

MANUFACTURED
TREATMENT DEVICE

MANUFACTURED
TREATMENT DEVICE

STORMWATER
OUTFALL

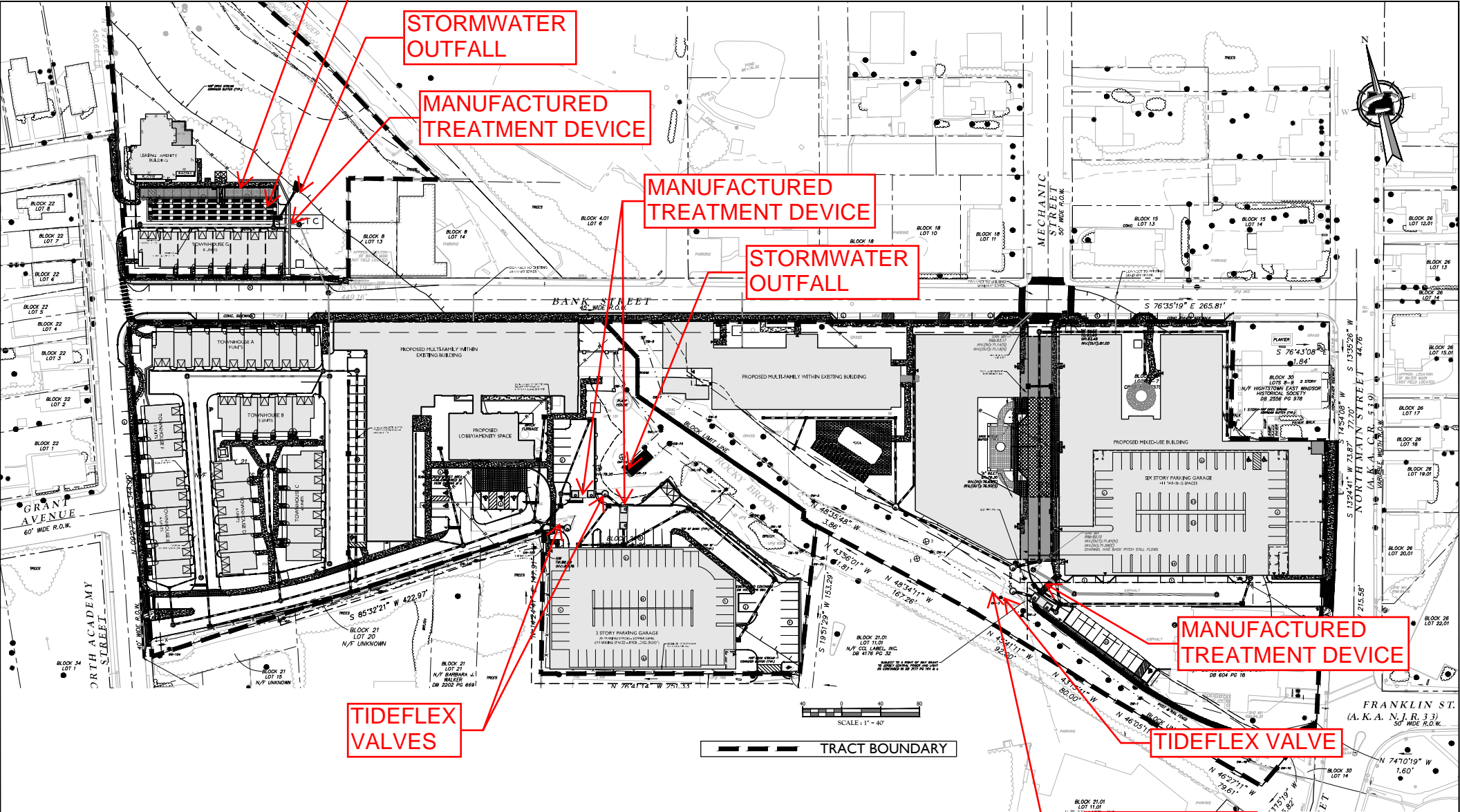
MANUFACTURED
TREATMENT DEVICE

TIDEFLEX
VALVES

TIDEFLEX VALVE

STORMWATER
OUTFALL

STORMWATER FACILITIES MAP





MAINTENANCE AND INSPECTION CHECKLISTS

Maintenance Work Order and Checklist
for
Stormwater Management Facilities

Name of Facility: _____
 Location: _____ Date: _____
 Crew: _____ Work Started: date _____ time _____
 Equipment: _____ Work Completed: date _____ time _____
 Weather: _____ Total Manhours of Work: _____

A. Preventative Maintenance

Work Item	Items Required (√)	Items Done (√)	Comments and Special Instructions
1. Grass Cutting			
A. Bottoms			
B. Embankments and Side Slopes			
C. Perimeter Areas			
D. Access Areas and Roads			
E. Other:			
2. Grass Maintenance			
A. Fertilizing			
B. Re-Seeding			
C. De-Thatching			
D. Pest Control			
E. Other:			
3. Vegetative Cover			
A. Fertilizing			
B. Pruning			
C. Pest Control			
D. Other:			
4. Trash and Debris Removal			
A. Bottoms			
B. Embankments and Side Slopes			
C. Perimeter Areas			
D. Access Areas and Roads			
E. Inlets			
F. Outlets and Trash Racks			
G. Other:			

Work Item	Items Required (√)	Items Done (√)	Comments and Special Instructions
5. Sediment Removal			
A. Inlets			
B. Outlets and Trash Racks			
C. Bottoms			
D. Other:			

6. Mechanical Components			
A. Valves			
B. Sluice Gates			
C. Pumps			
D. Fence Gates			
E. Locks			
F. Access Hatches			
G. Other:			

7. Elimination of Potential Mosquito Breeding Habitats			

8. Pond Maintenance			
A. Aeration Equipment			
B. Debris and Trash Removal			
C. Weed Removal			
D. Other:			

9. Other Preventative Maintenance			
A.			
B.			
C.			

B. Corrective Maintenance

Work Item	Items Required (√)	Items Done (√)	Comments and Special Instructions
1. Removal of Debris & Sediment			
2. Structural Repairs			
3. Dam, Embankment & Slope Repairs			
4. Dewatering			
5. Pond Maintenance			
6. Control of Mosquitoes			
7. Erosion Repair			
8. Fence Repair			
9. Elimination of Trees, Brush, Roots & Animal Burrows			
10. Snow & Ice Removal			
11. Other			

C. Aesthetic Maintenance

Work Item	Items	Items	Comments and Special Instructions
	Required	Done	
	(√)	(√)	
1. Graffiti Removal	<input type="checkbox"/>	<input type="checkbox"/>	
2. Grass Trimming	<input type="checkbox"/>	<input type="checkbox"/>	
3. Weeding	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	

Remarks (Refer to Item No. , If Applicable):

Work Order Prepared By: _____

Work Completed By: _____

C. Aesthetic Maintenance

Work Item

1. Graffiti Removal

--	--	--	--	--	--	--	--	--	--

2. Grass Trimming

--	--	--	--	--	--	--	--	--	--

3. Weeding

--	--	--	--	--	--	--	--	--	--

4. Other:

--	--	--	--	--	--	--	--	--	--

Remarks (Refer to Item No. , If Applicable):

Inspection Checklist
for
Stormwater Management Facilities

Name of Facility _____

Location: _____ Date: _____

Weather: _____

Facility Item	O.K. ¹	Routine ²	Urgent ³	Comments ⁴
1. Embankments and Side Slopes				
A. Vegetation				
B. Linings				
C. Erosion				
D. Settlement				
E. Sloughing				
F. Trash and Debris				
G. Seepage				
H. Aesthetics				
I. Other:				

2. Bottoms (Detention and Infiltration)				
A. Vegetation				
B. Erosion				
C. Standing Water				
D. Settlement				
E. Trash and Debris				
F. Sediment				
G. Aesthetics				
H. Other:				

3. Low Flow Channels (Detention)				
A. Vegetation				
B. Lining				
C. Erosion				
D. Settlement				
E. Standing Water				
F. Trash and Debris				
G. Sediments				
H. Other:				

Facility Item O.K.¹ Routine² Urgent³ Comments⁴

4. Ponds (Retention)

A. Vegetation				
B. Shoreline Erosion				
C. Aeration Equipment				
D. Trash and Debris				
E. Sediment				
F. Water Quality				
G. Other:				

5. Inlet Structure

A. Condition of Structure				
B. Erosion				
C. Trash and Debris				
D. Sediment				
E. Aesthetics				
F. Other:				

6. Outlet Structure (Detention & Retention)

A. Condition of Structure				
B. Erosion				
C. Trash and Debris				
D. Sediment				
E. Mechanical Components				
F. Aesthetics				
G. Other:				

7. Emergency Spillway

A. Vegetation				
B. Lining				
C. Erosion				
D. Trash and Debris				
E. Other:				

8. Perimeter

A. Vegetation				
B. Erosion				
C. Trash and Debris				
D. Fences and Gates				
E. Aesthetics				
F. Other:				

9. Access Roads

A. Vegetation				
B. Road Surface				
C. Fence and Gates				
D. Erosion				
E. Aesthetics				
F. Other:				

Facility Item	O.K. ¹	Routine ²	Urgent ³	Comments ⁴
10. Miscellaneous				
A. Effectiveness of Exist. Maint. Program				
B. Dam Inspections				
C. Potential Mosquito Habitats				
D. Mosquitoes				
E.				
F.				
G.				

¹ The item checked is in good condition and the maintenance program is adequate.

² The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.

³ The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

⁴ Provide explanation and details if columns 2 or 3 are checked.

Remarks (Refer to Item No. If Applicable):

Inspector: _____

Facility Item

9. Access Roads

A. Vegetation										
B. Road Surface										
C. Fence and Gates										
D. Erosion										
E. Aesthetics										
F. Other										

10. Miscellaneous

A. Effectiveness of Exist. Maint. Program										
B. Dam Inspections										
C. Potential Mosquito Habitats										
D. Mosquitoes										
E.										
F.										
G.										

¹ The item checked is in good condition and the maintenance program is adequate.

² The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.

³ The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

Remarks (Refer to Item No. If Applicable):

Cost Data		
SWMF Maintenance Equipment and Material Costs		
Grass Maintenance Equipment		
	Purchase	Rent (Per Day)
Hand Mower	\$300-\$500	\$25-\$40
Riding Mower	\$3,000-\$5,000	\$75-\$100
Tractor Mower	\$15,000-\$20,000	\$100-\$300
Trimmer/ Edger	\$200-\$500	\$25-\$35
Spreader	\$100-\$200	\$20-\$30
Chemical Sprayer	\$200-\$500	\$25-\$40

Vegetative Cover Maintenance Equipment		
	Purchase	Rent (Per Day)
Hand Saw	\$15	\$5
Chain Saw	\$300-\$500	\$15-\$35
Pruning Shears	\$25	\$5
Shrub Trimmer	\$200	\$25-\$35
Brush Chipper	\$1,000-\$5,000	\$50-\$150

Transportation Equipment			
	Purchase	Lease (per month)	Rent (Per Day)
Van	\$10,000-\$15,000	\$400	\$50-\$70
Pickup Truck	\$10,000-\$15,000	\$400	\$50-\$70
Dump Truck	\$30,000-\$50,000	\$1,200	\$75-\$150
Light Duty Trailer	\$3,000-\$5,000	\$150	\$30-\$50
Heavy Duty Trailer	\$10,000-\$20,000	\$500	\$100-\$200

Debris, Trash and Sediment Removal Equipment			
	Purchase	Lease (per month)	Rent (Per Day)
Front End Loader	\$50,000-\$100,000	\$1,500-\$2,000	\$200-\$400
Backhoe	\$30,000-\$50,000	\$1,200	\$150-\$300
Excavator	\$100,000+	\$2,000+	\$400-\$1,000
Vacuum Truck	\$100,000+	\$2,000+	\$400-\$1,000

Miscellaneous Equipment		
	Purchase	Rent (Per Day)
Shovel	\$15	\$5
Leaf Rake	\$15	\$5
Soil Rake	\$15	\$5
Pick	\$15	\$5
Wheelbarrow	\$100-\$200	\$10
Gloves	\$5	N/A
Portable Compressor	\$500-\$1,000	\$50-\$100
Portable Generator	\$500-\$1,000	\$50-\$100
Concrete Mixer	\$500-\$1,000	\$25-\$50
Welding Equipment	\$500-\$1,500	\$35-\$70

Materials	
	Purchase
Topsoil	\$35/Cubic Yard
Fill Soil	\$15/Cubic Yard
Grass Seed	\$5/Pound
Soil Amenities (Fertilizer, Lime, etc.)	\$0.05/sq.ft.
Chemicals (Pesticides, Herbicides, etc.)	\$10/gallon
Mulch	\$25/Cubic Yard
Paint	\$20/gallon
Paint Remover	\$10/gallon
Machine/Motor Lubricants	\$5/gallon
Dry Mortar Mix	\$4/50 pound bag
Concrete Delivered to Site	\$60-\$100/Cubic Yard

Notes:

1. Estimated equipment costs are based upon Industrial/Commercial grade equipment
2. The cost estimates presented above are intended for general planning and comparison purposes. See text for information regarding the basis of the cost estimates, instructions regarding their recommended use, and procedures for developing more specific cost estimates where necessary.
3. See CHAPTER FOUR - MAINTENANCE EQUIPMENT AND PROCEDURES for additional information on SWMF maintenance equipment and materials.

Cost Data		
Costs of SWMF Maintenance Tasks		
Preventative Maintenance Tasks (Values expressed in Man-Hours)		
	Small Facility	Large Facility
Grass Cutting	1	1-2
Grass Maintenance	0.5	1
Trash & Debris Removal	0.5	1
Sediment Removal	4	8
Mobilization	1	1
Inspection & Reporting	1	2

Corrective Maintenance Tasks (Values expressed in Man-Hours)		
	Small Facility	Large Facility
Trash & Debris Removal	4	8
Structural Repairs	24	40
Dewatering	4	80
Mosquito Extermination	1	2-4
Erosion Repair	4	8
Fence Repair	2-4	4-8
Snow & Ice Removal	1	2
Mobilization	2	2

Aesthetic Maintenance Tasks (Values expressed in Man-Hours)		
	Small Facility	Large Facility
Grass Trimming	0.5	2
Weed Control	0.5	2
Landscape Maintenance	1-2	2-4
Graffiti Removal	2-4	4-8

Notes:

1. Facility Size Definitions:

Small Facility: Total SWMF Site Area ¼ Acre

Large Facility: Total SWMF Site Area 1 Acre

Appropriate adjustments to the cost estimates presented above should be made as necessary to account for actual SWMF size. See text for further information.

2. Cost estimates are presented in terms of man-hours. These values should be used in conjunction with applicable personnel rates to determine labor costs for a specific program or facility.
3. The cost estimates presented above are intended for general planning and comparison purposes. See text for information regarding the basis of the cost estimates, instructions regarding their recommended use, and procedures for developing more specific cost estimates where necessary.
4. See CHAPTER FOUR - MAINTENANCE EQUIPMENT AND PROCEDURES for detailed information regarding SWMF maintenance tasks listed above.



PERKFILTER™ OPERATION AND MAINTENANCE MANUAL



PERKFILTER™

Inspection and Maintenance Guide



PerkFilter™ Media Filtration System

Description

The PerkFilter is a stormwater treatment device used to remove pollutants from urban runoff. Impervious surfaces and other urban and suburban landscapes generate a variety of contaminants that can enter stormwater and pollute downstream receiving waters. The PerkFilter is a media-filled cartridge filtration device designed to capture and retain sediment, gross solids, metals, nutrients, hydrocarbons, and trash and debris. As with any stormwater treatment system, the PerkFilter requires periodic maintenance to sustain optimum system performance.

Function

The PerkFilter is a water quality treatment system consisting of three chambers: an inlet chamber, a filter cartridge treatment chamber, and an outlet chamber (Figure 1). Stormwater runoff enters the inlet chamber through an inlet pipe, curb opening, or grated inlet. Gross solids are settled out, and floating trash and debris are trapped in the inlet chamber. Pretreated flow is then directed to the treatment chamber through an opening in the baffle wall between the inlet chamber and treatment chamber. The treatment chamber contains media-filled filter cartridges (Figure 2) that use physical and chemical processes to remove pollutants. During a storm event, runoff pools in the treatment chamber before passing radially through the cylindrical cartridges from the outside surface, through the media for treatment, and into the center of the cartridge. At the center of the cartridge is a center tube assembly designed to distribute the hydraulic load evenly across the surface of the filter cartridge and control the treatment flow rate. The center tube assembly discharges treated flow through the false floor and into the outlet chamber. A draindown feature built into each cartridge allows the treatment chamber to dewater between storm events.

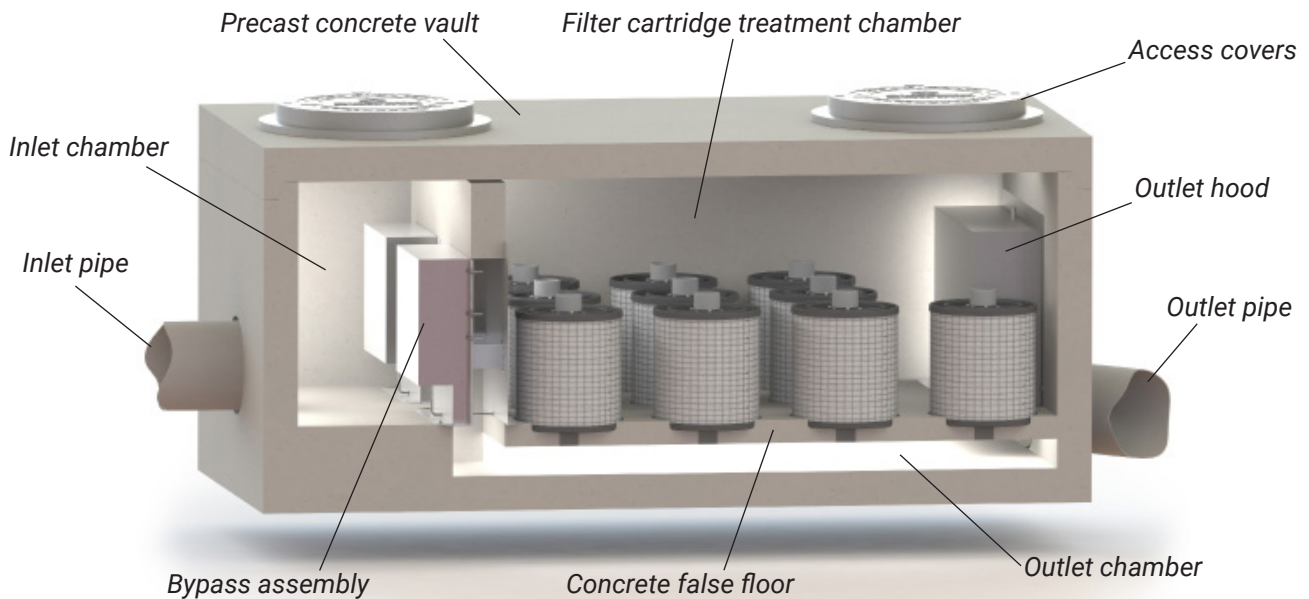


Figure 1. Schematic of the PerkFilter system.

All PerkFilter systems include a high-flow bypass assembly to divert flow exceeding the treatment capacity of the filter cartridges around the treatment chamber. The bypass assembly routes peak flow from the inlet chamber directly to the outlet chamber, bypassing the treatment chamber to prevent sediment and other captured pollutants from being scoured and re-entrained by high flow. Treated flow and bypass flow merge in the outlet chamber for discharge by a single outlet pipe.

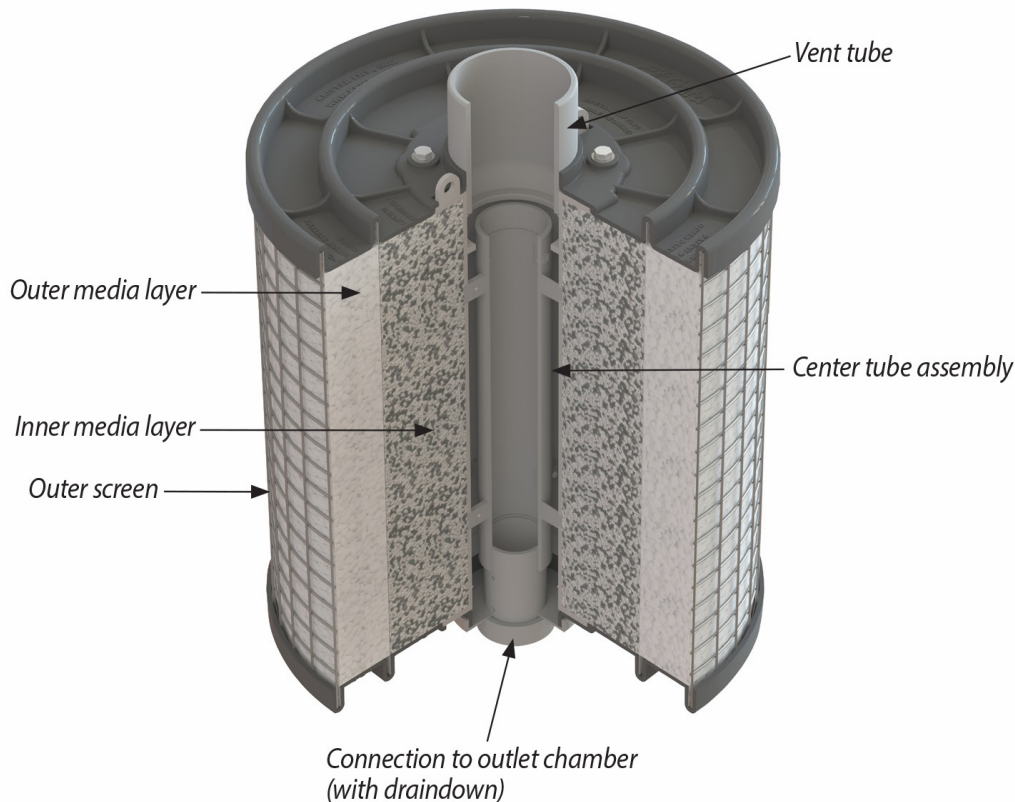


Figure 2. Schematic of PerkFilter cartridge.

Configuration

The PerkFilter structure may consist of a vault, manhole, or catch basin configuration. Catch basin units may be fabricated from concrete or steel. Internal components including the PerkFilter cartridges are manufactured from durable plastic and stainless steel components and hardware. All cartridges are 18 inches in diameter and are available in two heights: 12-inch and 18-inch. Cartridges may be used alone or may be stacked (Figure 3) to provide 24-inch and 30-inch combinations. The capacity of each cartridge or cartridge combination is dictated by the allowable operating rate of the media and the outer surface area of the cartridge. Thus, taller cartridges have greater treatment capacity than shorter cartridges, but they also require more hydraulic drop across the system. Cartridges may be filled with a wide variety of media but the standard mix is composed of zeolite, perlite and carbon (ZPC).

Access to an installed PerkFilter system is typically provided by ductile iron castings or hatch covers. The location and number of access appurtenances is dependent on the size and configuration of the system.

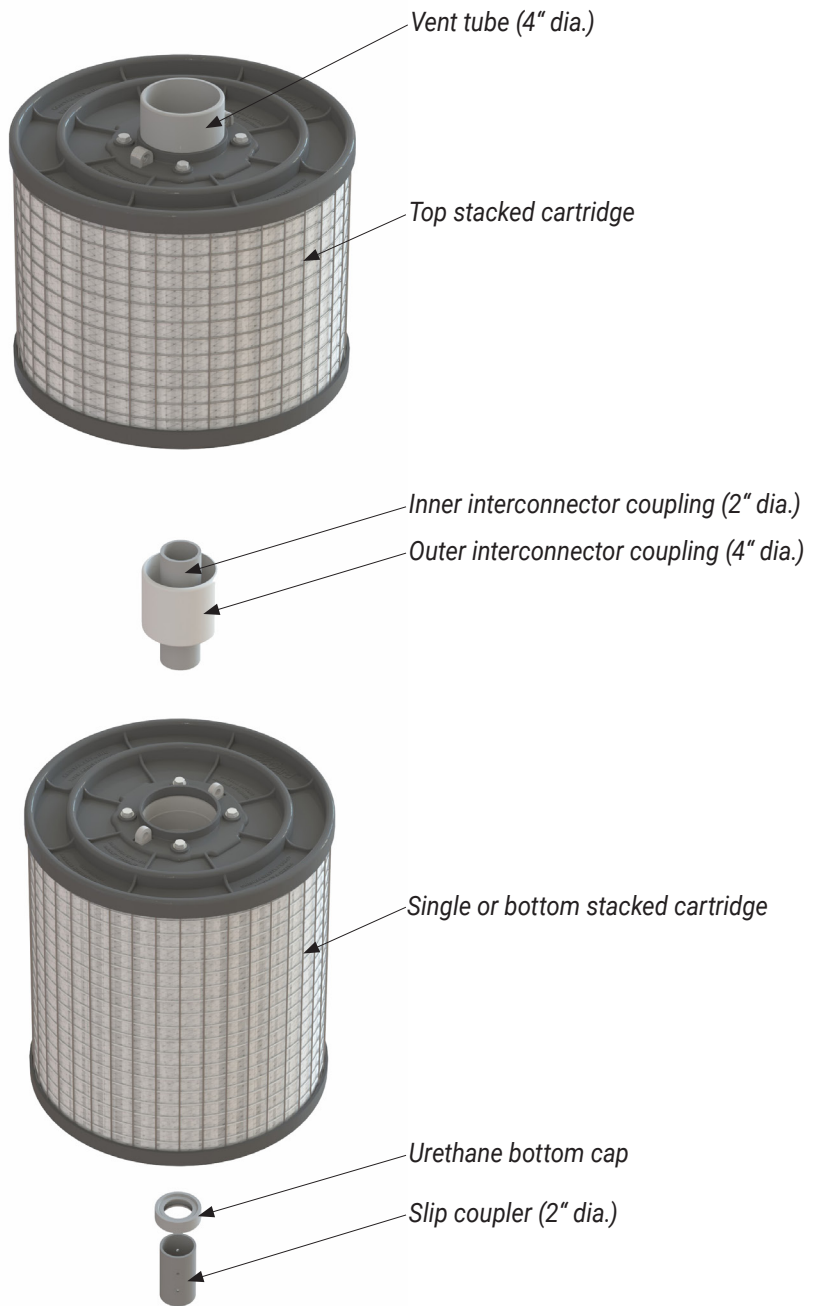


Figure 3. Schematic of stacked cartridges and connector components.

Maintenance Overview

State and local regulations require all stormwater management systems to be inspected on a periodic basis and maintained as necessary to ensure performance and protect downstream receiving waters. Maintenance prevents excessive pollutant buildup that can limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Inspection and Maintenance Frequency

The PerkFilter should be inspected on a periodic basis, typically twice per year, and maintained as required. Initially, inspections of a new system should be conducted more frequently to help establish an appropriate site-specific inspection frequency. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. In most cases, the optimum maintenance interval will be one to three years. Inspection and maintenance activities should be performed only during dry weather periods.

Inspection Equipment

The following equipment is helpful when conducting PerkFilter inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

PerkFilter inspections are visual and may be conducted from the ground surface without entering the unit. To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be checked and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Inspect the internal components and note whether there are any broken or missing parts. In the unlikely event that internal parts are broken or missing, contact Oldcastle Infrastructure at (800) 579-8819 to determine appropriate corrective action.
- Note whether the inlet pipe is blocked or obstructed. The outlet pipe is covered by a removable outlet hood and cannot be observed without entering the unit.
- Observe, quantify and record the accumulation of floating trash and debris in the inlet chamber. The significance of accumulated floating trash and debris is a matter of judgment. A long-handled net may be used to retrieve the bulk of trash and debris at the time of inspection if full maintenance due to accumulation of floating oils or settled sediment is not yet warranted.

- Observe, quantify and record the accumulation of oils in the inlet chamber. The significance of accumulated floating oils is a matter of judgment. However, if there is evidence of an oil or fuel spill, immediate maintenance by appropriate certified personnel is warranted.
- Observe, quantify and record the average accumulation of sediment in the inlet chamber and treatment chamber. A calibrated dipstick, tape measure, or sludge sampler may be used to determine the amount of accumulated sediment in each chamber. The depth of sediment may be determined by calculating the difference between the measurement from the rim of the PerkFilter to the top of the accumulated sediment, and the measurement from the rim of the PerkFilter to the bottom of the PerkFilter structure. Finding the top of the accumulated sediment below standing water takes some practice and a light touch, but increased resistance as the measuring device is lowered toward the bottom of the unit indicates the top of the accumulated sediment.
- Finally, observe, quantify and record the amount of standing water in the treatment chamber around the cartridges. If standing water is present, do not include the depth of sediment that may have settled out below the standing water in the measurement.

Maintenance Triggers

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Internal components are broken or missing.
- Inlet piping is obstructed.
- The accumulation of floating trash and debris that cannot be retrieved with a net and/or oil in the inlet chamber is significant.
- There is more than 6" of accumulated sediment in the inlet chamber.
- There is more than 4" of accumulated sediment in the treatment chamber.
- There is more than 4" of standing water in the treatment chamber more than 24 hours after end of rain event.
- A hazardous material release (e.g. automotive fluids) is observed or reported.
- The system has not been maintained for 3 years (wet climates) to 5 years (dry climates).

Maintenance Equipment

The following equipment is helpful when conducting PerkFilter maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- 9/16" socket and wrench to remove hold-down struts and filter cartridge tops
- Replacement filter cartridges
- Vacuum truck with water supply and water jet

Contact Oldcastle Infrastructure at (800) 579-8819 for replacement filter cartridges. A lead time of four weeks is recommended.

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is necessary to maintain vault and manhole PerkFilter configurations. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Confined space entry is not required for catch basin PerkFilter configurations. Once safety measures such as traffic control are deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove floating trash, debris and oils from the water surface in the inlet chamber using the extension nozzle on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the inlet chamber and evacuate all accumulated sediment from the inlet chamber. Some jetting may be required to fully remove sediment. The inlet chamber does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
- Remove the hold-down strut from each row of filter cartridges and then remove the top of each cartridge (the top is held on by four 9/16" bolts) and use the vacuum truck to evacuate the spent media. When empty, the spent cartridges may be easily lifted off their slip couplers and removed from the vault. The couplers may be left inserted into couplings cast into the false floor to prevent sediment and debris from being washed into the outlet chamber during washdown.
- Once all the spent cartridges have been removed from the structure, the vacuum truck may be used to evacuate all accumulated sediment from the treatment chamber. Some jetting may be required to fully remove sediment. Take care not to wash sediment and debris through the openings in the false floor and into the outlet chamber. All material removed from the PerkFilter during maintenance including the spent media must be disposed of in accordance with local, state, and/or federal regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Place a fresh cartridge in each cartridge position using the existing slip couplers and urethane bottom caps. If the vault is equipped with stacked cartridges, the existing outer and inner interconnector couplers must be used between the stacked cartridges to provide hydraulic connection. Transfer the existing vent tubes from the spent cartridges to the fresh cartridges. Finally, refit the struts to hold the fresh cartridges in place.
- Securely replace access covers, as appropriate.
- Make arrangements to return the empty spent cartridges to Oldcastle Infrastructure.

PerkFilter Inspection and Maintenance Log

Location _____

Structure Configuration and Size:

Inspection Date _____

- Vault _____ feet x _____ feet
- Manhole _____ feet diameter
- Catch Basin _____ feet x _____ feet

Number and Height of Cartridge Stacks:

Media Type:

Count _____ each 12" 18" 24" 30"

ZPC Perlite Other _____

Condition of Internal Components

Notes:

- Good Damaged Missing

Inlet or Outlet Blockage or Obstruction

Notes:

- Yes No

Floating Trash and Debris

Notes:

- Significant Not Significant

Floating Oils

Notes:

- Significant Not Significant Spill

Sediment Depth in Inlet Chamber

Notes:

Inches of Sediment: _____

Sediment Depth in Treatment Chamber

Notes:

Inches of Sediment: _____

Standing Water in Treatment Chamber

Notes:

Inches of Standing Water: _____

Maintenance Required

- Yes - Schedule Maintenance No - Inspect Again in _____ Months

PERKFILTER™

OUR MARKETS



**BUILDING
STRUCTURES**



COMMUNICATIONS



WATER



ENERGY



TRANSPORTATION

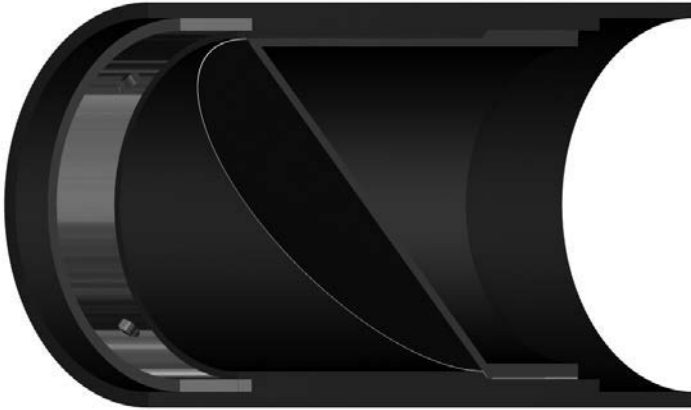


TIDEFLEX™ OPERATION AND MAINTENANCE MANUAL

CHECKMATE[®]

INLINE CHECK VALVES

INSTALLATION, OPERATION AND MAINTENANCE MANUAL



The revolutionary design of the CheckMate[®] Inline Check Valve provides superior backflow prevention and odor mitigation in stormwater, CSO and SSO outfalls. The CheckMate's[®] custom-engineered, all-rubber unibody design eliminates costly backflow from oceans, rivers and interceptors. The valve's unique elastomer fabric and wire reinforced design provides a proven record of maintenance-free performance, cost savings and results that no other inline check valve can match. The CheckMate[®] is built to suit all your site-specific and flow needs.

The CheckMate[®] has a 100% fabric and elastomer construction that eliminates corrosion problems. Because the CheckMate[®] is made with a unibody construction, there are no mechanical components that trap debris, corrode or fail.

The CheckMate[®] Valve's inherent flexibility virtually eliminates seating problems. The CheckMate[®] remains in the closed position until forward differential pressure opens it. The fabric-reinforced elastomer CheckMate[®] Valve seals around silt and small debris, preventing unwanted backflow.

The major advantage of the CheckMate[®] Valve is its extremely low headloss. The CheckMate[®] can open to a near full pipe diameter. This maximizes flow capacity of the outfall, which is particularly beneficial in low-lying areas where limited driving head is available.

Tideflex[®] Technologies recommends pinning all CheckMate[®] Valves for added security and stability. CheckMate's[®] effectively have a zero face-to-face dimension because they fit completely inside of the pipe. No modification of piping is required provided adequate pipe length exists.

IMPORTANT

Please take a moment to **review this manual**. The improper installation or use of this product may result in personal injury, product failure, or reduced product life. Tideflex[®] Technologies can accept NO liability resulting from the improper use or installation of this product. If you have any questions or problems, please call the customer service department at (412) 279-0044. We appreciate your comments. Thank you for choosing Tideflex[®] Technologies.

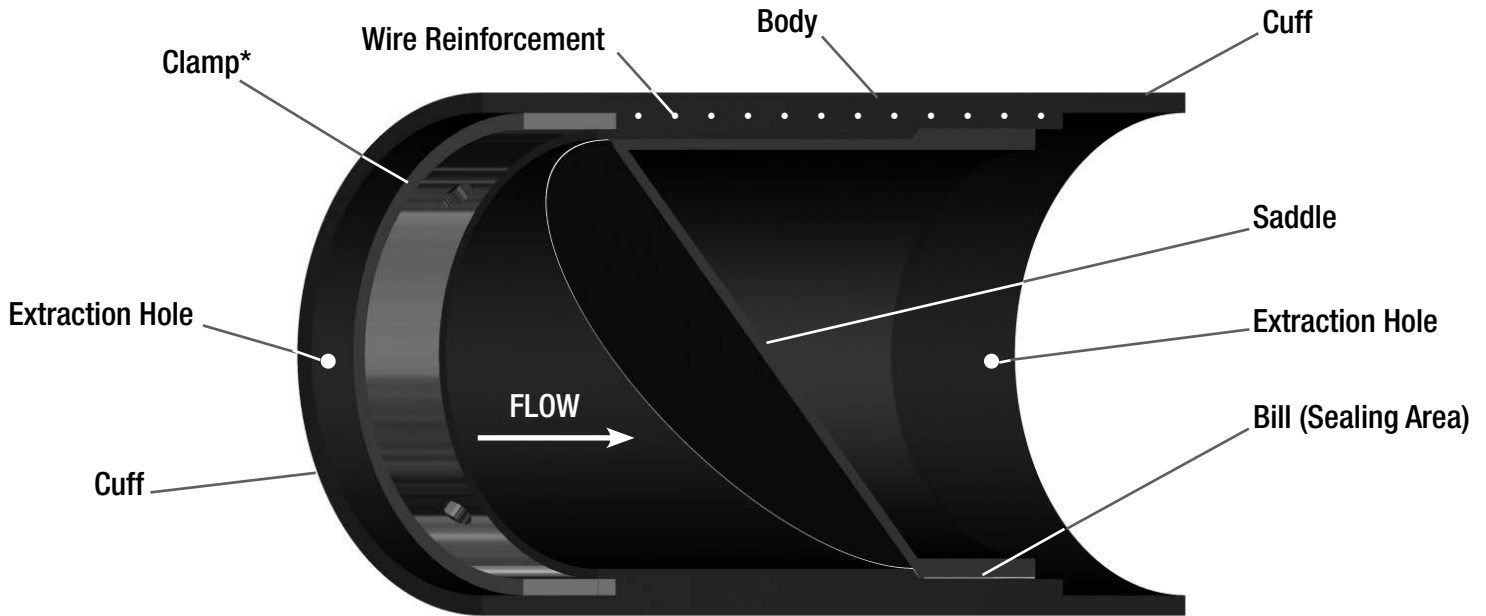
CheckMate® Installation Procedure

NEVER...
Install the valve at an angle

NEVER...
Use Sharp Tools on Rubber

NEVER...
Exceed Design Back Pressure

NEVER...
Install the Valve Backwards



*Clamps are installed in the upstream or downstream cuff, depending upon the application. The illustration above is shown clamped upstream.

CHECKMATE® INSTALLATION

1. Product Shipping

Valve sizes 2" - 18" are furnished with one clamp. Valves 20" - 60" ship with two clamps. 72" valves ship with three clamps.

NOTE: A clamp is installed on each end of the valve to keep the valve's shape during transit and storage. Once the installation orientation is determined the CheckMate® valve will be clamped from either the upstream or downstream side. **For valves with two or three clamps, they can be installed onto the same side of the valve and offset from each other, as illustrated in Figure 1.**

2. Unpacking & Lifting

Do not use sharp tools when unpacking this product as it may damage the valve.

For larger CheckMate® valves, the valve should be lifted with either a sling or with supports around the O.D. at each side of the valve to ease the installation procedure. Do not place an object through the valve in order to lift.

CAUTION: Do not try to bend, collapse or fold the valve in order to facilitate the installation as this will cause permanent damage and will not allow the valve to return to a fully round shape.

3. Inspection of Pipe I.D.

Check the inside diameter (I.D.) of the pipe section for rough or damaged areas. The inside surface should be uniform and relatively smooth. Long gouges or cracks in the pipe may allow water to pass and should be filled prior to installation. Do not attempt to install a CheckMate® in a smaller pipe I.D.

4. Pipe I.D. Measurements

The pipe I.D. is to be checked in the field. It should be a consistent diameter for the length of valve and should not be out of round. When there is a +/- tolerance on the pipe I.D., the CheckMate® Valve should be ordered to the smallest pipe I.D.. Then, rubber adhesive strip can be applied to both CheckMate® cuffs to build the cuff O.D. up to the actual pipe I.D. See procedure in #5.

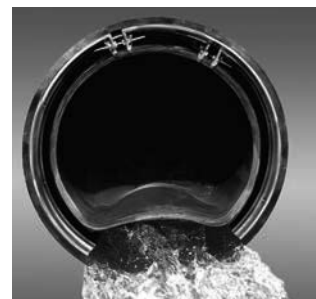


Figure 1 – Clamps shown installed on the same side of valve

CheckMate® Rubber Adhesive Strip Build Up Procedure

5. Rubber Adhesive Strip Build up

When valve O.D. is smaller than the pipe I.D., one-sided rubber adhesive strip is used to build up the O.D. of both CheckMate® cuffs to the actual pipe I.D.

NOTICE: Clean and dry the exterior of the valve prior to beginning rubber adhesive strip build up procedure.



STEP A: Place the valve on a solid, flat surface with the clamped end hanging slightly over the edge of the surface.



STEP B: Slowly rotate the valve while firmly pressing the rubber adhesive strip onto itself in concentric layers until valve O.D. is equal to or a fraction smaller than pipe I.D.



STEP C: Repeat steps A and B on the opposite side of the valve to ensure uniformity of the CheckMate's® O.D. is consistent and matches the pipe I.D.



STEP D: Lubricate the valve and rubber adhesive strip surface. Slide valve into pipe. Ensure the area marked TOP is in the 12:00 position.



STEP E: Check O.D. of the valve to ensure it fits snugly into the I.D. of pipe. If loose, add another layer(s) of the rubber adhesive strip.



STEP F: Once in place, tighten the clamp to secure it against the pipe and compress the rubber adhesive strip.

CheckMate® Installation Procedure

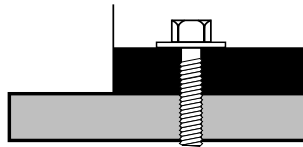
6. Preparation

The CheckMate® Valve uses expanding clamp(s) to exert pressure outwards on the walls of the valve to wedge it in place within the pipe. The walls of the pipe should be clean and free of debris prior to installation.

The valve should be inserted fully into the pipe so that no part of the cuff or bill extends outside the pipe. Ensure that the valve is not slanted at an angle with the bill pointing upwards or downwards. The valve centerline should be parallel to the pipe centerline.

Tidflex® Technologies recommends pinning the CheckMate® Valve on all installations. See below.

Four pre-drilled holes are provided in each expansion clamp. At least one clamp should be pinned. On exposed pipe, holes can be drilled through the valve and pipe, and a bolt run through secured with a nut. For buried pipe, silicon or similar sealant should be used to seal bolts.



7. Lubrication

The outside of the valve can be lubricated with a water-based lubricant prior to inserting the valve into the pipe. If the taping procedure has been used, the surface of the tape can be lubricate to aid insertion.

CAUTION: Do not use petroleum-based lubricants on this product or on the vulcanized rubber tape.

8. Plumb Lines and Arrows

The CheckMate® Valve arrives with a “top” arrow, “flow” arrow and plumb lines, marked in white, at the 12:00 and 6:00 position of the valve. Utilize this marking to orient the valve in the pipe, as well as to ensure the valve is oriented correctly in pipe section.

9. Valve Orientation

The CheckMate® Valve must be installed in a horizontal pipe. Valves 4” – 18” (nominal) are supplied with a single clamp. The clamp turnbuckle should be oriented at top dead center as delineated by the plumb line.

Valves 20” – 60” (nominal) are supplied with two clamps. The turnbuckles should be oriented 45° from the top center plumb line.

The 72” is supplied with three clamps. The turnbuckle for one clamp to be at top center. The other clamps to be 45° to each side of top center.

10. Insertion Into Pipe

Clamp to support the shape of the cuff should be hand tight and should be extended outward, but only tight enough to loosely keep the shape of the cuff during installation.

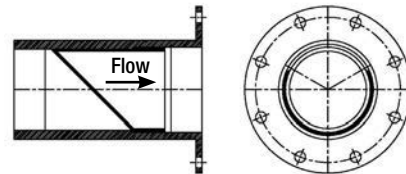
CAUTION: If you expand the clamp excessively at this step it will hinder or prevent the CheckMate® valve being fully inserted into the pipe.

CheckMate® Clamping Diagrams

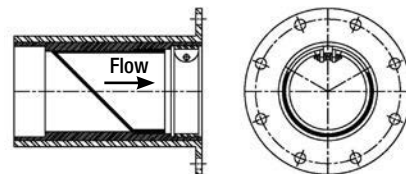
Downstream Clamp



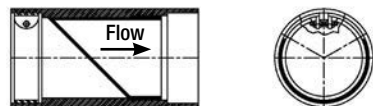
Downstream Flanged



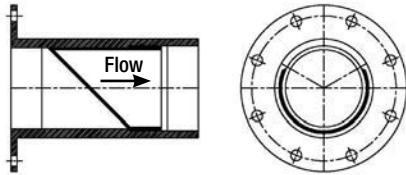
Downstream Flanged Thimble Insert



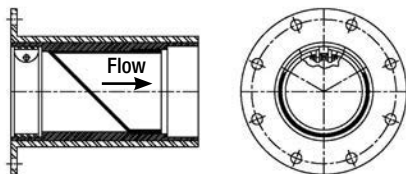
Upstream Clamp



Upstream Flanged



Upstream Flanged Thimble Insert



11. Pallet Push for Larger CheckMate® Valves

Larger CheckMate® valves can be pushed into the pipe utilizing the shipping pallet. The pallet should be placed perpendicular to the valve being inserted into the pipe. Then, with assistance from an excavator, push with consistent even force against the shipping pallet to insert the CheckMate® valve into the pipe.

See the image to the right for the suggested positioning and usage of the excavator's shovel assistance for larger-sized CheckMate® valves. Clamps must be installed to prevent damage to cuff.

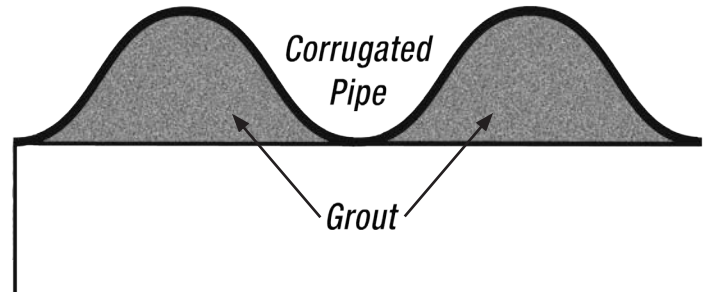


Pallet Push method for installing CheckMate® Valve

12. Corrugated Pipe and Smooth Wall (PVC, HDPE) Pipe Installation

For installation on corrugated pipe, it is recommended that the corrugations be filled with hydraulic cement (or similar material) that will provide a smooth I.D.

For smooth wall pipe, it is recommended that the valve be pinned.



CheckMates® can be made for any pipe I.D.
Built to fit in sizes from 3" to 78".

Flange shape and bolt pattern can be customized.
Flangeless thimble inserts are available.

CHECKMATE® VALVE											
	NOMINAL PIPE SIZE I.D.		OVERALL LENGTH*		NUMBER OF CLAMPS	CUFF DEPTH		BACK PRESSURE RATING**		WEIGHT	
	Inches	Millimeters	Inches	Millimeters		Inches	Millimeters	Feet	Meters	lbs	Kg
Low Pressure	3	75	5.1	130	1	1.5	38	5	1.5	1.5	0.7
	4	100	7.9	201	1	1.5	38	5	1.5	1.5	0.7
Standard Pressure	3	75	5.1	130	1	1.5	38	85	26.0	3	1.4
	4	100	7.9	201	1	1.5	38	85	26.0	3	1.5
	5	125	9.5	241	1	1.5	38	83	25.3	4	2
	6	150	11.0	279	1	2.0	51	83	25.3	9	4
	7	175	12.8	325	1	2.0	51	79	24.1	11	5
	8	200	15.2	386	1	2.0	51	79	24.1	13	6
	9	225	15.4	391	1	2.0	51	75	22.9	17	8
	10	250	16.1	409	1	2.0	51	71	21.6	20	10
	12	300	19.8	503	1	2.0	51	68	20.1	37	17
	14	350	25.8	655	1	4.0	102	64	20.0	110	50
	16	400	28.6	726	1	4.0	102	60	18.3	133	52
	18	450	31.0	787	1	4.0	102	56	17.1	143	65
	20	500	42.1	1069	2	8.0	203	53	16.2	223	102
	24	600	47.5	1207	2	8.0	203	45	13.7	304	137
	30	750	54.9	1395	2	8.0	203	38	11.6	500	227
	36	900	62.3	1582	2	8.0	203	30	9.1	828	376
42	1050	70.6	1793	2	8.0	203	26	7.9	1423	646	
48	1200	79.0	2007	2	8.0	203	23	7.0	1801	817	
54	1350	86.4	2195	2	8.0	203	17	5.2	2700	1225	
60	1500	96.8	2459	2	9.0	229	15	4.6	3315	1504	
72	1800	119.0	3023	3	12.0	305	13	4.0	6100	2767	
78	1950	119.0	3023	3	12.0	305	13	4.0	7000	3176	

*Shorter lengths available.

**Back pressure measured from pipe invert.
Higher back pressure ratings available. Consult factory.

13. Flanged Valve Bolt Torques

The valve end with the rubber flange shall be installed using the backup rings provided. The sleeve split should be installed facing downstream, with the split in the vertical position.

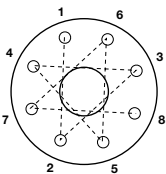
The installation bolt torque on the end flange bolts are listed in the table below.

RECOMMENDED MINIMUM BOLT TORQUE

Valve Size	Bolt Size	Torque (ft*lb.)
1"	1/2" - 13NC	20
1-1/2"	1/2" - 13NC	20
2"	5/8" - 11NC	30
2-1/2"	5/8" - 11NC	40
3"	5/8" - 11NC	40
4"	5/8" - 11NC	30
5"	3/4" - 10NC	40
6"	3/4" - 10NC	30
8"	3/4" - 10NC	40
10"	7/8" - 9NC	40
12"	7/8" - 9NC	50
14"	1" - 8NC	50
16"	1" - 8NC	50
18"	1-1/8" - 7NC	30
20"	1-1/8" - 7NC	30
24"	1-1/4" - 7NC	40
30"	1-1/4" - 7NC	30
36"	1-1/2" - 6NC	40
42"	1-1/2" - 6NC	50
48"	1-1/2" - 6NC	55
54"	1-3/4" - 5NC	60
60"	1-3/4" - 5NC	80
72"	1-3/4" - 5NC	100

Torque values are suggested minimum values.

Torque all flange bolts in a star pattern, first to 50% of tabulated values, then retorque to 100% of tabulated values. If greater torque is required, continue retorquing in increments of 50% of tabulated values. Use of a high quality anti-seize compound on all bolt threads is recommended.



Always use a "star" pattern when bolting a check valve.

Variables such as the surface finish on bolt threads, type of anti-seize compound used, and surface finish of the mating flanges all have an effect on the minimum torque required to obtain a leak-tight flange seal.

During installation you may need to retorque the flange bolts several times for a proper seal. This will overcome any leaks due to the cold flow of the rubber sleeve flange.

CheckMate® Installation Notes

1. It is important that the CheckMate® is installed level within the pipe. The CheckMate® may "gap open" if installed improperly.
2. The sealing area of the CheckMate® must have room to expand outwards, while bottom of the sealing area rises. The area around the sealing area must be kept free of debris to allow the bill to close in order for the valve to seal properly.
3. The CheckMate® effectively reduces the inside diameter of the pipe in which it is installed, creating a restriction. It may also create a "ledge" inside the pipe, causing standing water.
4. Back pressure in excess of the back pressure rating may cause valve failure.
5. Should the conditions that the CheckMate® was designed for change, (line pressure, back pressure, chemical compatibility) the performance of the valve may suffer.
6. CheckMate® Valves must be installed in true round pipe which is concentric across the entire length. Out of round pipe may cause the sealing area of the valve to distort and gap, which will cause the valve to leak.

MAINTENANCE

Inspection

Valves should occasionally be inspected for damage, wear, and buildup of debris. The frequency of the inspections should be determined by the severity of the service and the environment in which it operates.

The clamps should be checked for proper tension, and be sure that the inside of the valve is free of debris. Soft marine growth is normal on valves in submerged applications. Because hard marine growth such as barnacles will not bond well to the CheckMate®, they can be easily removed. Also insert pins to ensure they are tight.

STORAGE

If your CheckMate® is to be stored for a period of time prior to installation, the following storage guidelines will help to preserve the valve and assure a trouble-free installation:

1. Store in a clean, cool, dry location. Avoid exposure to light, electric motors, dirt, or chemicals.
2. Store valve vertically on floor or pallet.
3. Store valve to prevent other items from contacting check sleeve to prevent possible damage.
4. Store this manual with the valve, so that it is readily available at time of installation.

TROUBLESHOOTING GUIDE

Sleeve Inverted or Distorted

1. Excessive back pressure, water surge, or water hammer.

Leaking Around Perimeter of Valve

1. Tighten clamp.
2. Check for cracks and holes in surface of pipe.
3. If taped, check tape to ensure the pipe I.D. has been fully sealed

Backflow

1. Debris lodged inside bill.

TIDEFLEX® TECHNOLOGIES WARRANTY

WARRANTIES - REMEDIES - DISCLAIMERS - LIMITATION OF LIABILITY

Unless otherwise agreed to in writing signed by Tideflex® Technologies, all Products supplied by Tideflex® Technologies will be described in the specifications set forth on the face hereof.

THE WARRANTIES SET FORTH IN THIS PROVISION ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESS OR IMPLIED (INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OR TRADE).

Tideflex® Technologies Products are guaranteed for a period of one year from date of shipment, against defective workmanship and material only, when properly installed, operated and serviced in accordance with Tideflex® Technologies' recommendations. Replacement for items of Tideflex® Technologies manufacture will be made free of charge if proved to be defective within such year; but not claim for transportation, labor or consequential damages shall be allowed. We shall have the option of requiring the return of the defective product to our factory, with transportation charges prepaid, to establish the claim and our liability shall be limited to the repair or replacement of the defective product, F.O.B. our factory. Tideflex® Technologies will not assume costs incurred to remove or install defective products nor shall we incur back charges or liquidated damages as a result of warranty work. Tideflex® Technologies does not guarantee resistance to corrosion erosion, abrasion or other sources of failure, nor does Tideflex® Technologies guarantee a minimum length of service, or that the product shall be fit for any particular service. Failure of purchaser to give prompt written notice of any alleged defect under this guarantee forthwith upon its discovery, or use, and possession thereof after an attempt has been made and completed to remedy defects therein, or failure to return product or part for replacement as herein provided, or failure to install and operate said products and parts according to instructions furnished by Tideflex® Technologies, or failure to pay entire contract price when due, shall be a waiver by purchaser of all rights under these representations. All orders accepted shall be deemed accepted subject to this warranty which shall be exclusive of any other or previous warranty, and shall be the only effective guarantee or warranty binding on Tideflex® Technologies, anything on the contrary contained in purchaser's order, or represented by any agent or employee of Tideflex® Technologies in writing or otherwise, not withstanding implied warranties. TIDEFLEX® TECHNOLOGIES MAKES NO WARRANTY THAT THE PRODUCTS, AUXILIARIES AND PARTS ARE MERCHANTABILITY OR FIT FOR ANY PARTICULAR PURPOSE.



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Web: www.tideflex.com

CheckMate® IOM 8/30/17