APPENDIX D

Filterra Installation, Operation, and Maintenance Manual

Installation Manual
v01

filterra®
Bioretention Systems
A Growing Idea in Stormwater Filtration

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(804) 798-8400 Fax
design@filterra.com E-mail
www.filterra.com Web

Filterra® Stormwater Bioretention Filtration System

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Filterra® Overview
Stormwater Bioretention Filtration System

Save valuable space with small footprint for urban sites

Improve BMP aesthetics with attractive trees or shrubs

Reduce lifetime cost with safer and less expensive maintenance

Remove Pollutants and Comply with NPDES

The Filterra® Bioretention System is well-suited for the urban environment with high removal efficiencies for many pollutants such as petroleum, heavy metals, phosphorus, nitrogen, and TSS. Filterra is similar in concept to bioretention in its function and applications, with the major distinction that Filterra has been optimized for high volume/flow treatment and high pollutant removal. Filterra takes up little space (often 0.2% Filter Surface Area/Drainage Area) and may be used on highly developed sites such as landscaped areas, green spaces, parking lots and streetscapes; it is exceedingly adaptable and is the urban solution for Low Impact Development.

Stormwater runoff flows through a specially designed filter media mixture contained in a landscaped concrete container. The filter media captures and immobilizes pollutants; those pollutants are then decomposed, volatilized and incorporated into the biomass of the Filterra system's micro/macro fauna and flora. Once the stormwater runoff flows through the media it continues into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra via a downstream inlet structure, curb cut or other appropriate relief.

Section A

Installation

Installation Guidelines

Installation Procedure

Drawing FLP-2

Drawing CGT-5

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Installation Guidelines for Filterra®

Delivery & Unloading/Lifting

1. Filterra shall deliver the Filterra units to the site in coordination with the Contractor.

2. The Contractor will require spreader bars and chains/cables to safely and securely lift all box pieces and most of the top lids. Filterra will supply a set of suitable lifting hooks, shackles and eye bolts with each project at no extra charge.

3. The unit and top must be lifted separately.

   Please see Filterra Weights and Lifting Details on p. 22 - 23. Contact Filterra for non-standard Filterra unit lifting details.

Inspection

1. Inspection of the Filterra unit and all parts contained in or shipped outside of the unit shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any nonconformance to approved drawings or damage to any part of the system shall be documented on the Filterra shipping ticket. Damage to the unit during and after unloading shall be corrected at the expense of the Contractor. Any necessary repairs to the Filterra unit shall be made to the acceptance of the Engineer/Inspector.

Site Preparation

1. The Contractor is responsible for providing adequate and complete site/inlet protection when the Filterra unit is installed prior to final site stabilization (full landscaping, grass cover, final paving, and street sweeping completed)

2. The Contractor shall adhere to all jurisdictional and/or OSHA safety rules in providing temporary shoring of the excavation.

3. The Contractor or Owner is responsible for appropriately barricading the Filterra from traffic (in accordance with local codes).

Installation Guidelines for Filterra®

Installation

1. Do not place in a sump condition. The Filterra® cannot be used as a stand alone inlet, it will need effective bypass during higher intensity rainfall events. Refer to Drawing FLP-2 Grading & Gutter Flow. To test a proposed location, imagine the Filterra throat is completely blocked (so it would act like a typical curb and gutter). If this results in any ponding or pooling of drainage, the placement is inappropriate. If the drainage continues to flow by the blocked Filterra throat to the bypass inlet (or other relief) without any ponding or pooling, the placement is appropriate.

2. Each unit shall be constructed at the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.

3. The unit shall be placed on the compacted sub-grade with a minimum 6-inch gravel base matching the final grade of the curb line in the area of the unit. The unit is to be placed such that the unit and top slab match the grade of the curb in the area of the unit. Compact undisturbed sub-grade materials to 95% of maximum density at +1% to 2% of the optimum moisture. Unsuitable material below sub-grade shall be replaced to site engineer's approval. Please see Filterra Weights and Lifting Details on p. 22 and 23. Contact Filterra for guidance where slope exceeds 5%.

4. Once the unit is set, the internal wooden forms and protective silt fabric cover must be left intact. The top lid should be sealed onto the box section before backfilling, using a non-shrink grout, butyl rubber or similar waterproof seal. The boards on the top of the lid and boards sealed in the unit's throat must NOT be removed. The Supplier will remove these sections at the time of activation.

5. Outlet connections shall be aligned and sealed to meet the approved drawings with modifications necessary to meet site conditions and local regulations. The correct outlet will be marked on the Filterra box. Do NOT use plugged couplings marked "USE OTHER CONNECTION".

6. Backfilling should be performed in a careful manner, bringing the appropriate fill material up in 6" lifts on all sides. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of the Filterra unit shall conform to ASTM specification C891 "Standard Practice for Installation of Underground Precast Utility Structures" unless specified otherwise in contract documents.

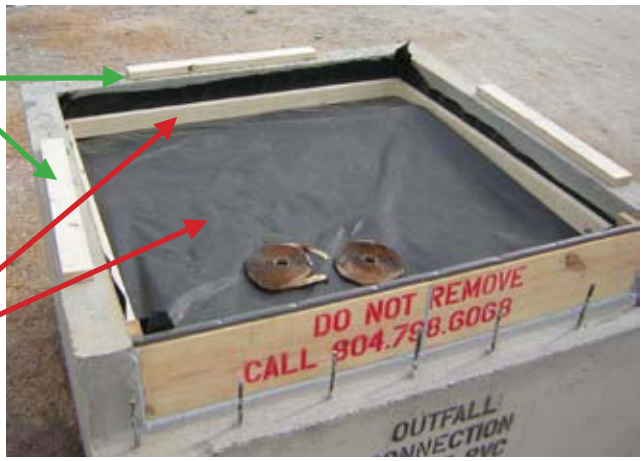
7. It is the responsibility of the Contractor to provide curb and gutter and transition to the Filterra unit for proper stormwater flow into the system through the throat opening. A standard drawing of the throat and gutter detail (Drawing CGT-5) is available on page 12, however the plans and contract documents supersede all standard drawings. Flume variations are detailed in Section B of this manual. Effective bypass for the Filterra system is essential for correct operation (i.e. bypass to an overflow at lower elevation.)

Installation Procedure

DO NOT remove protective boards or tree grates from the top slab.

Remove the shipping dunnage along the top of box wall.

DO NOT remove wooden internal bracing or protective silt fabric.



DO NOT remove the protective throat board.

Curb and gutter details are provided on the protective throat board.

A set of lifting hooks, shackles and eye bolts are provided by Filterra with the first delivery of every project.

The contractor **MUST** provide all rigging and lifting apparatus, such as all cables and chains or straps.

The unit and top slab **MUST** be lifted separately. At this time you can remove the boards between the box and top.

It is the contractor's responsibility to provide suitable lifting equipment to off load the Filterra unit. Filterra units are designed to be off loaded using the contractor's spreader bar.

1. <u>Unload Or Remove Top From Unit</u>

Unload the top slab and set it on the ground.

2. Unload And Set Box

Unload the Filterra box and set into the pre-prepared hole with appropriate sub-grade.*

* Compacted sub-grade with a minimum of six inches of gravel base which must match the final grade of curb line the area of the unit.

3. Apply Butyl Tape Seal

Apply butyl tape seal along the top of the box section. Butyl tape seal is provided with every unit.

Filterra installed protective throat board and installed silt fabric must be left in place to protect the unit from construction sediment.

4. Set Top On Box

Set the top slab on the box.

5. Connect Outfall Pipe

The correct outlet will be marked on the Filterra box.

DO NOT use plugged couplings marked "USE OTHER CONNECTION".

6. Install Curb & Gutter

It is the responsibility of the Contractor to provide curb and gutter and transition to the Filterra unit for proper flow into the system through a 4"- 6" throat opening. A standard drawing of the throat and gutter detail (Drawing CGT-4) is on page 12.

7. Provide Inlet Protection

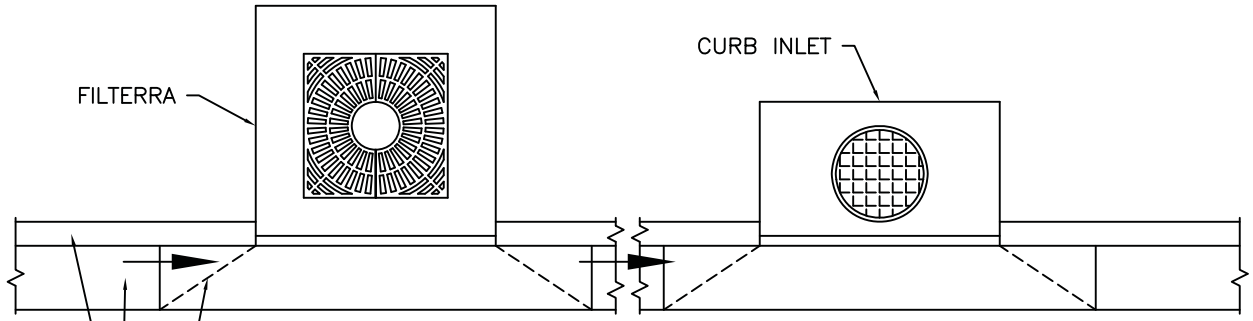
It is the responsibility of the Contractor to provide inlet protection/sediment control and cleaning around each Filterra unit.

7. Activation

Activation is performed **ONLY** by Filterra personnel.

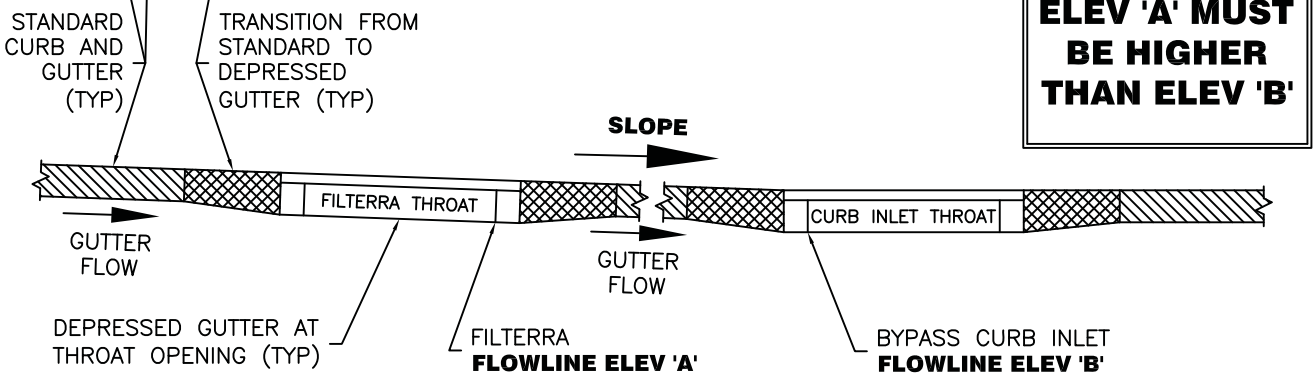
Activation can occur once the project site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed) and there is a 4” - 6” throat opening.

Call 866-349-3458 to schedule your activation.

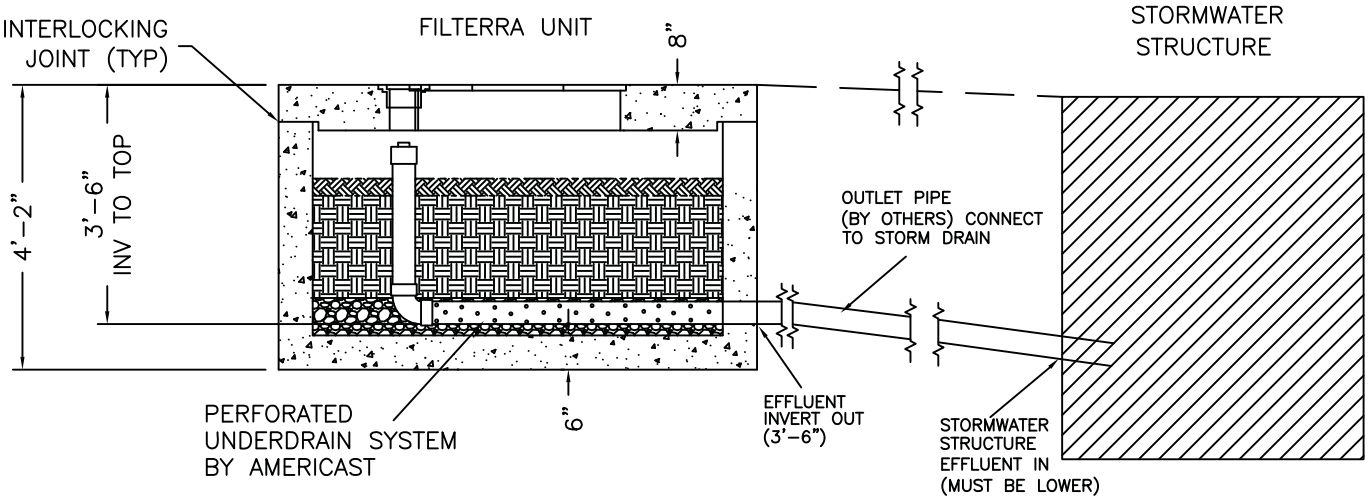


PLAN VIEW

ELEV 'A' MUST BE HIGHER THAN ELEV 'B'



ELEVATION VIEW



CROSS SECTION

MODIFICATIONS OF DRAWINGS ARE ONLY PERMITTED BY WRITTEN AUTHORIZATION FROM FILTERRA

AMERICAST®

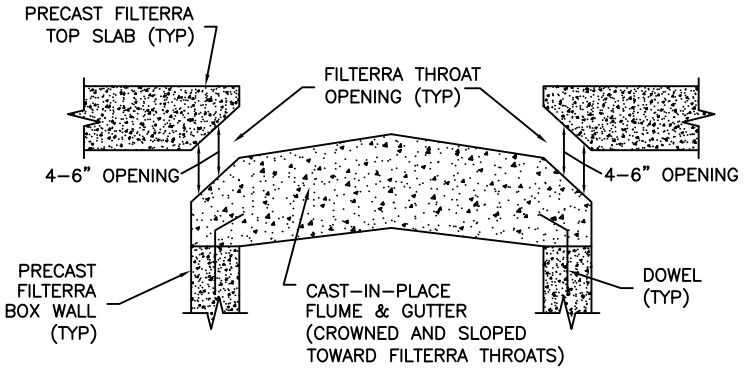
DATE: 07-07-06 | DWG: FLP-2

FILTERRA® TYPICAL FLOWLINE AND OULET PIPE RELATIONSHIP

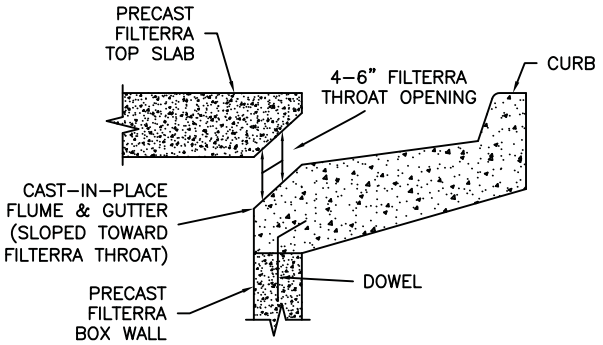
filterra®

US PAT 6,277,274 AND 6,569,321

CROWNED FLUME

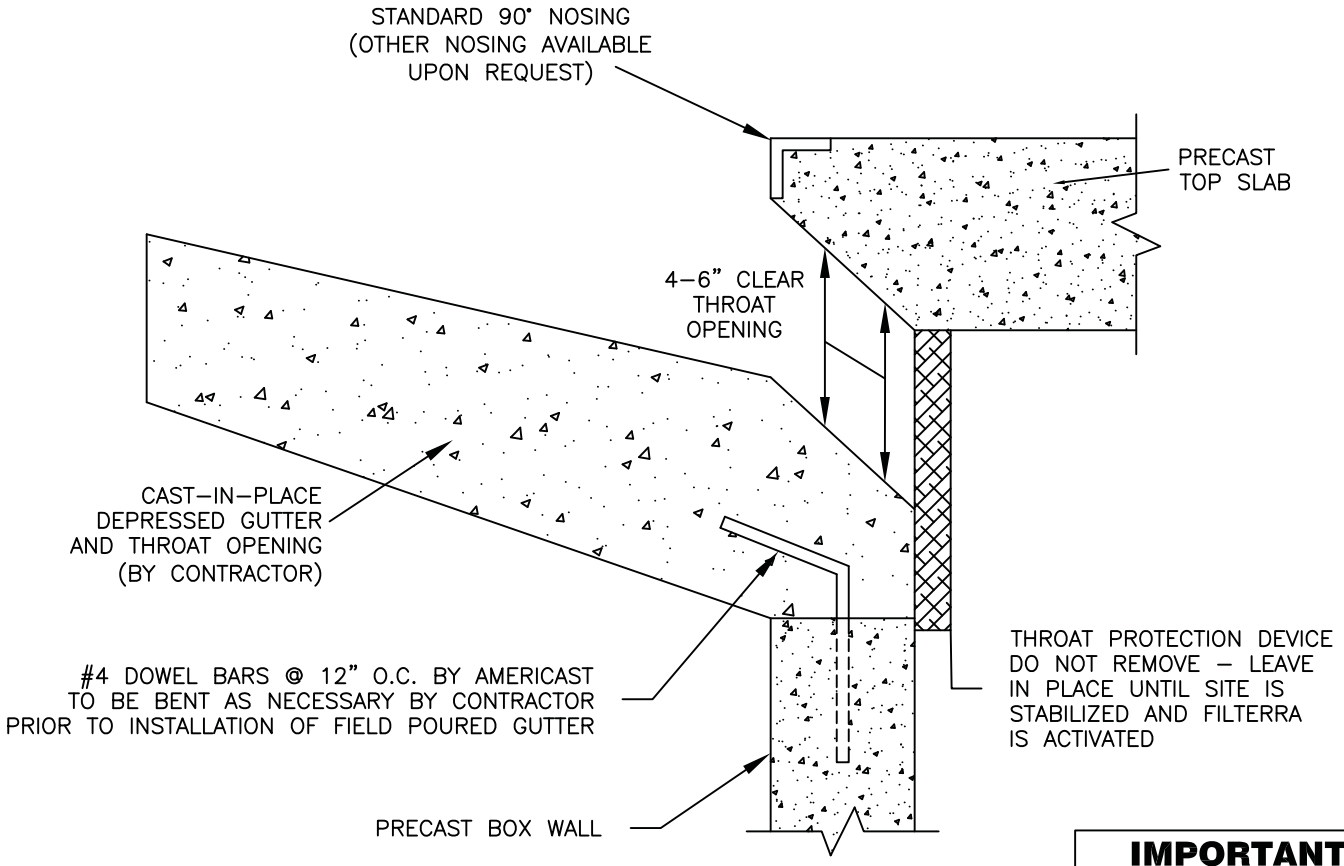


FLUME – SLOPED TOWARDS FILTERRA THROAT



SECTIONS VIEWS OF FILTERRA IN TYPICAL FLUME APPLICATIONS

SEE BELOW FOR DETAILS NOT SHOWN



IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)

SECTION VIEW
STANDARD FILTERRA THROAT OPENING

MODIFICATIONS OF DRAWINGS ARE ONLY PERMITTED BY WRITTEN AUTHORIZATION FROM FILTERRA

DRAWING AVAILABLE IN TIFF FILE FORMAT.

AMERICAST®

DATE: 02–26–09 | DWG: CGT–5

FILTERRA® THROAT OPENING AND GUTTER OR FLUME DETAIL

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US PAT 6,277,274 AND 6,569,321

Section B

Curb and Gutter

Standard Curb and Gutter with Inlet Bypass

Curb Cut or Grate Inlet Bypass

Single Sided Flume

Double Sided Flume

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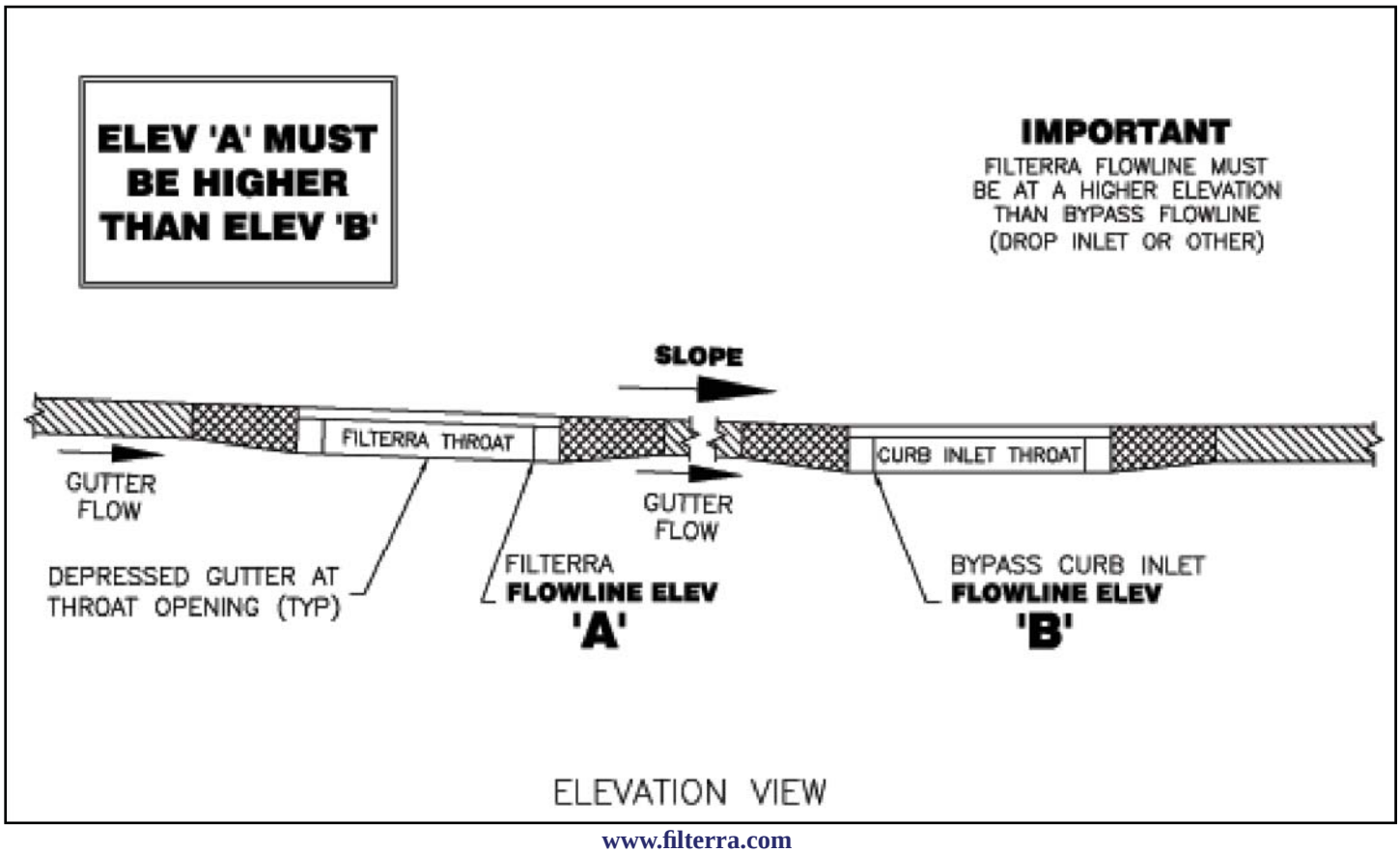
Standard Curb and Gutter with inlet bypass



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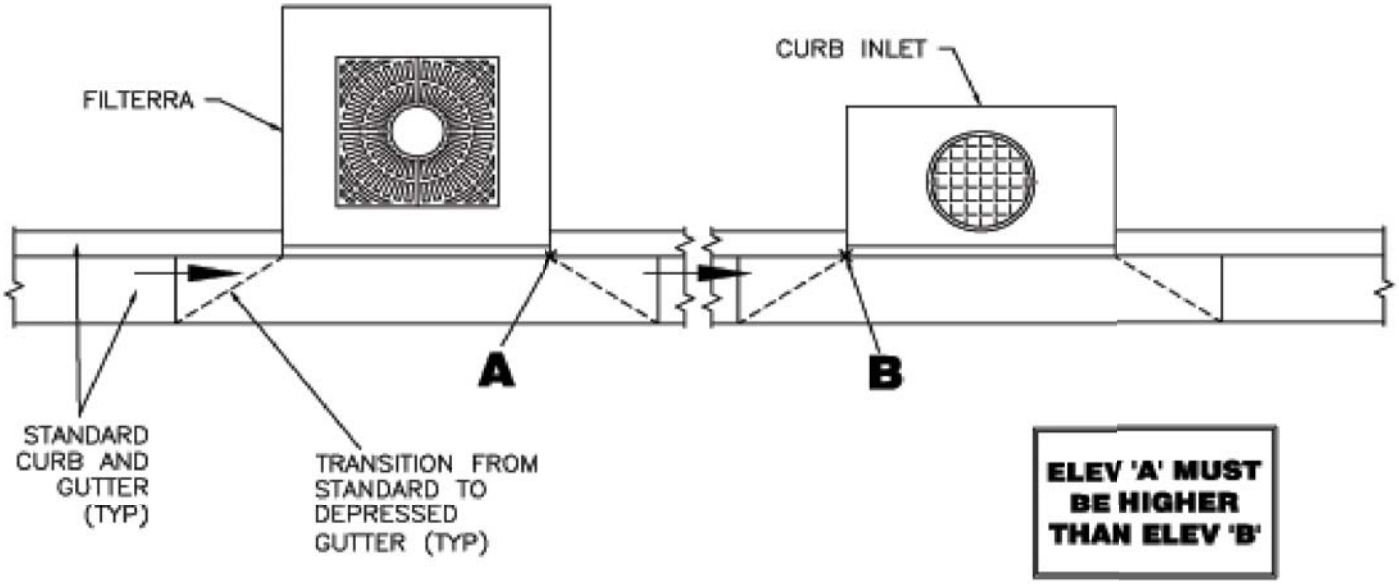
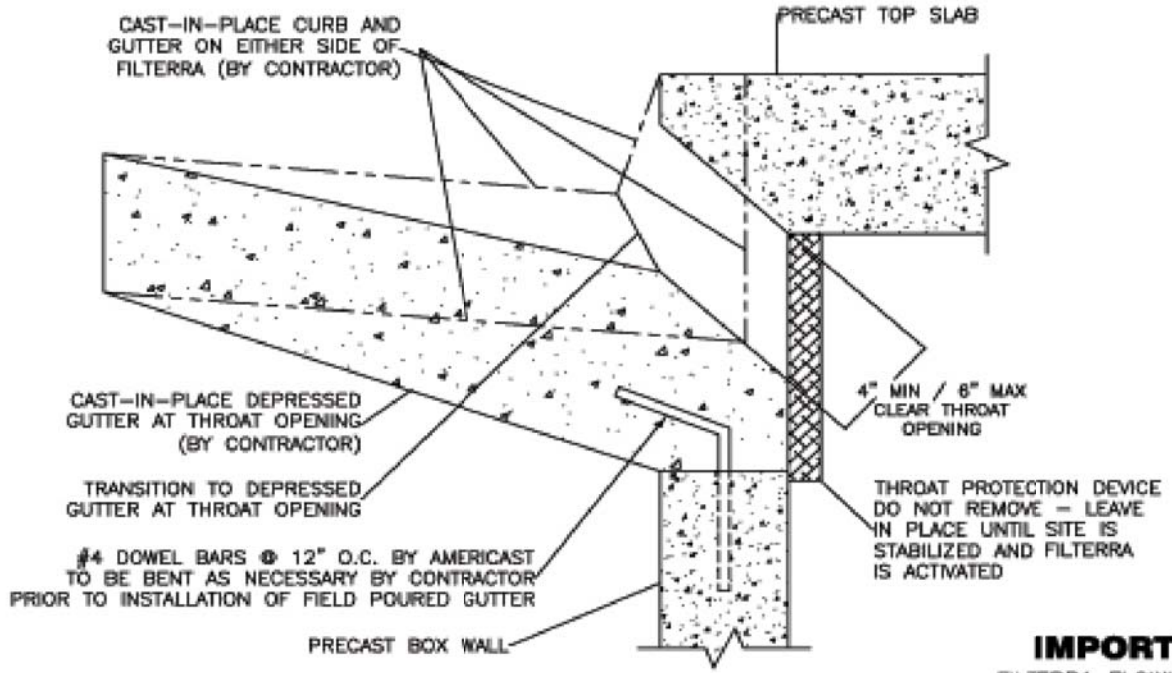


PLAN VIEW



SECTION VIEW
FILTERRA THROAT OPENING

IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)

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DATE: 11-15-05 | DWG: CGC01-A

FILTERRA® THROAT OPENING AND TYPICAL FLOWLINE RELATIONSHIP FOR REQUIRED EFFECTIVE BYPASS

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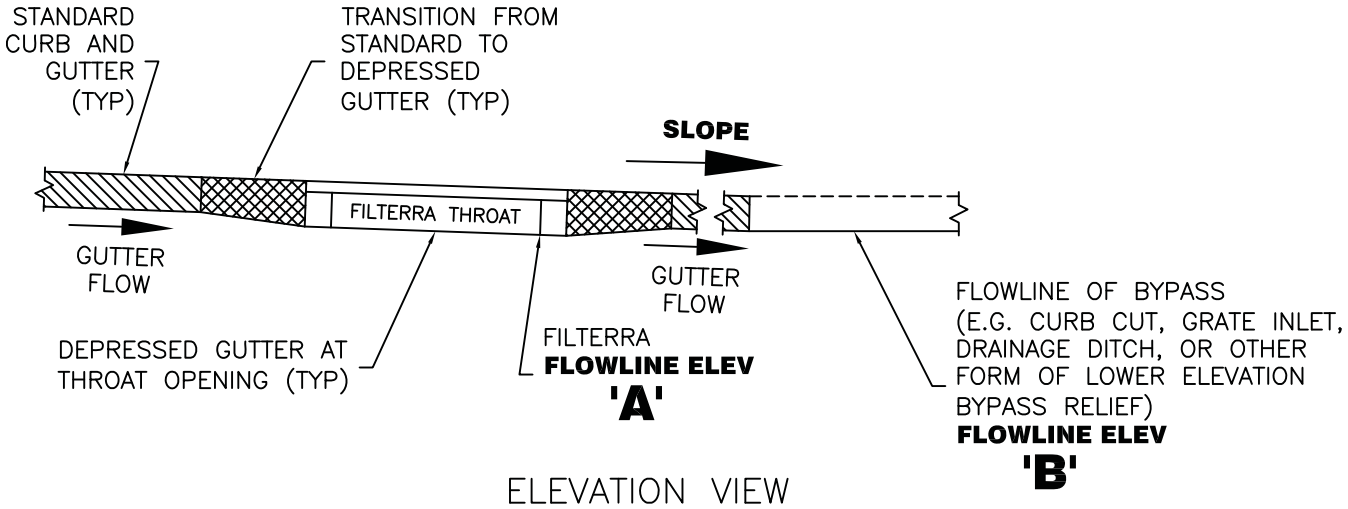
Curb cut or grate inlet bypass

ELEV 'A' MUST BE HIGHER THAN ELEV 'B'

IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)



ELEVATION VIEW

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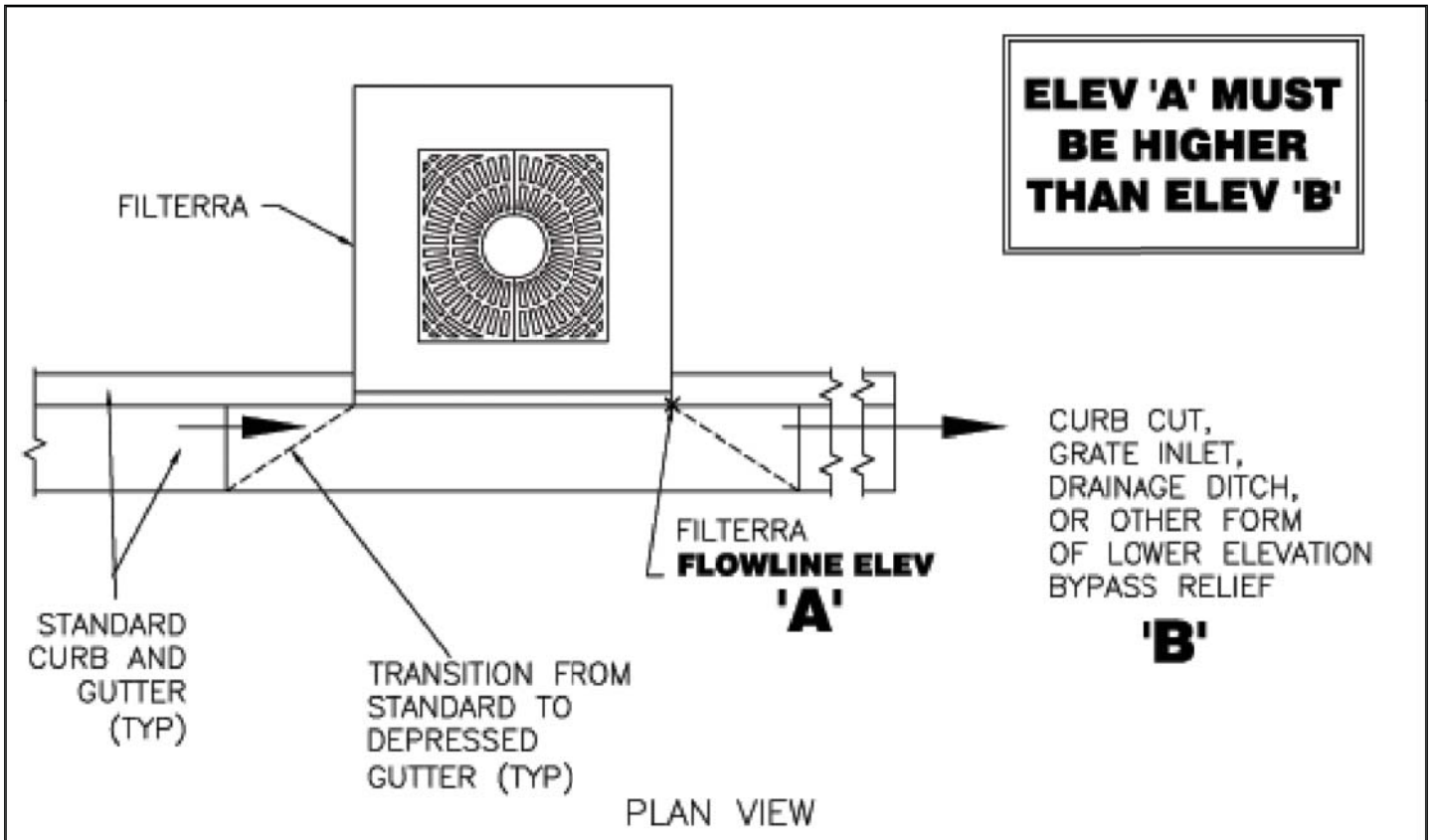
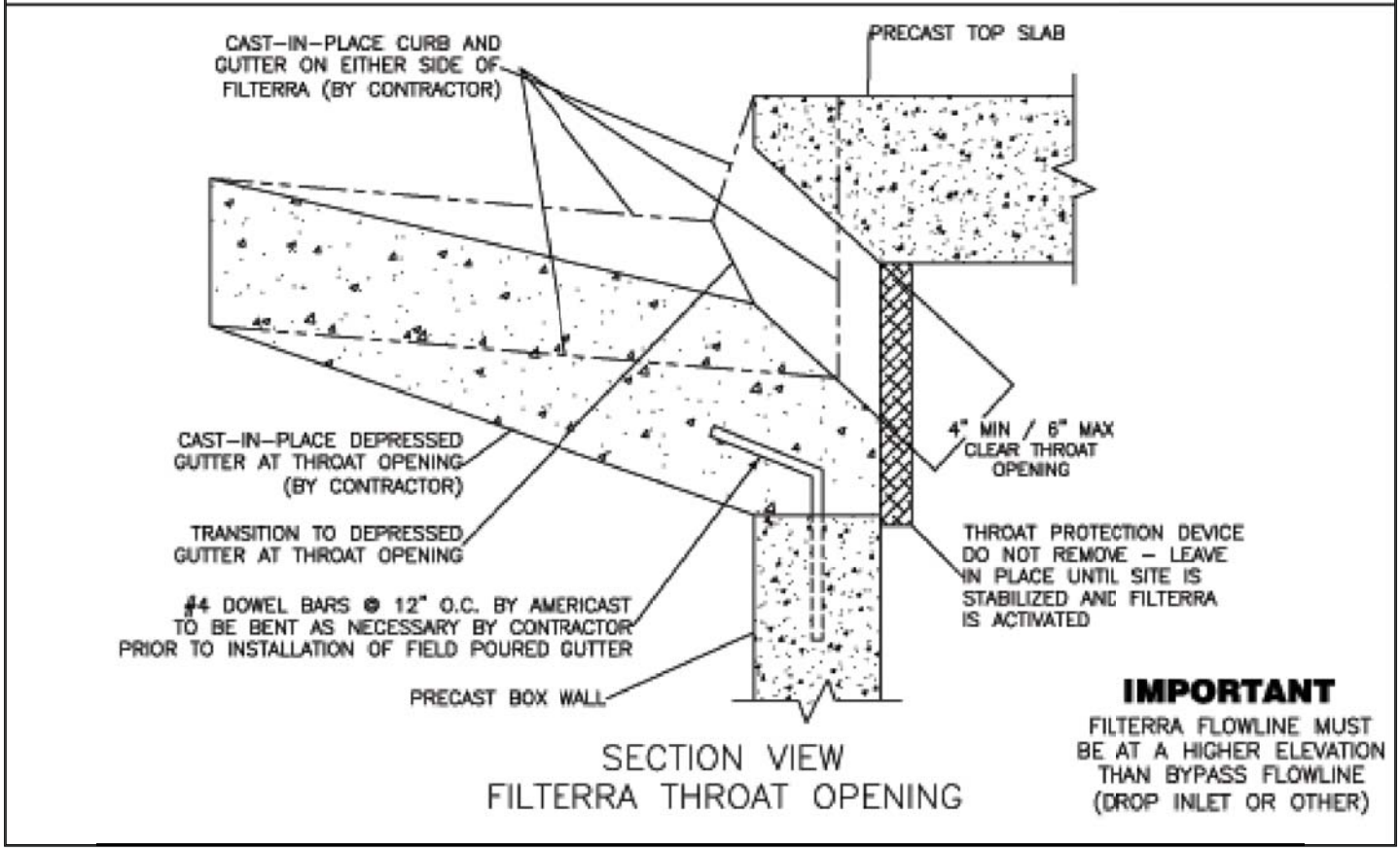
Bioretention Systems





IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)

Single sided flume

ELEV 'A' MUST BE HIGHER THAN ELEV 'B'

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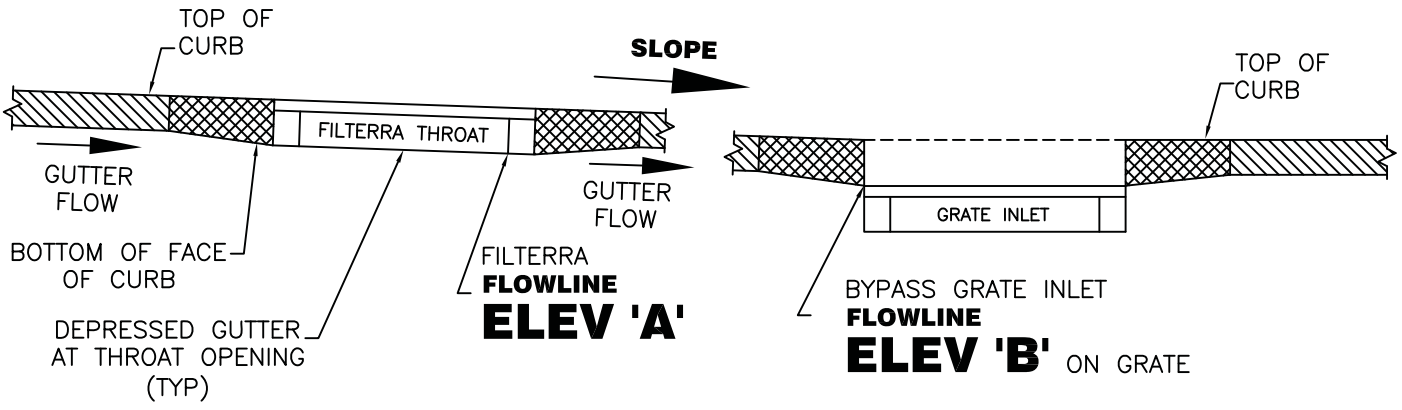

ELEVATION VIEW

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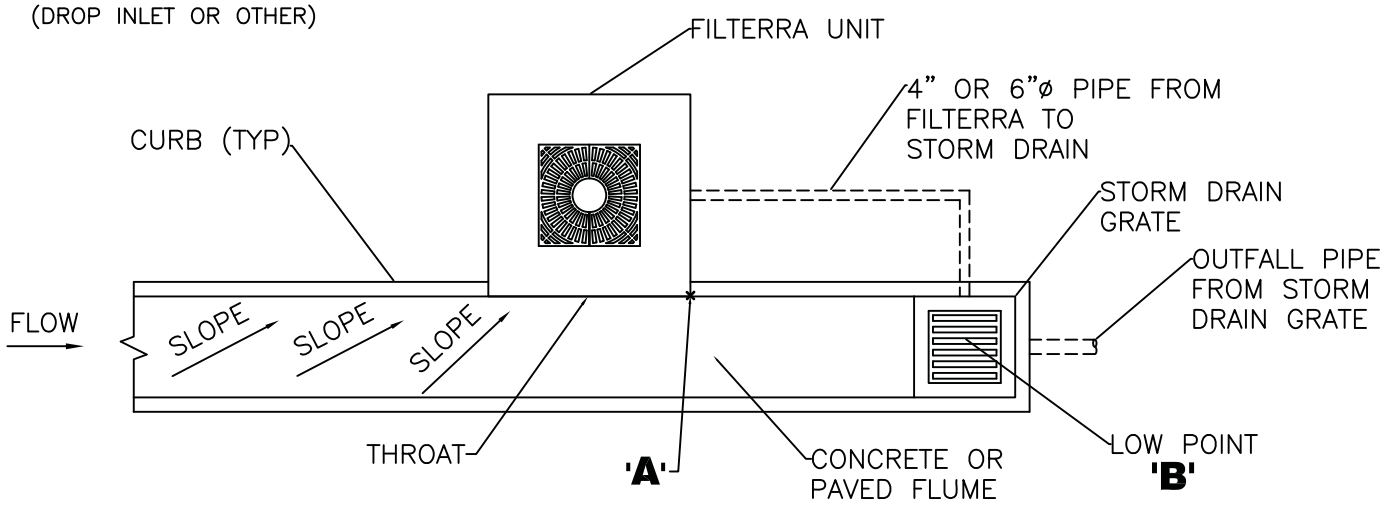
Bioretention Systems

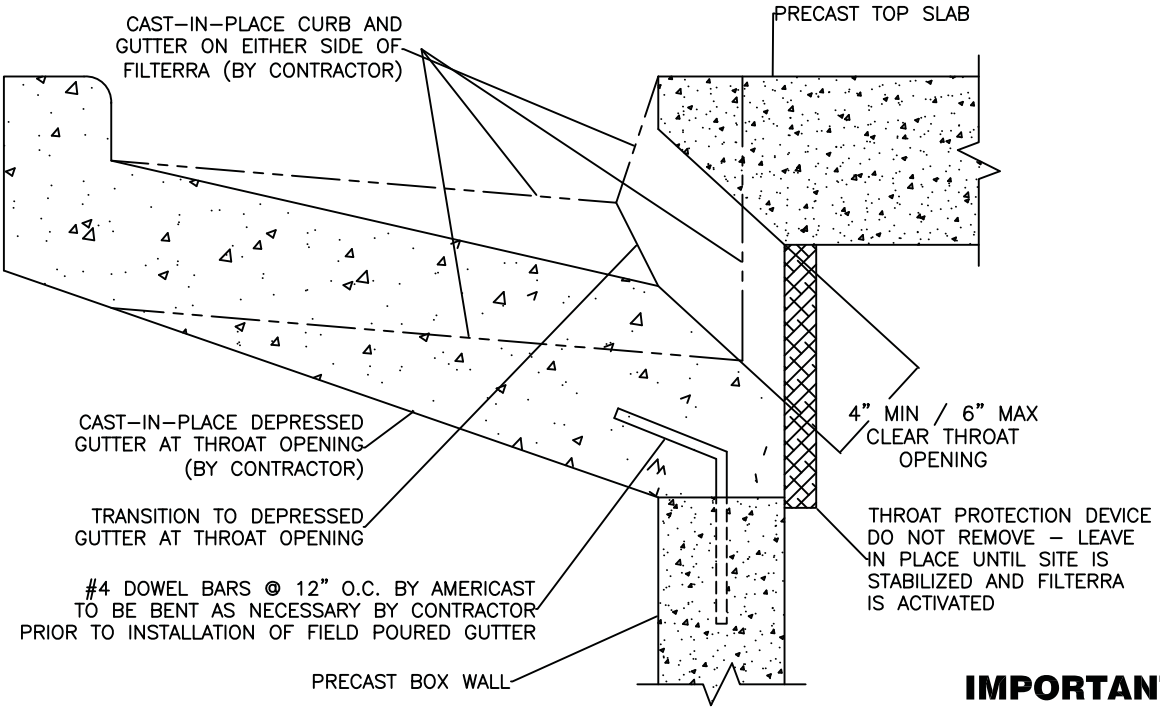
IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)



ELEV 'A' MUST BE HIGHER THAN ELEV 'B'

PLAN VIEW

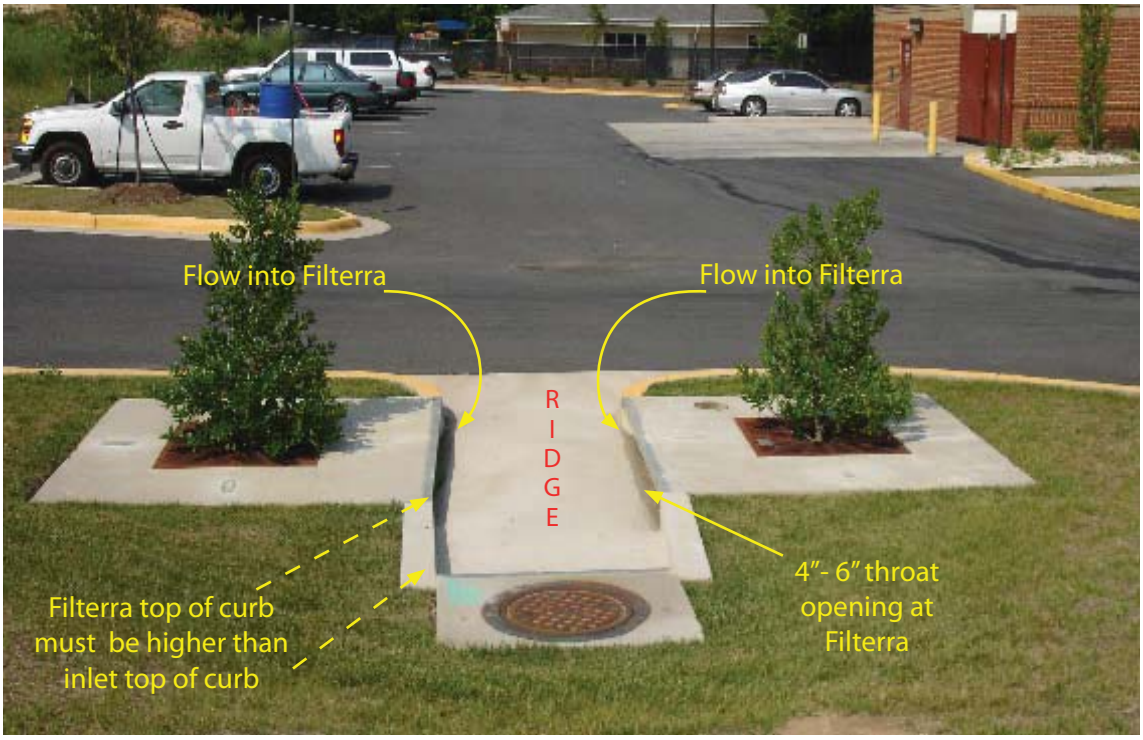


FLUME SECTION VIEW
FILTERRA THROAT OPENING

IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)

Double sided flume



ELEV 'A' MUST BE HIGHER THAN ELEV 'B'

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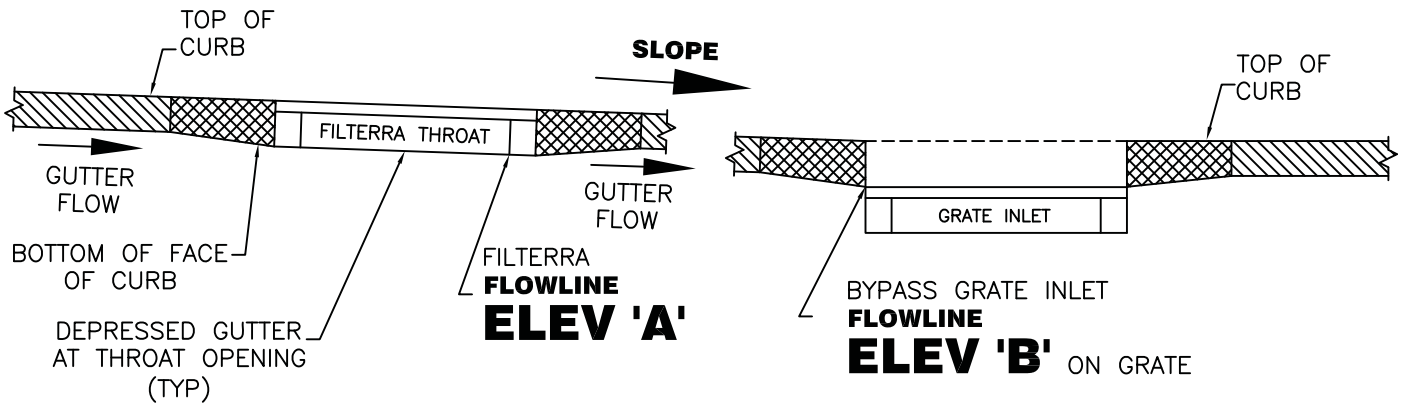
FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)



ELEVATION VIEW

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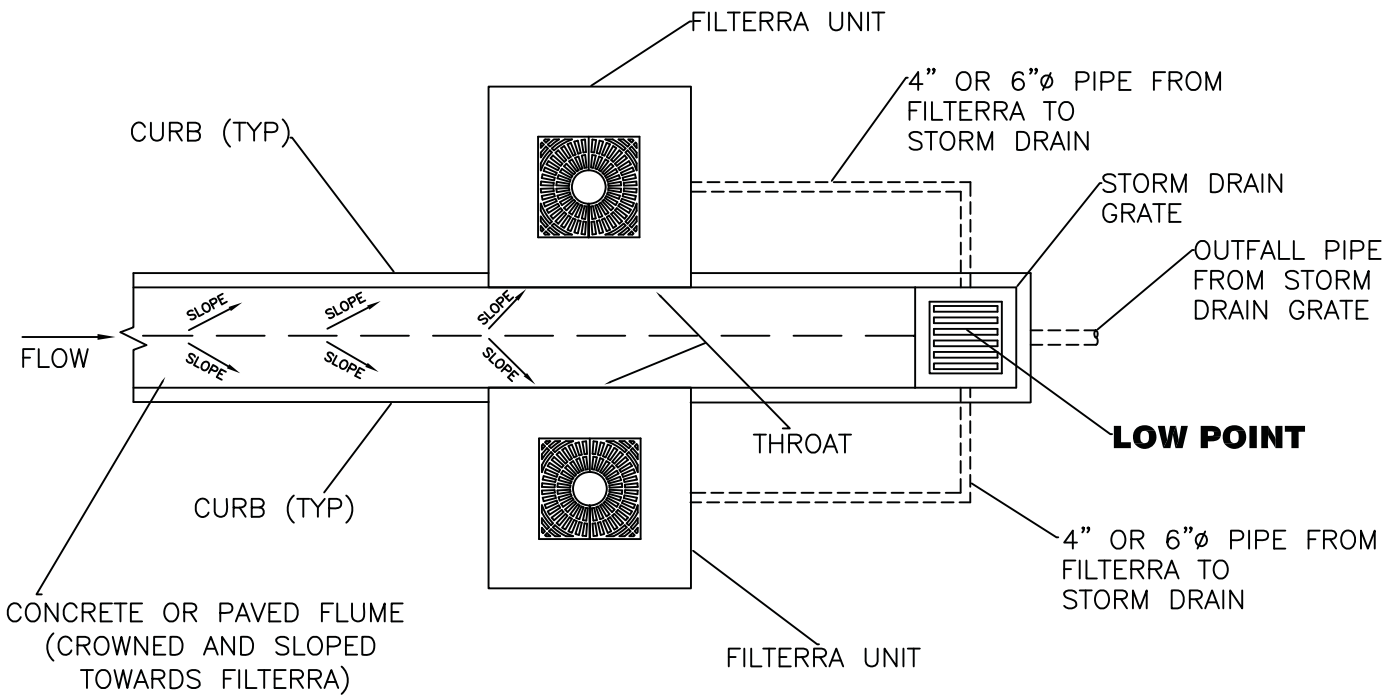
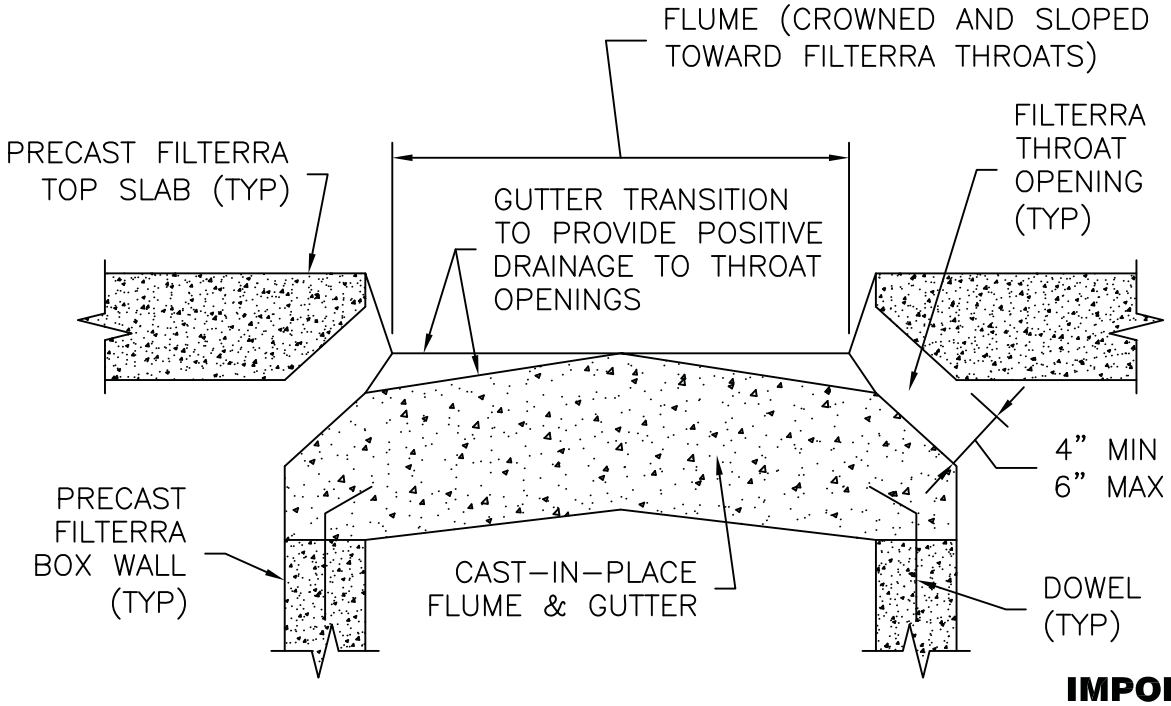
Bioretention Systems



PLAN VIEW
TYPICAL FLUME CROWNED AND SLOPED TOWARDS FILTERRA THROAT



SECTION VIEW
FILTERRA THROAT OPENINGS

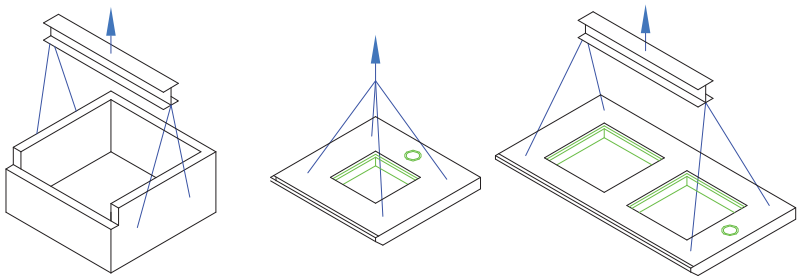
IMPORTANT

FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)

Filterra® Weights and Lifting Details
Eastern Zone

		Top Only		Box + Media		*Spreader Bar	
		Pounds	Tons	Pounds	Tons	Min	Max
4'-0" Throat	4x6	2,819	1.41	12,607	6.30	5.00 ft	7.50 ft
	4x8	3,829	1.91	16,035	8.02	5.00 ft	7.50 ft
	4x12	5,231	2.62	22,889	11.44	5.00 ft	7.50 ft
6'-0" Throat	6x4	3,417	1.71	12,452	6.23	5.50 ft	7.50 ft
	Std 6x6	**4,221**	**2.11**	**17,051**	**8.53**	**7.00 ft**	**9.00 ft**
	6x8	5,121	2.56	21,649	10.82	7.00 ft	9.00 ft
	6x10	6,545	3.27	26,248	13.12	7.00 ft	9.00 ft
	6x12	6,825	3.41	30,847	15.42	7.00 ft	9.00 ft
7'-0" Throat	7x13	10,106	5.05	37,185	18.59	8.00 ft	10.00 ft
8'-0" Throat	8x4	3,787	1.89	15,725	7.86	5.50 ft	7.50 ft
	8x6	5,100	2.55	21,494	10.75	7.50 ft	9.50 ft
10'-0" Throat	10x6	6,503	3.25	25,938	12.97	7.50 ft	9.50 ft
12'-0" Throat	12x4	5,146	2.57	22,269	11.13	5.50 ft	7.50 ft
	12x6	6,762	3.38	30,382	15.19	7.50 ft	9.50 ft
13'-0" Throat	13x7	10,042	5.02	37,185	18.59	8.50 ft	10.50 ft

*** BOX AND TOP MUST BE LIFTED SEPARATELY**

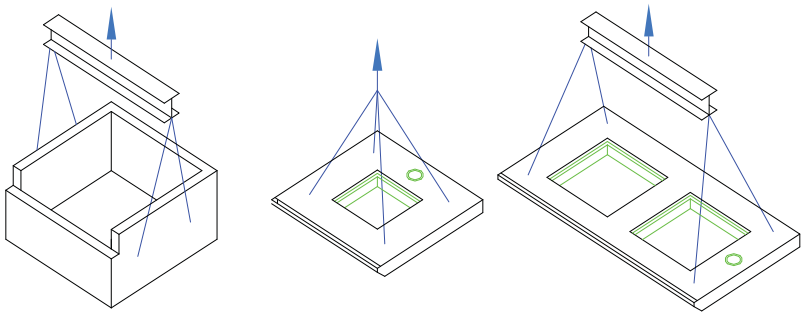


* A 7.50 ft spreader bar is suitable for all sized shown and is always needed for safe lifting of all box sizes.

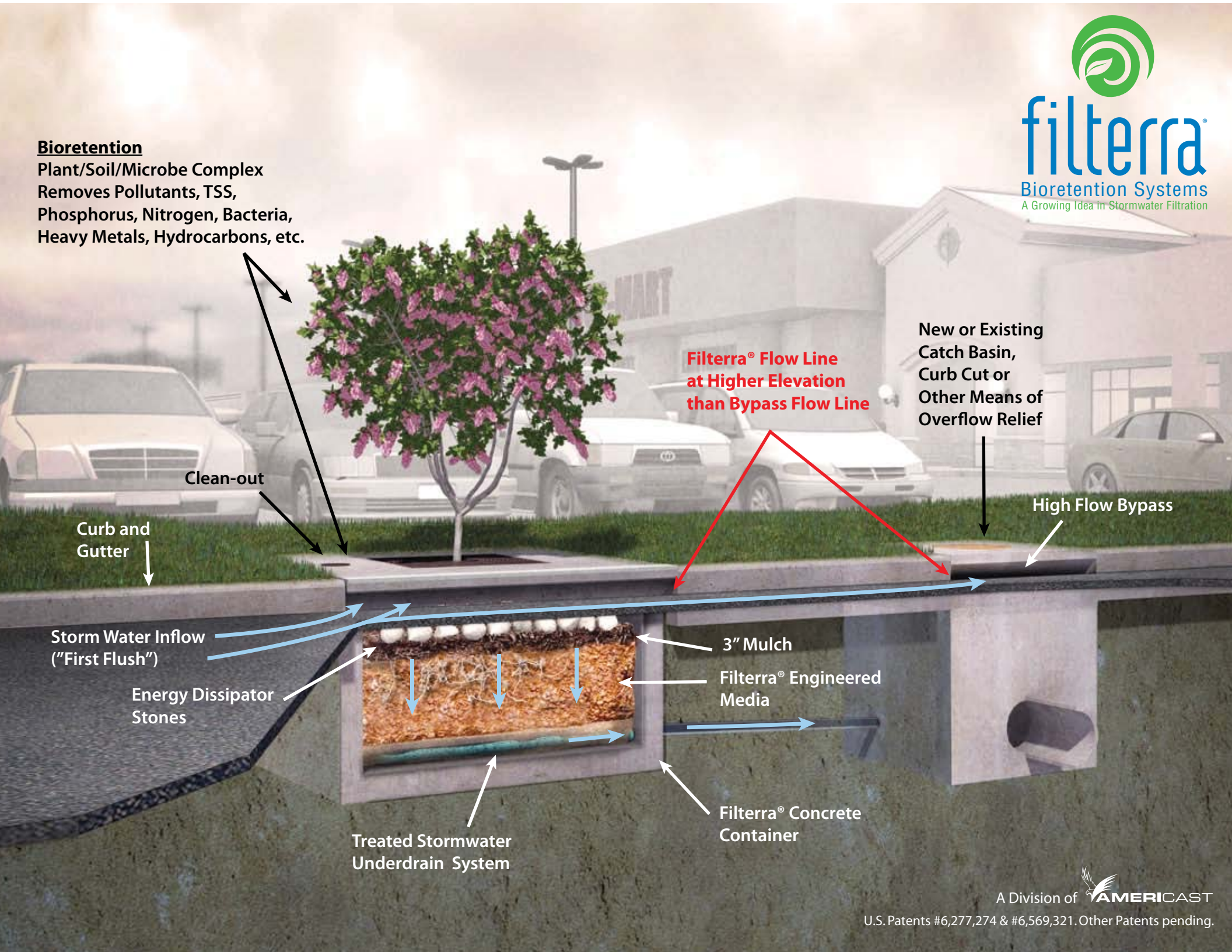
Filterra® Weights and Lifting Details
Western Zone

		Top Only		Box + Media		*Spreader Bar	
		Pounds	Tons	Pounds	Tons	Min	Max
4'-0" Throat	4x4	1,808	0.90	9,180	4.59	5.00 ft	7.50 ft
	4x6.5	3,178	1.59	13,994	7.00	5.08 ft	7.58 ft
	4x8	3,829	1.91	16,035	8.02	5.00 ft	7.50 ft
	4.5x8.5	4,562	2.28	18,368	9.18	5.50 ft	7.50 ft
6'-0" Throat	6.5x4	3,151	1.58	13,784	6.89	5.58 ft	7.58 ft
	Std 6x6	**4,221**	**2.11**	**17,051**	**8.53**	**7.00 ft**	**9.00 ft**
	6x8	5,121	2.56	21,649	10.82	7.00 ft	9.00 ft
	6x10	6,545	3.27	26,248	13.12	7.00 ft	9.00 ft
	6x12	6,997	3.50	31,702	15.85	7.08 ft	9.08 ft
8'-0" Throat	8x4	3,787	1.89	15,725	7.86	5.50 ft	7.50 ft
	8.5x4.5	4,519	2.26	18,058	9.03	6.00 ft	8.00 ft
	8x6	5,100	2.55	21,494	10.75	7.50 ft	9.50 ft
10'-0" Throat	10x6	6,503	3.25	25,938	12.97	7.50 ft	9.50 ft
12'-0" Throat	12x6	6,933	3.47	31,199	15.60	7.58 ft	9.58 ft

*** BOX AND TOP MUST BE LIFTED SEPARATELY**



* A 7.50 ft spreader bar is suitable for all sized shown and is always needed for safe lifting of all box sizes.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Bioretention Systems
A Growing Idea in Stormwater Filtration
Bioretention
Plant/Soil/Microbe Complex
Removes Pollutants, TSS,
Phosphorus, Nitrogen, Bacteria,
Heavy Metals, Hydrocarbons, etc.
Clean-out
Curb and
Gutter
Filterra® Flow Line
at Higher Elevation
than Bypass Flow Line
New or Existing
Catch Basin,
Curb Cut or
Other Means of
Overflow Relief
High Flow Bypass
Storm Water Inflow
("First Flush")
Energy Dissipator
Stones
3" Mulch
Filterra® Engineered
Media
Treated Stormwater
Underdrain System
Filterra® Concrete
Container
A Division of AMERICAST
U.S. Patents #6,277,274 & #6,569,321. Other Patents pending.

Operation & Maintenance (OM) Manual v01

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Filterra® Stormwater Bioretention Filtration System

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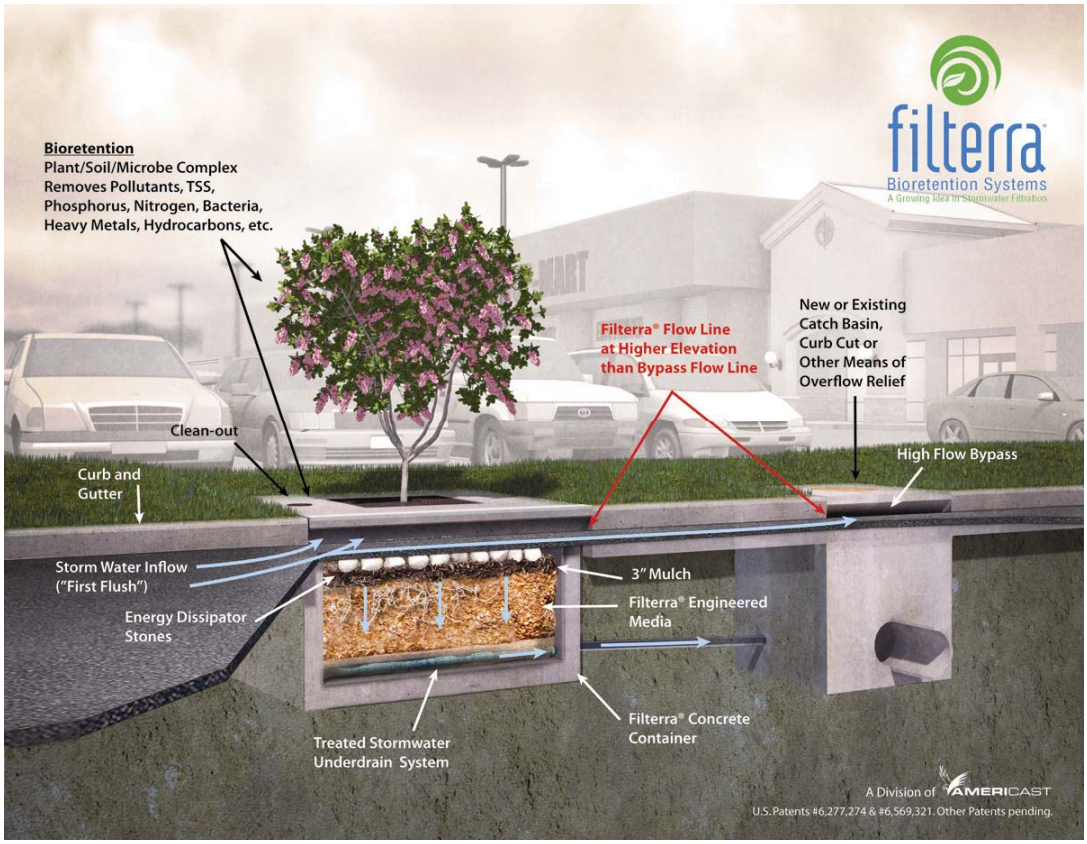
Maintenance Visit Summary
Maintenance Tools, Safety Equipment and Supplies
Maintenance Visit Procedure
Maintenance Checklist

Resources

Example Filterra Project Maintenance Report Sheet
Example Filterra Structure Maintenance Report Sheet
Filterra® Warranty
Drawing FTST-2: Filterra Standard Configuration Detail
Drawing FTNL-3: Filterra Narrow Length Configuration Detail
Drawing FTNW-3: Filterra Narrow Width Configuration Detail

General Description

The following general specifications describe the general operations and maintenance requirements for the Americast stormwater bioretention filtration system, the Filterra®. The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, pre-constructed drop-in place unit designed for applications in the urban landscape to treat contaminated runoff.



Stormwater flows through a specially designed filter media mixture contained in a landscaped concrete container. The mixture immobilizes pollutants which are then decomposed, volatilized and incorporated into the biomass of the Filterra® system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® to a downstream inlet or outfall.

Maintenance is a simple, inexpensive and safe operation that does not require confined space access, pumping or vacuum equipment or specialized tools. Properly trained landscape personnel can effectively maintain Filterra® Stormwater systems by following instructions in this manual.

Basic Operations

Filterra® is a bioretention system in a concrete box. Contaminated stormwater runoff enters the filter box through the curb inlet spreading over the 3-inch layer of mulch on the surface of the filter media. As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the soil media where the finer particles are removed and other chemical reactions take place to immobilize and capture pollutants in the soil media. The cleansed water passes into an underdrain and flows to a pipe system or other appropriate discharge point. Once the pollutants are in the soil, the bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a very complex variety of biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

Design and Installation

Each project presents different scopes for the use of Filterra® systems. To ensure the safe and specified function of the stormwater BMP, Americast reviews each application before supply. Information and help may be provided to the design engineer during the planning process. Correct Filterra® box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at fillrerra.com.

Maintenance

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement.

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the expected lifespan of your Filterra media.
- Avoid more costly media replacement.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the Filterra® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the throat. This may include trash, silt and leaves etc. which will be contained within the void below the top grate and above the mulch layer. Too much silt may inhibit the Filterra's® flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Americast includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as the unit installed, curb and gutter and transitions in place and activation (by Supplier) when mulch and plant are added and temporary throat protection removed.

Activation cannot be carried out until the site is **fully** stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after every major storm event of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing).

Exclusion of Services

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop-inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra® and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra®
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.).

Most visits require only replacement mulch. Three bags of double shredded mulch are used per unit (on a standard 6x6' size). Some visits may require additional Filterra® engineered soil media available from the Supplier.

Maintenance Visit Procedure

1. Inspection of Filterra® and surrounding area

- Record individual unit **before** maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure Damage	yes | no
to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove metal grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
# of Buckets Removed	

3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12”, add Filterra® media (not top soil or other) to recharge to a 9” distance.

Record on Maintenance Report the following:

Distance to Bottom of Top Slab (inches)
# of Buckets of Media Added

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3”.
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of trash during a storm event.
- Replace Filterra® grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant’s health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	(feet)
Width at Widest Point	(feet)
Health	alive | dead
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra®

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Americast during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check For	Conditions That Should Exist	Actions
Inlet	Excessive sediment or trash accumulation	Accumulated sediments or trash impair free flow of water into Filterra	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	“Ponding” of water on mulch cover.	“Ponding” in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks	Cracks wider than ½ inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.
Inspection to be performed after every major storm event >1 inch total depth, subject to climate.

Filterra® Project Maintenance Order

Project	
Address	
Directions	

Project Owner	Company	
	Contact Name	
	Telephone #	
	Owner Notified of Mtce on (date)	

Filterra Units on this Order _____

Total Units on this Project _____

Date of Maintenance	
Arrival Time	
Departure Time	
# of Workers	
Notes on Project	

Maintenance Supervisor _____

Filterra® Structure Maintenance Report

Project		**Structure Number**	
Plant Type		**Structure Size**	
Date		**GPS**	
		Pre Mtce Photo #	

Initial Observations

Standing Water	Y	N	Damage to Grate	Y	N
IF Yes, STOP NOW & call 804-798-6068			Is Bypass Clear	Y	N
			Notes		
Damage to Box Structure	Y	N			
If YES to any observation take close up photo					

Waste

Silt / Clay	Y	N	Buckets Removed (# of)	
Cups/Bags	Y	N	Notes	
Leaves	Y	N		
Other				

Media

Distance to Bottom of Top Slab (in.)		Notes	
Buckets of Media Added (# of)			

Mulch

Netting Replaced	Y	N	Bags of Mulch Added (# of)	
Stones Replaced	Y	N	Notes	

Plant	#1	(#2)		#1	(#2)
Height above Grate (feet)			Plant Replaced	Y / N	Y / N
Width at Widest Point (feet)			Notes		
Health	Alive/Dead	Alive/Dead			
Damage to Plant	Y / N	Y / N			
If YES to plant damage take close up photo					

Other Notes

(use back if necessary)

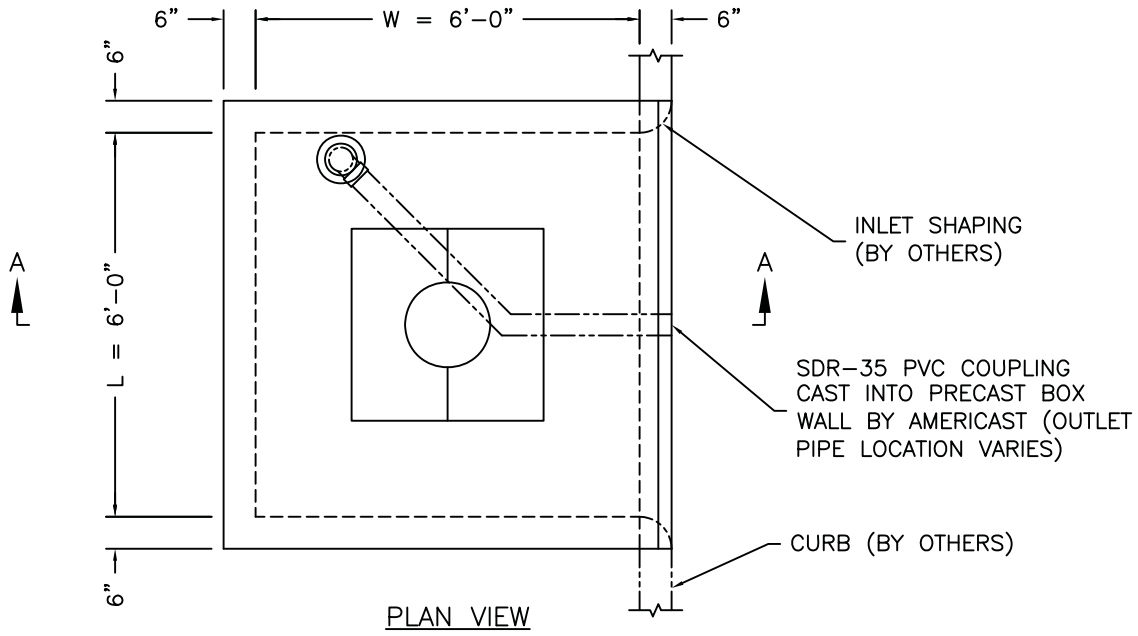
Filterra® Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

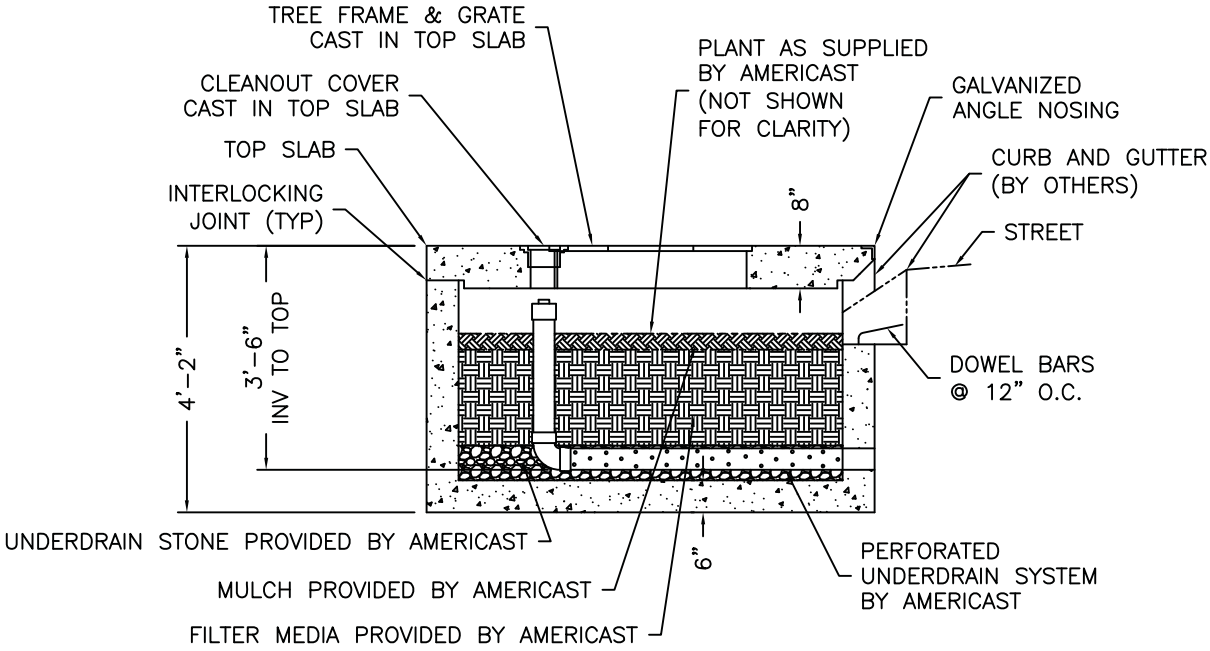
Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.



PLAN VIEW



SECTION A–A

DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
6 x 6	6'–0"	6'–0"	(1) 3x3	4" SDR–35 PVC

** SIZES SHOWN ARE FOR THE MID ATLANTIC AND MAY VARY ACROSS THE COUNTRY
PLEASE CONTACT FILTERRA FOR A LIST OF SIZES WITHIN YOUR REGION

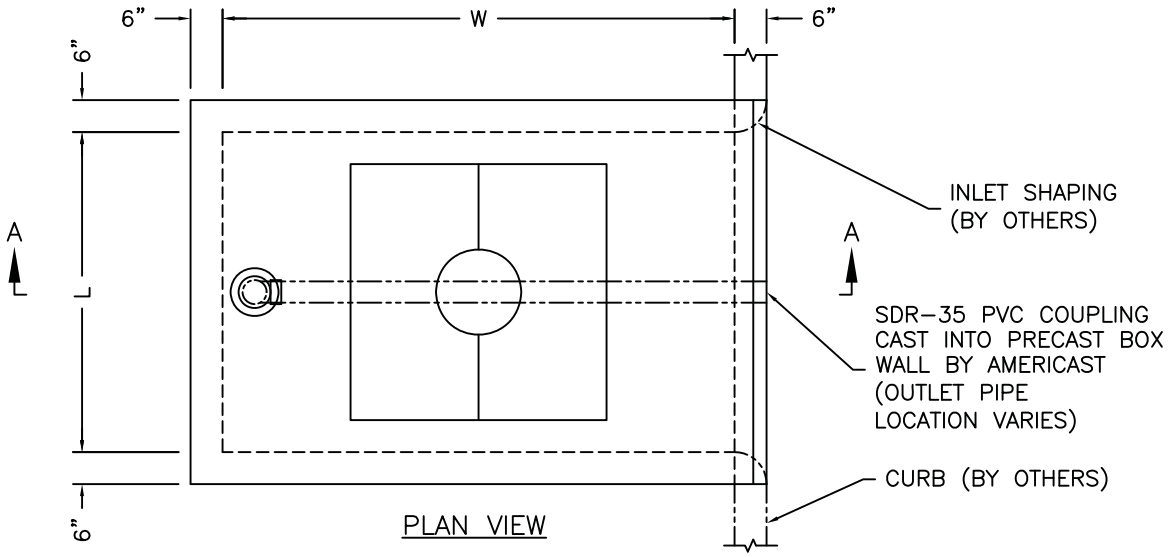
AMERICAST®

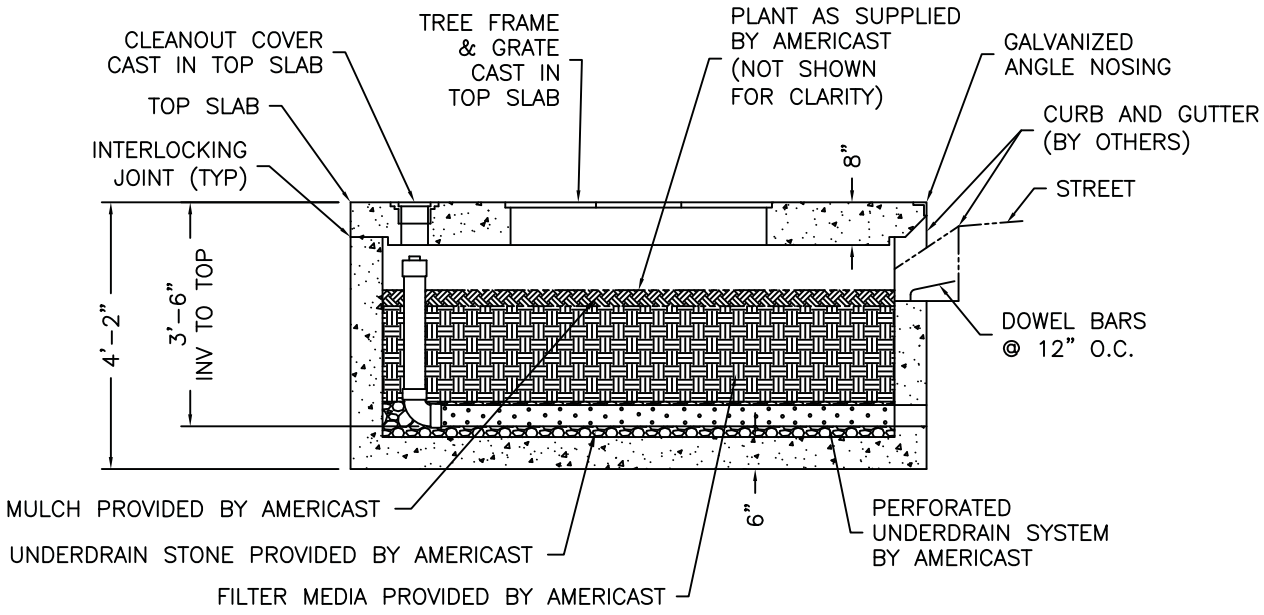
DATE: 07–07–06 | DWG: FTST–2

PRECAST FILTERRA® UNIT STANDARD CONFIGURATION

filterra®

US PAT 6,277,274
AND 6,569,321





SECTION A–A

DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
4 x 6	4'–0"	6'–0"	(1) 3x3	4" SDR–35 PVC
4 x 8	4'–0"	8'–0"	(1) 3x3	4" SDR–35 PVC
4 x 12	4'–0"	12'–0"	(2) 3x3	4" SDR–35 PVC
6 x 8	6'–0"	8'–0"	(1) 4x4	4" SDR–35 PVC
6 x 10	6'–0"	10'–0"	(1) 4x4	6" SDR–35 PVC
6 x 12	6'–0"	12'–0"	(2) 4x4	6" SDR–35 PVC
7 x 13	7'–0"	13'–0"	(2) 4x4	6" SDR–35 PVC

** SIZES SHOWN ARE FOR THE MID ATLANTIC AND MAY VARY ACROSS THE COUNTRY
PLEASE CONTACT FILTERRA FOR A LIST OF SIZES WITHIN YOUR REGION

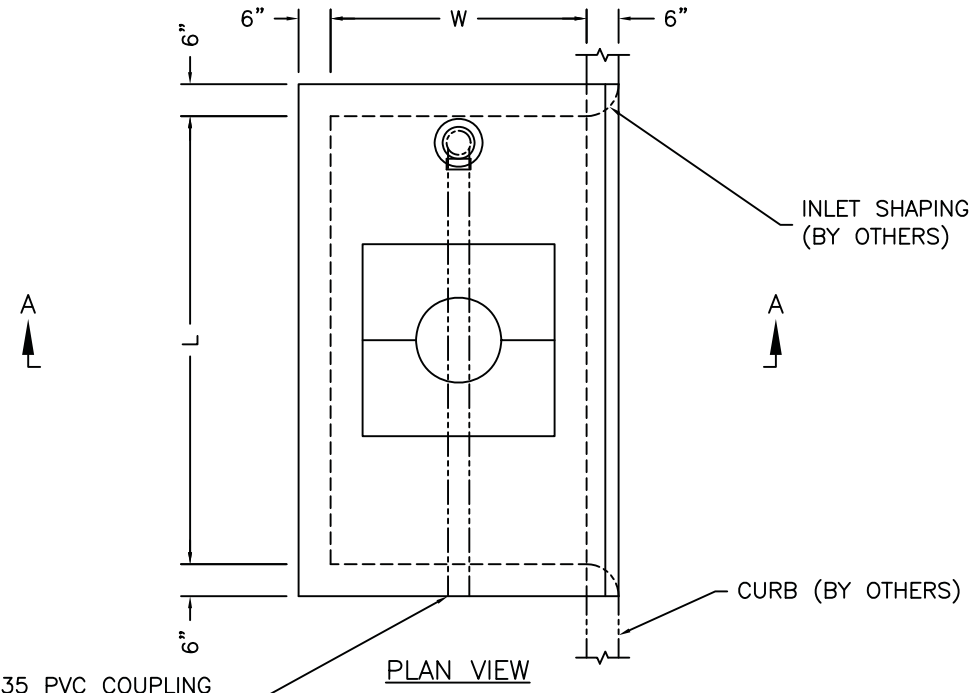
AMERICAST®

DATE: 09–04–07 | DWG: FTNL–3

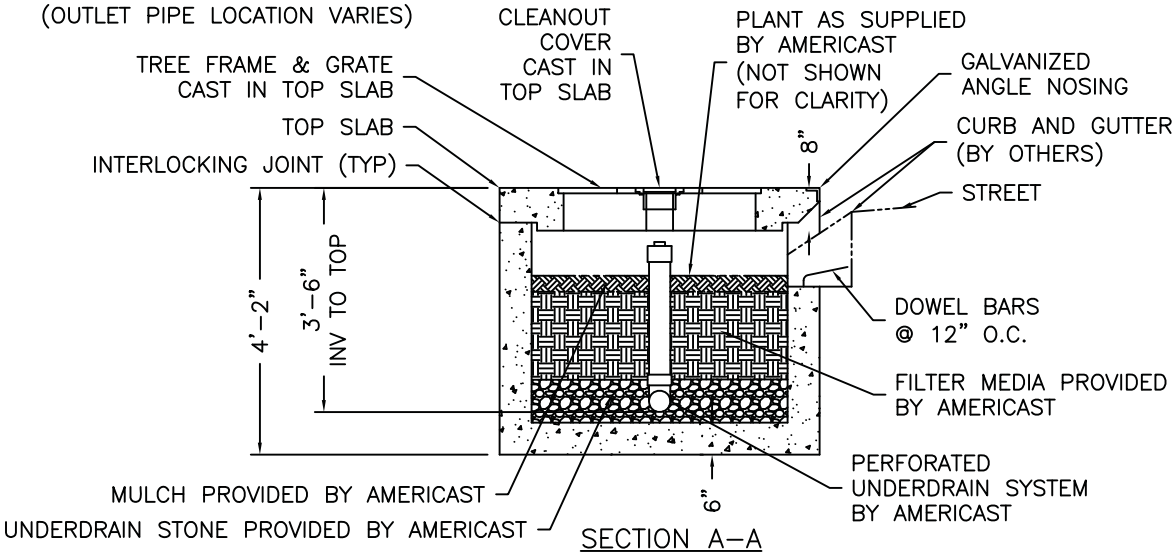
PRECAST FILTERRA® UNIT NARROW LENGTH CONFIGURATION

filterra®

US PAT 6,277,274
AND 6,569,321



PLAN VIEW



SECTION A–A

DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
6 x 4	6'–0"	4'–0"	(1) 3x3	4" SDR–35 PVC
8 x 4	8'–0"	4'–0"	(1) 3x3	4" SDR–35 PVC
8 x 6	8'–0"	6'–0"	(1) 4x4	4" SDR–35 PVC
10 x 6	10'–0"	6'–0"	(1) 4x4	6" SDR–35 PVC
12 x 4	12'–0"	4'–0"	(2) 3x3	4" SDR–35 PVC
12 x 6	12'–0"	6'–0"	(2) 4x4	6" SDR–35 PVC
13 x 7	13'–0"	7'–0"	(2) 4x4	6" SDR–35 PVC

** SIZES SHOWN ARE FOR THE MID ATLANTIC AND MAY VARY ACROSS THE COUNTRY
PLEASE CONTACT FILTERRA FOR A LIST OF SIZES WITHIN YOUR REGION

AMERICAST®

DATE: 09–04–07 | DWG: FTNW–3

PRECAST FILTERRA® UNIT NARROW WIDTH CONFIGURATION

filterra®

US PAT 6,277,274
AND 6,569,321