Abtech Industries, Inc.
4110 N. Scottsdale Rd
Scottsdale, AZ 85251

April 09, 2020

Mr. Jaime Favila
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA, 95812-100

Re: Trash Treatment Control Device Application for Abtech Industries Full Trash Capture (FTC) Ultra Urban Filter

Dear Mr. Favila,

AbTech Industries, Inc. is pleased to submit this application of our Ultra Urban Filter (UUF) for consideration to be included on the California State Water Resources Control Board's Certified Full Capture Systems List. This application shall cover the curb opening and drop-in series UUF units. The application is submitted in and organized in accordance with the California State Water Resources Control Board's Trash Treatment Control Device Application Requirements Document (amended, June 27, 2018). Per the application requirements the following document includes the requisite 7 sections and an appendix:

1. Cover Letter
2. Table of Contents
3. Physical Description
4. Installation Information
5. Operation and Maintenance Information
6. Reliability Information
7. Field/Lab Testing Information and Analysis

Appendix

Thank you for consideration of this application, if there are any questions or any additional information is required please contact us as needed.

Shawn Lolling, Director of Engineering
Abtech Industries, Inc

1. COVER LETTER

1.A. General description of the device.

The ULTRA URBAN FILTER is an engineered, stand-alone filtration device for capturing trash and debris as well as other contaminants in storm drain catch basins and curb openings. It is placed directly under a catch basin drainage grate or suspended below a catch basin curb opening in order to collect trash and debris from surface storm water runoff as part of a TMDL program, or as directed by the Engineer. With its intended design, the filter is capable of capturing pollutants as small as 4.8mm (no media) or 0.3mm (with media), significantly exceeding the requirement of 5mm for Full Capture Trash devices. It does this while still maintaining high flow rates due to its large surface area, hole sizing profile in the mesh screen, and filtration media porosity.

Abtech Industries has provided inlet filters targeting various levels of particle size and pollutant removal since 1997 with well over 20,000 UUF installations throughout the world. The field results including a 3 year EPA funded study in Norwalk, CT have been successful in capturing everything from cigarette butts, syringes, needles, sediment leaves and trash without resuspension given the filters high storage capacity. The screen openings and large surface area allow ample flow through and will not blind from sand and sediment loading off streets and parking lots.

1.B. The applicant's contact information and location.

Shawn Lolling
Director of Engineering
4110 N. Scottsdale Rd Suite 235
Scottsdale, AZ 85251
(480) 874-4000
slolling@abtechindustries.com

Benny Lonchar
National Sales Manager
4110 N. Scottsdale Rd Suite 235
Scottsdale, AZ 85251
(602) 702-1998
cbrown@abtechindustries.com

1.C. The device's manufacturing location.

ULTRA URBAN FILTERS are designed and manufactured primarily at its facility located in Phoenix, AZ. They are distributed and supplied within CA by United Stormwater, Inc. and several other channel partners. Other distributors supply to 25 other States and internationally in South America, United Kingdom, Australia, and New Zealand.

The manufacturing address is: Abtech Industries, Inc., 3610 E. Southern Ave Suite 2, Phoenix, AZ, 85040

1.D. A brief summary of any field/lab testing results that demonstrate Device's functions as described within the application.

The ULTRA URBAN FILTER has been validated by third parties that it successfully captures trash and debris that is 5mm or greater. These validations were also conducted at numerous test locations in the CA and other locations. Reports, results and pictures from these tests are presented in Section 7. These tests include hydraulic capacity verification.

1.E. A brief summary of Device limitations, and operational, sizing, and maintenance considerations.

Device Limitations: Designed for point source treatment in most cases. Contaminant removal is limited to the constituents the medias can remove, both non-soluble and soluble. Maximum treated and bypass flow rates are given in section 3C.

Operational: The units operate on gravity flow with little head pressure required. Flow rate, bypass flow rate, and storage capacity for the units are shown in the table in section 3C.

Sizing: The drop inserts are designed to fit the CA market for all standard concrete catch basin openings and grate sizes. AbTech Industries, also has the capability to provide custom designs and materials of fabrication to meet specified site specific requirements for many unique environments where the filter will be installed. In section 3C, tables are provided which standard outline model sizes.

Maintenance: Drop inserts usually take 2-5 minutes to install, while wall mount (curb opening units) inserts will take approximately 10 minutes per 4' length. For installation, use gloves when handling the flow diverter (if required) and mounting brackets. A jib crane or two-man team can be used to lower the filter into the catch basin. Maintenance is typically performed using an industrial vacuum with 3" hose or vacuum truck when the baskets are 50% full, or as required as dictated by local conditions and standard maintenance practices. Alternatively, the filters may be completely lifted from the drainage structure and dumped into a receptacle, rinsed and replaced.

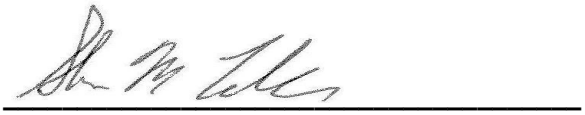
1.F. Description or list of locations, if any, where Device has been installed.

Abtech has sold the ULTRA URBAN FILTERS or other products in 45 US states and 15 countries in various markets including, but not limited to, from the eastern US (MA, ME, NY,NJ,CT,PA, MD) to the west coast of CA, WA and OR with excellent results.

- Camp Pendleton USMC base in Camp Pendleton, CA
- Saint Kateri Parish in Santa Clarita, CA
- R.M. Ahlke CO. in Newport Beach, CA
- The Paseo Club in Valencia, CA
- Sierra Pacific West in San Diego, CA
- County Pipeline, Inc. in Ventura, CA
- Frize Corporation in City of Industry, CA
- Construction Plumbing in Santa Barbara, CA
- Rite Aid in Irvine, CA
- United Stormwater, Multiple CA locations (municipal, commercial)
- Hal Hays Construction in Riverside, CA
- Ferguson Waterworks in Ventura, CA
- Szemenyei Construction in San Juan Capistrano, CA
- Town of Easton, MD
- Inland Environments, Multiple Texas locations (municipal, commercial)

1.G. Certification Clause.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Shawn Lolling, Director of Engineering
Abtech Industries, Inc.

2. Table of Contents

Appendices

3. Physical Description

3.A. Description of how the Device works to trap all particles that are 5mm or greater in size and how it is sized for varying flow volumes.

The ULTRA URBAN FILTER (UUF) filter ensures that all particles greater than or equal to 5mm are captured using a HDPE or Stainless steel screen with uniformly punched 4.8mm openings. This ensures that no particles larger than 4.8mm can pass by the filter. Additionally, uniformly hot packed smart sponge media is fully encapsulated between the two layers of screens. This media will provide additional filtration for removing pollutants greater than 0.3mm.

ULTRA URBAN FILTERS are manufactured to fit the catch-basin they are being inserted into and as a result, their flow capability. This applies to drop-in and curb opening units.

A catalog of standard size filters based on the structures found throughout California are provided in the following section in Tables 1 & 2.

3.B. Design drawings for all standard Device sizes including dimensions, and alternative configurations.

Refer to APPENDIX B for design drawings

3.C. If the Device is designed with an internal bypass, explain how the bypass only operates for volumes greater than the design storm.

The bypass region of the ULTRA URBAN FILTER Insert for drop-in and curb opening units is located above the filter enclosure. It only becomes active should the enclosure become completely filled with storm water, trash, and debris. In these cases the water spills over the top sides of the enclosure and is deemed to have entered bypass mode. Hydraulic calculations for the bypass region of the UUF inserts can be found in Appendix E.

The design engineer is responsible to confirm that the Maximum bypass flow rate of the UUF insert exceeds the design flow to the catch basin for a chosen rain event.

3.D. Engineering plans/diagrams for a typical installation.

Written instructions and diagrams for a typical installation can be found on the technical drawings in Appendix B.

3.E. Photographs, if any, of pre-and post-installation examples

See appendix D (Photo 1,2,3)

3.F. Device maximum trash capture capacity.

Table 1: Flow and Storage Capacities for select filter FTC offerings

Standard Drop-In ULTRA URBAN FILTER Performance Specifications - Full Trash Capture						
ABTECH-ULTRA URBAN FILTER P/N	Filter Size	Filter Depth	Maximum Bypass Flow Rate (CFS)	Storage Volume (ft^3)	Flow Rate when Empty (CFS)	Flow Rate when 50% Full (CFS)
DI1309N-FTC	13 x 09	13.5"	3.70	0.6	0.25	0.09
DI1309H-FTC	13 x 09	8.5"	3.70	0.4	0.16	0.06
DI1414N-FTC	14 x 14	21"	4.84	1.5	0.44	0.16
DI1414H-FTC	14 x 14	13"	4.84	0.8	0.39	0.14
DI1420N-FTC	14 x 20	21"	5.98	2.1	0.70	0.25
DI1420H-FTC	14 x 20	13.4"	5.98	1.1	0.70	0.22
DI1616N-FTC	16 x 16	21"	5.60	1.8	0.55	0.19
DI1616H-FTC	16 x 16	13.3"	5.60	1.0	0.55	0.17
DI2020N-FTC	20 x 20	21"	7.12	3.0	1.11	0.40
DI2020H-FTC	20 x 20	13.3"	7.12	1.7	1.11	0.37

Table 2: Flow and storage capacities for select FTC Wall Mounted Filters for Open Throat Basins

Standard Curb Opening ULTRA URBAN FILTER Performance Specifications - Full Trash Capture						
ABTECH-ULTRA URBAN FILTER P/N	Filter Size	Filter Depth	Maximum Bypass Flow Rate (CFS)	Storage Volume (ft^3)	Flow Rate when Empty (CFS)	Flow Rate when 50% Full (CFS)
CO1414N-FTC	14 x 14	22.5"	4.84	1.5	0.44	0.16
CO1414H-FTC	14 x 14	13"	4.84	0.8	0.39	0.14
*(2) CO1414N-FTC	28 x 14	22.5"	8.47	3.0	0.88	0.32
*(2) CO1414H-FTC	28 x 14	13"	8.47	1.6	0.78	0.28
*(3) CO1414N-FTC	42 x 14	22.5"	12.1	4.5	1.20	0.48
*(3) CO1414H-FTC	42 x 14	13"	12.1	2.4	1.17	0.42
*(4) CO1414N-FTC	56 x 14	22.5"	15.7	6.0	1.76	0.64
*(4) CO1414H-FTC	56 x 14	13"	15.7	3.2	1.56	0.56

* Multiple filters of the same width and length placed side by side with lateral overflow

3.G. The Device hydraulic capacity (flow in cfs) at its maximum trash capture capacity for all standard Device sizes.

Refer to Tables 1 & 2 for hydraulic capacity of UUF units. Hydraulic calculations for UUF units are found in Appendix C and E.

3.H. Each material and material grade used to construct the Device.

The UUF enclosure is primarily constructed from corrugated recycled plastic material, high-grade HDPE mesh screen, and aluminum (or stainless steel) rivets for additional structural integrity. Additionally, the UUF enclosure and screen can be constructed in 304L or 316 stainless steel of varying gauge.

Galvanized metal (or Stainless steel) brackets and nylon straps allow for the enclosure to be attached to a 304L stainless steel custom sized metal collar (or ABS plastic) placed on the grate lip.

There are two active filtering components, the mesh screen and filter media. The HDPE or stainless mesh screen is permanently affixed into the enclosure walls. The second active filtering component is smart sponge media and its variants. The smart sponge media is a blend of synthetic polymers. The media is fully contained in a high-grade HDPE mesh screen (or stainless) on the top and bottom surrounding the media.

3.I. Conditions under which the device re-introduces previously trapped trash.

The ULTRA URBAN FILTER trash retention screen and storage basket will not reintroduce previously trapped trash except for when the entire storm drain conveyance system is surcharged. When there is free discharge beneath the filter screen, previously trapped trash will continually compact into the filter screen.

3.J. Estimated design life of the Device

The corrugated plastic UUF units have a 3-5 year minimum design life when used in storm water applications exposed to moderate levels of salt and other naturally occurring roadway contaminants. Units have been shown to last over 10 years when serviced as required and designed based on 125 lbs. per cubic ft. storage capacity. The stainless steel version of the UUF has a 15-20 year life span.

3.K. Similarity of Device to products currently on the certified list of trash devices

ADS-Flexstorm FTC inserts: The UUF filters are similar in application and suspended solids filtration (without media) performance to these. We have similar materials in stainless steel construction, though we offer a corrugated plastic version which is more corrosive resistant if needed based on the application. We both have similar sized openings for the filter screen. We believe their listed treated water flow rates are significantly in error as this not close to the data we have experienced both in the field and in a laboratory setting. Our units have a lower treated water flow rate and we believe their flow rates should be similar. We also can offer filter media between our filter screens which they do not. This allows us to selectively target hydrocarbons, soluble metals, soluble phosphorus, and even bacteria. If the media is added, we can easily filter down to 0.3mm for TSS and suspended solids.

Bioclean Grate Inlet and Curb Inlet Screens: The UUF filters are similar in application and suspended solids filtration (without media) performance to these. We have similar materials in stainless construction, though we offer a corrugated plastic version which is more corrosive resistant if needed based on the application. We both have similar sized openings for the filter screen. We believe their listed treated water flow rates are significantly in error as this not close to the data we have experienced both in the field and in a laboratory setting. Our units have a lower treated water flow rate and we believe their flow rates should be similar. We also can offer filter media between our filter screens which they do not. This allows us to target hydrocarbons, soluble metals, soluble phosphorus and even bacteria. If the media is added, we can easily filter down to 0.3mm for TSS and suspended solids. They have an optional “boom” that they say will address hydrocarbons. The boom design they have does not treat the full flow of water into the unit so only a small portion of any hydrocarbons will be addressed.

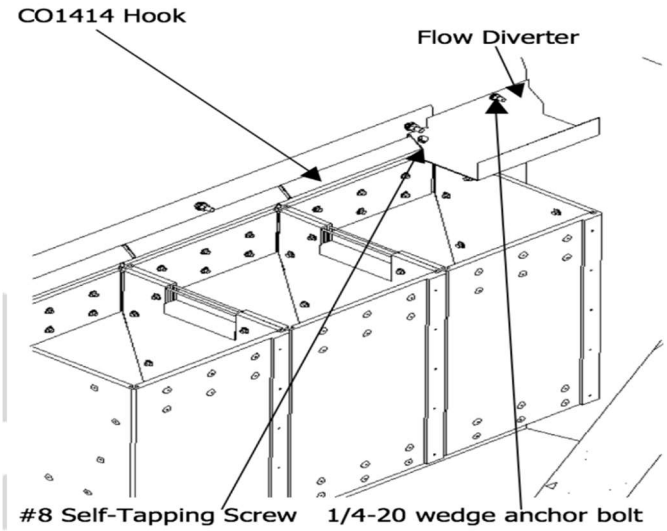
Storm Clean Filtrations System by CleanWay: The UUF filters are similar in application and suspended solids filtration (without media) performance to these. We have similar materials in stainless steel construction, though we offer a corrugated plastic version which is more corrosive resistant if needed based on the application. They also offer a fabric filter which does not offer structural integrity to the unit and we do not recommend use of that product. We both have similar sized openings for the filter screen. We believe their listed treated water flow rates are more in line than the two products listed above. We offer a media integrated into our filter as they do. Ours is enclosed between tow screens and theirs is on the outside of the filter screen. Structurally this is a weakness in their design as the media wrapping is not supported by a structural member of the filter enclosure. They claim to target hydrocarbons which we believe they could do given the appropriate absorptive media. Their metal reduction media is not as effective in metals and phosphorus reduction as our media. This is based on field and laboratory side by side testing. We also require less contact time. Their metals reduction media also contains vermiculite which a

water retaining media. This would encourage mosquito growth instead of being hydrophobic as our media is. They do not offer a bacteria reduction media. Abtech currently offers Smart Sponge Plus bacteria reduction media.

3.L. Optional Components for the UUF

Abtech offers a maintenance saver for all UUF units. This is a high strength fabric insert which is suspended above the filter screen. This will not alter the unit performance as it allows for the user to remove the maintenance saver manually vs using a vacuum truck or removing the entire unit for maintenance.

The curb inlet version of the UUF shall require a flow diverter if the size does not match the 14” width or 14” multiple of the unit. Sizing is described in section 4D. This is to capture 100% of the flow coming from the entire length of the curb opening. This doesn’t alter the unit performance.

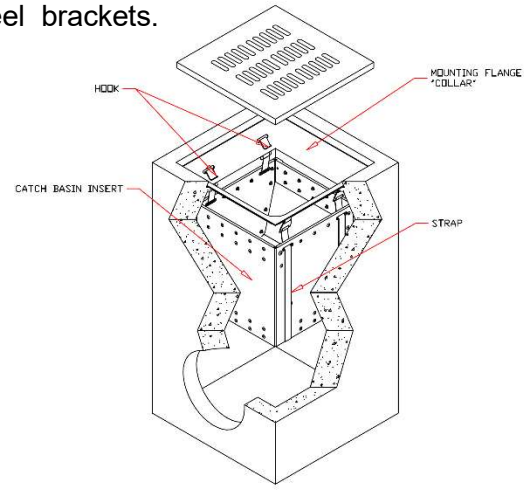


4. Installation

4.A. And 4.B Device installation procedures and considerations.

Installation into Standard Grated Drainage Structures-Drop In:

Remove the grate from the casting or concrete drainage structure using a grate removal tool. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt. Place the custom sized stainless steel collar onto the grate lip. The collar will have a viewport included for mosquito abatement. Lower the UUF insert through the clear opening and be sure the suspension brackets rest firmly on the openings of the stainless collar. Replace the grate and confirm it is elevated no more than 1/8", which is the thickness of the steel brackets.



Installation into Curb Inlets:
For curb inlet wall mount inserts, the filter profile size is 14" x 14" with lengths up to 56". Lower the filter into the catch basin through the manhole opening. Mark the wall mount support bracket locations on the basin wall beneath the street/curb opening. Using a hammer drill install the provided wedge anchor bolts into the concrete wall and secure the support brackets. Lift the UUF filter and engage the support brackets allowing the enclosure to hang cantilevered off the wall for quick installation and removal. For multiple lengths on longer curb openings, simply use the dual support brackets securing the enclosures side by side to cover the entire curb span. A custom sized flow diverter shall be used to ensure 100% of the required flow is treated. See Appendix B Design Drawings for more wall mount installation detail.

4.C. Methods for diagnosing and correcting installation errors.

Abtech offers standard sized configurations to fit many drainage structures, however there are instances where the catch basin drainage structure has been customized or varies from typical designs. This is not an issue as long as the dimensions are documented. Abtech can build UUF collars and enclosures for any catch basin configuration. By utilizing and submitting the information on the field dimensional form, AbTech can custom fabricate the UUF to fit the catch basin: Catch Basin Measurement Form (Appendix F)

4.D. Optional Component Installation

Maintenance Savers are based on the specific project customer's maintenance schedule and servicing methods. The UUF units do not require use of these for operation. For curb inlet UUF's, diverters are not needed if the width dimension of the curb opening matches the CO1414 or combination of units or the customer chooses not to utilize the entire curb opening. Each standard CO1414 unit is 14" wide . For example, if the curb opening is 20" wide, a 6" diverter shall be affixed to the wall of the catch basin to direct and ensure 100% of the water flow and trash goes through the UUF. One of more diverters shall be used to achieve this.

5. Operation and Maintenance Information

5.A. Device inspection procedures and inspection frequency considerations.

Upon inspection, the ULTRA URBAN FILTER should be emptied if the enclosure is more than half filled with trash and debris, or as directed by the engineer, city, or municipal private contractor. For a drop in or curb opening unit, use a vacuum truck or industrial vacuum to remove the trash and debris that has collected in the filter. Alternatively, the filter may be lifted out of the drainage structure and trash emptied into a receptacle to be hauled away and the filter re-installed. Remove any stuck trash and debris from the steel basket to ensure proper flow. When the enclosure is cleaned, the grate should be replaced onto the basin and maintenance logged.

5.B. Maintenance procedures, including a description of necessary equipment and materials.

ULTRA URBAN FILTER inspections should occur three times per year (every four months) in areas with year-round rainfall. Alternatively, maintenance guidelines per the specific project should be followed. Drop inserts usually take 2-5 minutes to install, while wall mount inserts will take approximately 10 minutes per 4' length. For installation, use gloves when handling the flow diverter. A jib crane or two-man teams can be used to lower the filter into the catch basin. Maintenance is typically performed using an industrial vacuum with 3" hose or vacuum truck when the baskets are 50% full, or as required as dictated by local conditions and standard maintenance practices. Alternatively, the filters may be completely lifted from the drainage structure and dumped into a receptacle, rinsed and replaced.

5.C. Maintenance frequency considerations, including effects of delay.

As with all storm water BMPs, inspection and maintenance must occur on a regular basis for proper operation. Observations made during inspections are used to determine when maintenance is required. As the filter screens blind, less flow is treated (as is shown in tables 1 and 2 in section 3.F.), and more is bypassed reducing the volume of water screened and filtered during a given storm event. With fully occluded screen and filter media, all flows are bypassed to ensure full water flow but without filtration. During bypass, trash entering the drainage structure may escape directly into the sewer system. The UUF units are designed to hold 2 times their stated storage capacity. Water should freely drain from the units. IF improperly maintained and fully occluded, some small amount of water could sit on top of the unit until maintenance, replacement, or natural evaporation.

5.D. Device maintenance and vector control accessibility.

The ULTRA URBAN FILTER provides a bypass area with a minimum 3"x4" opening on the mounting collar to allow for vector control insertion of mosquito pellets into the catch basin without requiring removal of the drop insert. If a double collar unit is used, two viewports will be included. If multiple units are used, one viewport shall be included per filter. The wall mounted inserts (curb opening units) provide no interference with vector control procedures for abatement in curb inlets.
Furthermore, the large 4.8mm dia. openings in the filter screen will not accumulate standing water in the enclosure, which will discourage mosquito breeding. Abtech has submitted these filters for vector control approval. Correspondence and initial submittal was given on August 18, 2019. A revision was submitted on January 23, 2020. Approval was given by MVCAC on April 8, 2020.

5.E. Repair Procedures for Device's structural components

Any damaged equipment should be replaced with new equipment per manufacturer's recommendation.

6.0 Reliability Information:

6.A. Estimated Design Life of Device Components before major overhaul

Description	Material(s)	Design Life
Mounting Collar	Stainless Steel or ABS Plastic	10 years or 3-5 years
Mounting Brackets	Stainless Steel or Galvanized Steel	10 years
Enclosure Box	Stainless Steel or Corrugated Plastic	10 years or 3-5 years
Screen	Stainless Steel or Nylon Mesh	10 years or 3-5 years
Media (Smart Sponge, SS HM, SS BC, SS AC, SS Plus)	Polymer Blend with Added Components	1-5 Years

6.B. Device sensitivity to loadings other than trash (i.e. leaves, sediment).

The ULTRA URBAN FILTER system (for both drop-in and curb opening units) is a very durable and robust enclosure assembly that will not corrode or break down even when subjected to heavy loading conditions, exposure to salt or chemicals, or during extreme temperature conditions. Abtech integrates smart sponge media and its variants to line the inside of the enclosure if higher removal rates for targeted pollutants are required. The HDPE or stainless screen openings will not prematurely blind like other geotextile filter elements, so it is the preferred solution.

6.C. Warranty information.

The corrugated plastic enclosure along with product construction are warranted for a period of 3 years from the date of installation. The 304 stainless steel framing and basket materials along with product construction are warranted for a period of 7 years from the date of installation. Under warranty, replacement parts are supplied at no charge to the end user provided the inserts were installed and maintained properly for their intended use as a full trash capture device.

6.D. Applicant's customer support.

Abtech has a nationwide support team with local field representatives and product managers. Abtech Industries headquarters can address any engineering and design questions, we can be reached at 480-874-4000 or slolling@abtechindustries.com

ABTECH website: www.abtechindustries.com

7. Field/Lab Testing Information and Analysis

7.A. Provide available field or lab testing information that demonstrates Device functionality and performance.

Appendix A presents an EPA funded study demonstrating the performance of the UUF and the results collected by the Long Island Soundkeepers and City of Norwalk for trash and sediment loading.
Appendix H presents the performance capabilities for filtration media for particle size filtration of a UUF unit as documented by Millsaps College.

Appendix A: Summary of Norwalk, CT EPA study

AbTech INDUSTRIES

City of Norwalk Filter Project Report

12/3/2007

AbTech Industries, Inc.
4110 N Scottsdale Road, Suite 235
Scottsdale, AZ 85251
Phone: 480.874.4000
Web Site: wwwabtechindustries.com

Executive Summary

This report was prepared for the City of Norwalk and the Soundkeeper as a part of the Filter Project, a $500,000 project to treat stormwater flowing into the Long Island Sound from the streets of Norwalk. It is evident that the Filter Project has offered amazing protection against contaminants that would have otherwise entered the Long Island Sound. This project will result in far reaching positive effects for the city of Norwalk and other municipalities around the country.

The objectives of the Filter Project as related to the technology's performance were as follows:

1. Field demonstrate in New England, the effectiveness of AbTech's Smart Sponge® Plus in a catch basin insert application in reducing bacteria contamination on stormwater.

2. To remove 75% of hydrocarbons and bacteria, along with trash, sediment and debris from stormdrain systems before they have a chance to enter Long Island Sound.

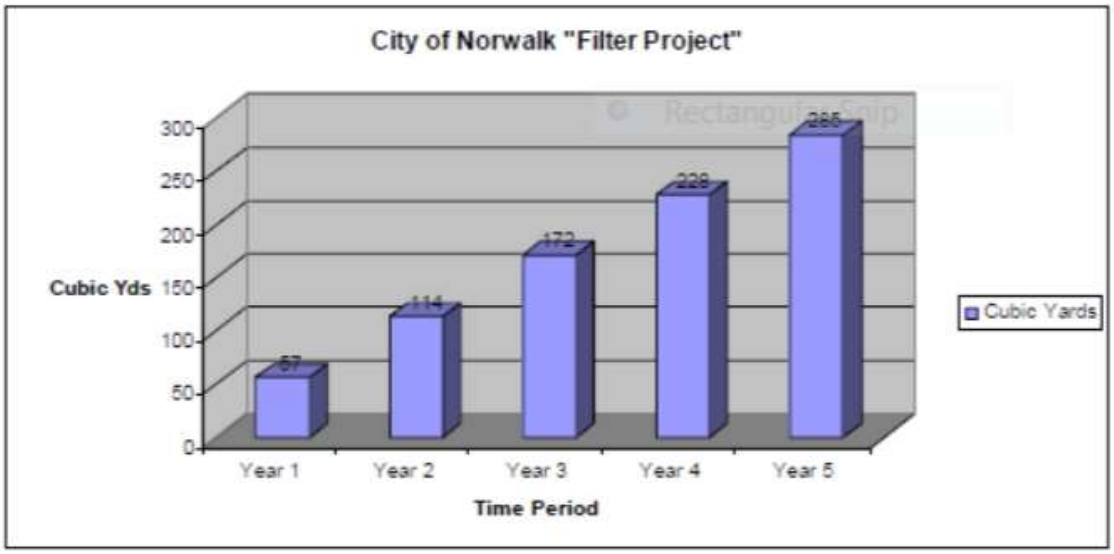
After almost two years in the ground, the 275 AbTech filters installed in Norwalk have yielded the results outlined in the summary below:

- There were three rounds of filter maintenance & cleanings performed to determine the volume of trash, leaves and other debris removed from the filters. Combined, the cleanings yielded a **grand total of 37,976 pounds, or over 19 tons of trash and debris removed from the filters that otherwise would have entered the Long Island Sound. In the pilot project alone, this equates to 342 cubic feet or 13 cubic yards of trash, sediment and debris, that would otherwise have to be dredged from the Long Island Sound.**[1]

- The City of Norwalk houses an estimated 10,000 drains. If the city were to retrofit the most critical areas that lead to the Long Island Sound, which is approximately 25% or 2,500 drains, **it is estimated that over 172,000 pounds of trash and debris would be removed from stormwater runoff over the period of one year. This equates to 1,550 cubic feet or 57 cubic yards of trash, sediment and debris, that would otherwise have to be dredged from the Long Island Sound.**[2] **Over a five-year period, this equates to 285 cubic yards of trash, sediment and debris that would otherwise have to be dredged from the Long Island Sound.**

[1] This assumes 111 lbs per cubic foot.
[2] This assumes 111 lbs per cubic foot.

A breakdown of the volume of cubic yards (if 25% of the drains were retrofitted) for Year 1 through Year 5 is shown in the following graph:



- In addition, an analysis of the water quality was also performed with the results showing filter removal efficiency of bacteria (E. Coli) averaging approximately 75%. In some locations, removal rates were as high as 95.9%. Oil and grease removal was 70.5%.

- Unfortunately, further sampling of filter runoff by the city was hindered by the timing of the rainfall events, which usually occurred after the lab was closed. This made it difficult to meet the stringent testing protocols. Therefore, alternative methods were pursued to document contaminant removal for hydrocarbons and solid contaminants. This alternative "Black Box Characterization" method consisted of quantifying the amount of the contaminants trapped in the Smart Sponge® media through sophisticated analytical techniques. (See attached chart – Smart Sponge Characterization). The deconstruction or meltdown of the Smart Sponge® media documented (for the tested filters) approximately 50 pounds per filter of total contaminants with the presence of several heavy metals (copper, titanium, zinc) and a variety of hydrocarbons, (about 32 pounds per filter), including solvents, oils, and cosmetic product components as well as chemical plasticizers. With an average removal of 49.2 pounds per filter, **the grand total of contaminants including hydrocarbons and heavy metals removed, extrapolated for the 275 filters, is an estimated 13,530 pounds.**[3] Essentially, the installation of the filters prevented the equivalent of an oil spill (based on the 32 pounds of hydrocarbons

[3] Assuming equal or consistent contaminant removal by all installed filters as of July 13, 2007.

per filter, at 7 pounds per gallon) of over **1,200 gallons from entering the Long Island Sound**.

- Based on the same information, if 25% of the drain infrastructure or 2,500 drains had been retrofitted over the same period, **over 82,500 lbs. of hydrocarbons or approximately 11,800 gallons would have been prevented from entering the Long Island Sound**.

Background

The Long Island Sound watershed houses 8 million people with another 20 million living within 50 miles of it. Regulation has resulted in many improvements over the last few decades, but it has done little to stop the largest source of toxins – nonpoint source pollution. This is the pollution that comes from nonspecific sources – it's the urban runoff that flows from paved surfaces through the storm drain system.

"The Filter Project," as Norwalk, Connecticut's city officials call it, began as a natural outgrowth of the Soundkeeper's mission of protecting the Sound's ecosystem coupled with Norwalk's commitment to clean up local waterways. The heart of this approximately $500,000 project involved fitting AbTech Industries' catch basin filtration systems into storm drains in south Norwalk to catch trash, debris, animal waste, hydrocarbons, oil, grease, and bacteria before they enter the Sound. The City of Norwalk, population 84,000, has a harbor, marinas, and a shellfish industry. People are equally at risk of exposure to toxins whether they fish in the Sound to feed their families or whether they use the waters for recreation. The public health threats exist primarily because of contaminants such as hydrocarbons and bacteria entering the sound, which is the primary reason the Smart Sponge® Plus technology was chosen for this project.

The project is a collaborative effort, which brought together an impressive roster of national businesses, nonprofit organizations, and local, state, and federal government officials. The City of Norwalk partnered with the Soundkeeper, The Maritime Aquarium, the Norwalk River Watershed Initiative, and AbTech Industries. Much of project cost – over $500,000 was funded by the U.S. EPA as a result of legislation sponsored by U.S. Senator Joseph Lieberman. Other funds were raised by private organizations through the assistance of the Soundkeeper's Terry Backer. The filter project was implemented as a result of the dedication, commitment and drive by the Soundkeeper and the City of Norwalk and today remains the largest federally funded program of its kind.

Smart Sponge® Technology

AbTech's patented Smart Sponge® technology features a unique molecular structure based on innovative polymer technologies that are chemically selective to hydrocarbons. Smart Sponge recovers and fully encapsulates oil, resulting in a substantially more effective system that prevents the absorbed oil from leaking or leaching back into the water stream. In addition, the Smart Sponge remains buoyant in calm or agitated water, permitting it to remain in one place until fully saturated, thereby resulting in no wasted product. Once the oil is absorbed, the Smart Sponge transforms the pollutants into a stable solid for easy recycling, providing a closed-loop solution to water pollution treatment.

Smart Sponge technology also features a bacteria removal version known as Smart Sponge Plus. It employs an antimicrobial agent that is chemically bound to the Smart Sponge material. Smart Sponge Plus destroys dangerous disease causing microorganisms such as Enterococcus, E.coli, and Fecal Coliforms on contact. Independent field testing has validated the effectiveness of the Smart Sponge Plus in multiple locations for a variety of microorganisms.

Unlike other antimicrobials that act by poisoning harmful microorganisms, Smart Sponge Plus technology is based on the antimicrobial agent's interaction with the microorganism's cell membrane. Simply put, it acts by rupturing the cell membrane—rendering the microorganism inactive. Because no chemical or physical change occurs in the antimicrobial agent, the filtration system maintains long-term effectiveness without releasing any chemicals or by-products.

Project Description

The Filter Project is a part of Norwalk Public Work's stormwater management improvement program and involved fitting over 275 storm drains with high-technology filtration systems equipped with Smart Sponge® Plus. The filtration systems – Ultra Urban® Filters with Smart Sponge® Plus – are produced by the Arizona-based company, AbTech Industries, which holds the technology's patents. The Smart Sponge technology is chemically selective, absorbing hydrocarbons and permanently bonding them within the structure. Once absorbed it will not leach or leak contaminants back into the environment; rather, it transforms them into a solid waste with substantially lower disposal costs than other systems. It also passes the EPA's Toxicity Characteristic Leaching Procedure (TCLP).

AbTech's antimicrobial Smart Sponge Plus in the stormwater catch basin selected for this project also destroys bacteria. The antimicrobial agent used in Smart Sponge® Plus is an Organosilane derivative widely used in a variety of fields including medical, consumables, pool equipment, and consumer goods, and it is registered with the U.S. Environmental Protection Agency in various applications, having been proven effective against a wide variety of microorganisms. It also acts as a fungi static, odor, and mildew control.

Monitoring Program

As a part of the stormwater management project, a monitoring program was developed by the City of Norwalk, CT in partnership with Long Island Soundkeeper, Inc., the U.S. Environmental Protection Agency (EPA), the Maritime Aquarium at Norwalk, the Norwalk River Watershed Initiative, and AbTech Industries. The purposes of the monitoring program were as follows:

1. Collect, quantify, and classify the trash, debris and sediment retained by the filter and assess overall filter conditions.

2. Conduct initial and follow-up baseline water quality sampling/testing and document program results.

Advanced Monitoring Program

In addition to the original scope of work outlined in the monitoring program above, AbTech took progressive steps to ensure that a more thorough and comprehensive analysis was conducted. While coarse contaminants, such as trash & debris, are easily collected and measured, (see filter cleaning paragraph below), all other contaminants (i.e., fine sediment, oil & grease, suspended heavy metals, etc.) can be more difficult to quantify based only on random sampling events. AbTech took a more advanced approach to quantify and identify the contaminants removed and trapped inside the UUFs. This innovative process required the use of complex analytical techniques to deconstruct the Smart Sponge polymer and selectively extract all the entrapped contaminants collected inside the filters over the duration of the project. This in-depth mapping and finger printing of contaminants (a first of its kind in stormwater treatment) is analogous to a "Black Box" reading of the UUF, offering an advanced method of testing that produces more reliable results than mere random sampling with reference to various pollutants present. Random sampling and comparisons of influent and effluent can be misleading due to the non-homogenous concentrations in the storm water runoff. Analyzing all contaminants entrapped in the filter over a period time provides a better indicator of the filters' true performance. Accordingly, the extrapolation of data generated from this quantification of contaminants in the UUF is potentially more consistent and factual than data obtained by other methods.

Filter Cleanings

As agreed in the monitoring program, AbTech's distributor, Longo & Longo performed filter maintenance events with the City of Norwalk after the date of initial installation. According to procedure, the gross contaminants (trash, debris and sediment) were manually removed from the UUFs, bagged, and labeled with identifying information for each respective catch basin. Upon

completion of the field collection, removed materials were shipped offsite for classification and quantification. Following analysis, collected materials were disposed of in accordance with all applicable regulations and protocols.

The following cleanings of contaminants (sediment, trash, debris, organic material and vegetation) were performed:

March 2006
January 2007
September 2007

The first cleaning yielded 14,816 pounds, the second cleaning yielded 15,860 pounds and the third cleaning yielded 7,300 pounds.

- Combined, the cleanings yielded a **grand total of 37,976 pounds, or over 19 tons of trash and debris removed from the filters that otherwise would have entered the Long Island Sound. This equates to 342 cubic feet or 13 cubic yards of trash, sediment and debris, that would otherwise have to be dredged from the Long Island Sound.**[4]

- The City of Norwalk houses an estimated 10,000 drains. If the city were to retrofit the most critical areas that lead to the Long Island Sound, which is approximately 25% or 2,500 drains, **it is estimated that over 172,000 pounds of trash and debris would be removed from stormwater runoff over the period of one year. This equates to 1,550 cubic feet or 57 cubic yards of trash, sediment and debris, that would otherwise have to be dredged from the Long Island Sound.**[5]

"Black Box" Smart Sponge® Characterization

Due to the unique ability of the Smart Sponge® to capture and retain hydrocarbons and other contaminants within its highly porous structure, one of the best measures of its performance is an in-depth look at the spent material to analyze the composition and quantity of the various contaminants retained. AbTech engaged a highly qualified, analytical laboratory, Analyze, Inc. to conduct this complex analysis and characterize various samples of used Smart Sponge generated in this Project. Through extrapolation of these results, an estimation was made of the total contaminants retained in the entire drain network.

Four (4) Smart Sponge® filters were extracted from catch basins in different areas, dried, and shipped to Analyze, Inc. for sample preparation and analysis. Analyze, Inc. is a custom chemical technology lab which provides total materials characterization services. The composite sample was subjected to various analytical tests and results were compared to base tests performed on

[4] This assumes 111 lbs per cubic foot.
[5] This assumes 111 lbs per cubic foot.

Norwalk

THE RIGHT PLACE • THE RIGHT TIME

DEPARTMENT OF PUBLIC WORKS

April 2006

During March 2006, Longo & Longo Storm Water Treatment, Inc, completed the 1st cleaning of the 275 Abtech Ultra Urban Filters (UUF), installed in November 2005, as part of the Norwalk Filter Demonstration Project. This first cleaning of the filters yielded 14,816 pounds of trash, leaves, sand and other materials, averaging approximately 54 lbs. per UUF.

Ten locations were selected, with the removed materials sorted and weighed. The results are presented in Table 1.

Table 1 – Materials Removed

Location	Trash & Debris	Leaves & Organics	Sand & Silt	Total Weight
S1	7.75 lbs. (6.6%)	41.5 lbs. (35.7%)	67 lbs. (57.7%)	116.25 lbs.
S2	1.5 lbs. (5.8%)	1.75 lbs. (6.8%)	22.5 lbs. (87.7%)	25.75 lbs.
S3	1.5 lbs. (6.5%)	16.25 lbs. (69.9%)	5.5 lbs. (23.6%)	23.25 lbs.
S4	10.0 lbs. (48.2%)	8.0 lbs. (38.6%)	2.75 lbs. (13.2%)	20.75 lbs.
S5	7.5 lbs. (15.6%)	7.25 lbs. (15.1%)	33.25 lbs. (69.3%)	48.0 lbs.
S6	0.25 lbs. (0.9%)	14.25 lbs. (50.0%)	14.0 lbs. (49.1%)	28.5 lbs.
S7	1.5 lbs. (3.0%)	7.25 lbs. (14.3%)	42.0 lbs. (82.7%)	50.75 lbs.
S8	0.75 lbs. (2.5%)	28.5 lbs. (93.4%)	1.25 lbs. (4.1%)	30.5 lbs.
S9	2.0 lbs. (5.0%)	20.0 lbs. (50.3%)	17.75 lbs. (44.7%)	39.75 lbs.
S10	2.0 lbs. (3.8%)	0.0 lbs. (0.0%)	50.5 lbs. (96.2%)	52.5 lbs.
Total	**34.75 lbs. (8.0%)**	**144.75 lbs. (33.2%)**	**256.5 lbs. (58.8%)**	**436.0 lbs.**

An analysis of water quality characteristics was also done. The results are shown in Table 2.

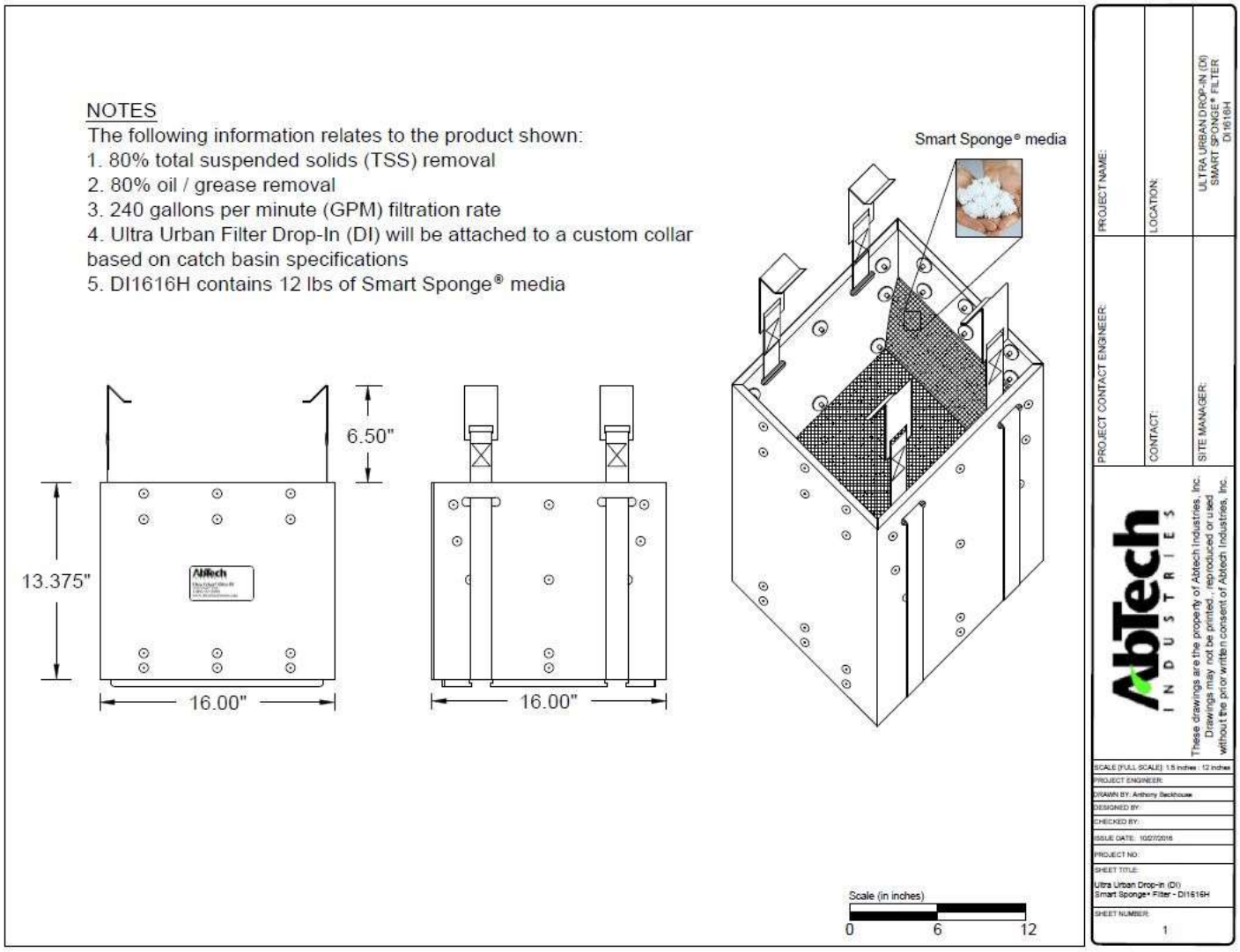
Location	E. Coli (% removal)	Oil and Grease(% removal)
1	980.4 to 110.6 (88.7%)	<5 to <5 (Undetermined*)
2	275.5 to 59.1 (78.5%)	<5 to <5 (Undetermined*)
3	325.5 to 214.3 (34.2%)	20 to <5 (70.5%)
4	24.3 to <1 (over 95.9%)	<5 to <5 (Undetermined*)

* Removal rate cannot be calculated

The City will continue to monitor the performance of this project through November 2006.

125 EAST AVENUE * NORWALK, CT 06851 * TELEPHONE 203-854-7791 * FAX 203-857-0143

Appendix B: Design Drawings (examples of several standard sizes, others can be provided if required)

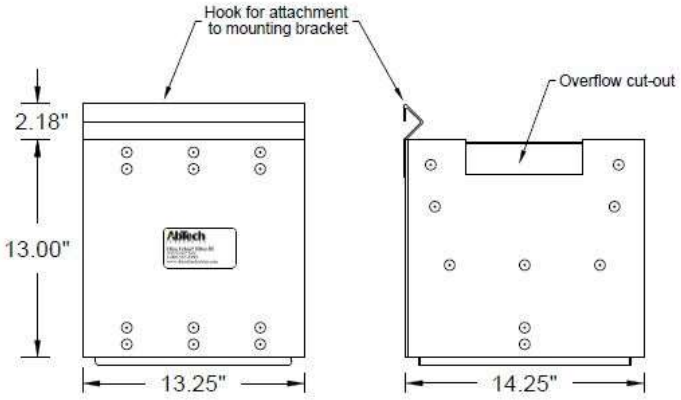


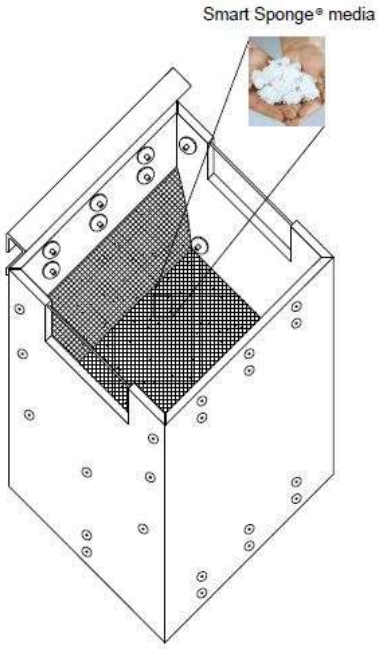
* DI1616H Ultra Urban Filter (Drop-In)

NOTES

The following information relates to the product shown:

1. 80% total suspended solids (TSS) removal
2. 80% oil / grease removal
3. 190 gallons per minute (GPM) filtration rate before the built-in bypass
4. Ultra Urban Filter Curb Opening (CO) will be attached to a mounting bracket as per installation instructions
5. CO1414H contains 10 lbs (+/- 10%) of Smart Sponge® media





Scale (in inches)

0 6 12

PROJECT NAME: ULTRA URBAN CURB OPENING (CO) SMART SPONGE® FILTER CO1414H

LOCATION:

PROJECT CONTACT ENGINEER:

CONTACT:

SITE MANAGER:

AbTech INDUSTRIES

SCALE (FULL SCALE): 1.5 inches - 12 inches

PROJECT ENGINEER:

DRAWN BY: APB

DESIGNED BY:

CHECKED BY:

ISSUE DATE: 01/03/2017

PROJECT NO:

SHEET TITLE:

Ultra Urban Curb Opening (CO) Smart Sponge+ Filter - CO1414H

SHEET NUMBER:

1

*CO1414H Ultra Urban Filter (Curb Opening)

Appendix C: Hydraulic Calculations for Ultra-Urban Filter Flow Rate

Example: Flow Through calculation DI1616N-FTC

Method for determining flow rate through 4.8mm HDPE (or stainless) screen

In order to determine the flow rate through a screen we first determine the total number of 4.8 mm holes in the screen. Then we determine a pressure difference in the water between the top of the enclosure and the screen. Then that pressure difference is used to calculate the flow rate of water through a single 4.8 mm opening. That flow rate is multiplied by the total # of holes to give a flow rate for the entire basket.

1. Determine the # of holes in a HDPE or stainless steel screen (DI1616N-FTC)

The equation for the screen surface area of a UUF with two screen "wings":

$$SA = 2^* (W^*H) + (W^*L)$$

Using: W = 15", L = 11", H = 11.5"

$$SA_{DI1616N} = 2^* (15^*11.5) + (15^*11) = 510in^2$$

From physical measurements it was determined that there are 21 holes/in^2 the perforated material.

Therefore:

$$510in^2 * 21 \text{ holes}/in^2 = 10710 \text{ holes in the DI1616N-FTC screen}$$

2. Determine the flow rate of water through a 4.8 mm orifice:

To determine the flow rate through a 4.8 mm orifice, we first determine the pressure difference of water before and after it flow through the orifice. It is assumed that once the water exits the orifice it has a pressure equal to sea level (101.325 kPa). Before exiting the orifice, it is assumed the water has a pressure equal to depth of the filter opening beneath the curb line (102.857 kPa). Using the formula shown below we can convert that pressure difference into a flow rate:

Equation(s)

$$p_1 - p_2 < FL^2 \cdot (p_1 - FF \cdot P) \rightarrow$$
$$Q_w = 0.0865 \cdot C \cdot \left(\frac{d_o}{4.654}\right)^2 \cdot \sqrt{\frac{p_1 - p_2}{SG}}$$
$$p_1 - p_2 \geq FL^2 \cdot (p_1 - FF \cdot P) \rightarrow$$
$$Q_w = 0.0865 \cdot C \cdot \left(\frac{d_o}{4.654}\right)^2 \cdot FL \cdot \sqrt{\frac{p_1 - FF \cdot P}{SG}}$$

p1 : Primary Pressure (kPa abs)
p2 : Secondary Pressure (kPa abs)
do : Diameter of Orifice (mm)
C : Discharge Coefficient
Qw: Water Flow Rate (m^3/h)
FL : Pressure recovery factor (=0.9)
FF : Critical pressure ratio factor
P : Absolute vapor pressure of the water at inlet temperature (kPa abs)
SG : Specific Gravity

Plugging those pressure values into the formula yields a water flow rate per opening of .289058 GPM or .00005135 CFS/hole.

Finally, we multiply the total # of holes in the DI1616N-FTC basket by the flow rate of water per hole:

0.00005135 CFS/hole*10710 holes = **0.55 CFS** through the screen when empty.

To determine the flow through of the basket when it is 50% full with sediment we make a change to the surface area calculation. Since it is assumed that 50% of the side walls and the bottom of the basket is blocked with debris the surface area equation becomes:

SA = [2* (W*H)]/2

SA = [2*(15*11.5)]/2 = 172in^2

Multiplying that surface area by the # of openings per square inch and the flow rate through each hole yields:

172* 21 holes/in^2 * .00005135 CFS/hole = **0.19CFS**

Therefore, when 50% filled or blocked with debris the DI1616N-FTC is expected to have a water flow through rate of 0.19 CFS.

Appendix D: Photo Gallery

Photo 1: Drop-In UUF Install with two man team

Photo 2: Drop-In UUF with one man

Photo 3: Curb Inlet Install with Multiple Units

Appendix E: Hydraulic Calculations of Maximum Bypass Flow Rate

Example maximum bypass calculation for Ultra Urban Filter (DI1616N-FTC)

As water flow rate exceeds the designed treatment flow, water will enter bypass mode. Water will overflow on all sides acting as a contracted weir during this bypass mode.

The Equation used to determine the flow rate (Q) of a Rectangular Contracted Weir is:

$$Q = \frac{3.247 \cdot L \cdot H^{1.48} - 0.566 \cdot L^{1.9}}{1 + 2L^{1.87}} \cdot H^{1.9}$$

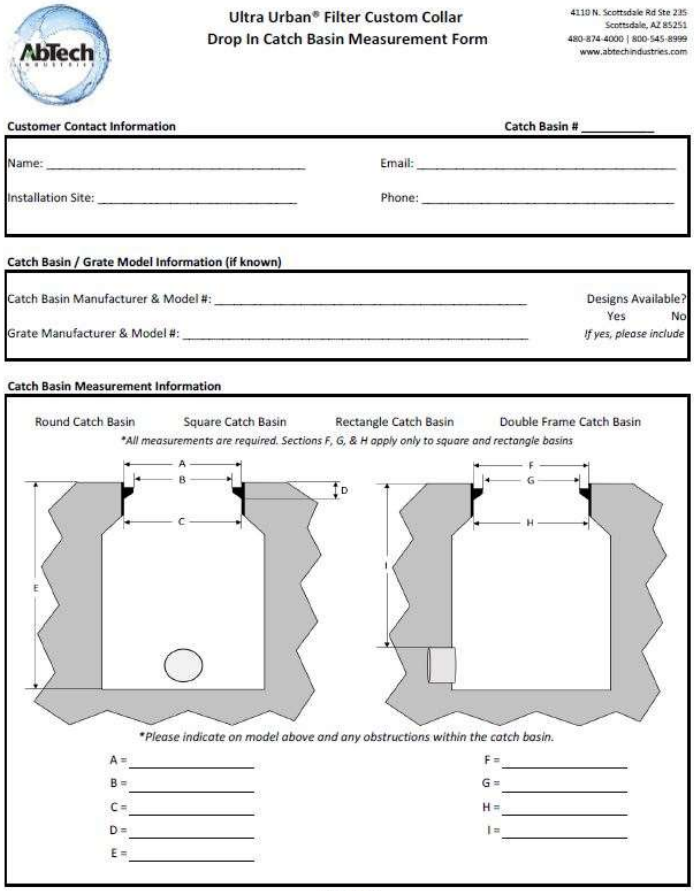
Where:
Q = Flow Rate in cfs.
L = Width of the enclosure in feet.
H = Height of the water above the enclosure crest in feet

Using L = 15” or 1.25ft, H = 6” or 0.5ft (based on distance from top of enclosure to mounting collar)

$Q = [3.247*1.25*(0.5)^{1.48} – 0.566*(1.25ft)^{1.9}]/[1+2*(1.25ft)^{1.87}] * (0.5)^{1.9} = 1.4cfs$

We have four sides to the filter so, 1.4cfs*4 = 5.6cfs maximum bypass flow for a DI1616N-FTC Ultra Urban Filter.

Appendix F: Catch Basin Measurement Form



Ultra Urban® Filter Custom Collar
Drop In Catch Basin Measurement Form

4110 N. Scottsdale Rd Ste 235
Scottsdale, AZ 85251
480-874-4000 | 800-545-8999
www.abtechindustries.com

Customer Contact Information **Catch Basin # _____**

Name: _____ Email: _____

Installation Site: _____ Phone: _____

Catch Basin / Grate Model Information (if known)

Catch Basin Manufacturer & Model #: _____ Designs Available? Yes No

Grate Manufacturer & Model #: _____ *If yes, please include*

Catch Basin Measurement Information

Round Catch Basin Square Catch Basin Rectangle Catch Basin Double Frame Catch Basin

**All measurements are required. Sections F, G, & H apply only to square and rectangle basins*

**Please indicate on model above and any obstructions within the catch basin.*

A = _____ F = _____

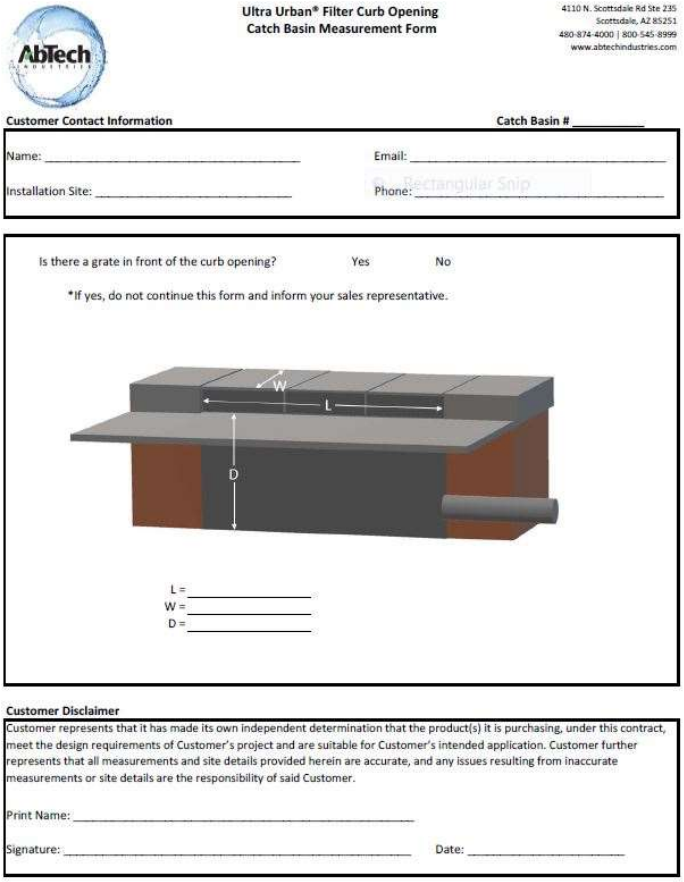
B = _____ G = _____

C = _____ H = _____

D = _____ I = _____

E = _____

*Drop-In UUF Unit



Ultra Urban® Filter Curb Opening
Catch Basin Measurement Form

4110 N. Scottsdale Rd Ste 235
Scottsdale, AZ 85251
480-874-4000 | 800-545-8999
www.abtechindustries.com

Customer Contact Information **Catch Basin # _____**

Name: _____ Email: _____

Installation Site: _____ Phone: _____

Is there a grate in front of the curb opening? Yes No

**If yes, do not continue this form and inform your sales representative.*

L = _____

W = _____

D = _____

Customer Disclaimer

Customer represents that it has made its own independent determination that the product(s) it is purchasing, under this contract, meet the design requirements of Customer's project and are suitable for Customer's intended application. Customer further represents that all measurements and site details provided herein are accurate, and any issues resulting from inaccurate measurements or site details are the responsibility of said Customer.

Print Name: _____

Signature: _____ Date: _____

*Curb Opening Unit

Appendix G: Installation Instructions

DI SERIES ULTRA URBAN FILTER

INSTALLATION INSTRUCTIONS

1. Getting Started

The location and number of Ultra Urban Filters (UUF) to be installed in each catch basin should be determined based on flow rates and characteristics of the drain.

- Measure catch basin length, width, and depth. Include measurement of ledge. Catch basin measurement form should be filled out and submitted to AbTech. A custom stainless steel flow diverter will be designed from measurements.
- Determine the size of Ultra Urban Filter to be installed, and number if applicable.
- Use table 1 for standard Ultra Urban Filter product dimensions.
- Allow for Ultra Urban Filter length plus bypass length above outlet pipe. Filter should not be installed to inhibit flow through the outlet pipe.
- Once catch basin measurements and number of Ultra Urban Filters are submitted, the following time frames apply:
  - 2 – 4 days for quote and flow diverter design
  - 2 – 3 weeks for delivery

2. Preparation & Safety

- Users should follow their own safety protocols.
- Setup the appropriate barriers and traffic control equipment. Remove the drain inlet cover. Make sure the drain is clean and clear of debris.
- Use gloves when handling or installing mounting bracket, sharp edges can cause injuries.

3. Installation of the UUF Boxes

- UUF boxes should be installed so that the flow through catch basin inlet and the outlet pipe is not affected.
- Prior to installation, remove trash, debris, and any obstructions from the catch basin.

4. Installation of the Flow Diverter Stainless Steel Collar and UUF

- Flow diverter collar will be created in 14 gauge stainless steel.
- Users are encouraged to develop and follow their safety protocols.
- Remove grate from catch basin.
- The UUF attaches to the stainless steel flow diverter through the straps and clip.
- See Figure 2 on page 2 for installation of UUF to flow diverter.

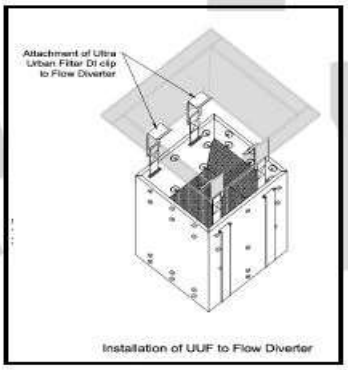


Figure 1

DI SERIES ULTRA URBAN FILTER

INSTALLATION INSTRUCTIONS

4. Installation of the Flow Diverter Stainless Steel Collar and UUF *(continued)*

- Once the UUF is attached to the stainless steel flow diverter collar, place the collar into the catch basin.
- Stainless steel flow diverter was created to exact specifications of the catch basin previously submitted through the Catch Basin Measurement form. There is a slight room available for material expansion to account for changes in temperature. When installed the UUF can accommodate the following flow rates:

TABLE 1: ULTRA-URBAN FILTER DRAIN INLET (DI SERIES) PRODUCT SIZE CHART

Product Code	Dimensions	Treatment Flow Rate (Approx.)	Min. Mounting Depth
DI1309N	13" L x 8.5" W x 13.5" H	110 gpm (0.25 cfs)	23"
DI1309H	13" L x 8.5" W x 8.5" H	70 gpm (0.16 cfs)	18"
DI1414N	13.25" L x 14.25" W x 21.125" H	280 gpm (0.62 cfs)	31"
DI1414H	13.25" L x 14.25" W x 13" H	190 gpm (0.42 cfs)	22"
DI1420N	14" L x 19.25" W x 21.125" H	350 gpm (0.78 cfs)	31"
DI1420H	14" L x 19.25" W x 13.375" H	240 gpm (0.53 cfs)	22"
DI1616N	16" L x 16" W x 21.125" H	360 gpm (0.80 cfs)	31"
DI1616H	16" L x 16" W x 13.375" H	280 gpm (0.60 cfs)	22"
DI2020N	19.25" L x 19.25" W x 21.125" H	500 gpm (1.11 cfs)	31"
DI2020H	19.25" L x 19.25" W x 13.375" H	370 gpm (0.82 cfs)	22"

- Flows outside of the above treatment rates will flow over the bypass area above the filtration unit.
- Use gloves when handling and installing the Flow Diverter, sharp edges can cause injuries.

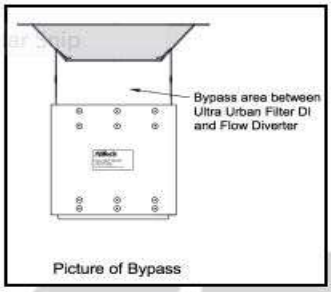


Figure 2

- Monitoring and maintenance of the Ultra Urban Filter catch basin installation needs to be visually inspected at regular intervals, at a minimum every 6 months or after major storm events.
- When visually inspecting the Ultra Urban Filter if sediments/TSS and Trash and Debris are present, this needs to be removed. Excess sediment impedes flow rate accommodated by Ultra Urban Filter.
- Under normal operating conditions, the Ultra Urban Filter should be replaced every 1 -3 years depending on its deployment and the pollutant (hydrocarbon) loading.

CO1414 ULTRA URBAN FILTER

INSTALLATION INSTRUCTIONS

1. Getting Started

Location and number of Ultra Urban Filter box(es) in each catch basin should be determined by the end user and based on actual flow rates and characteristics of the drain.

- Measure width of the drain opening and the depth of the drain inlet.
- Table 1 provides standard product dimensions.

TABLE 1: ULTRA-URBAN FILTER CURB OPENING (CO SERIES) PRODUCT SIZE CHART

Product Code	Dimensions	Treatment Flow Rate (Approx.)	Min. Mounting Depth
CO1414N	13.25" L x 14.25" W x 22.5" H	280 gpm (0.62 cfs)	29"
CO1414H	13.25" L x 14.25" W x 13" H	190 gpm (0.42 cfs)	21"

2. Preparation & Safety

- Determine the number of UUF boxes to be installed.
- Determine the length of the bracket, number and location of the holes.
- Table 2 provides suggestions. Users are encouraged to follow their own safety protocols, including confined space entry procedures.
- Setup the appropriate barriers and traffic control equipment. Remove the drain inlet cover. Make sure the drain is clean and clear of debris.

TABLE 2: SUGGESTED LENGTH AND HOLES LOCATION OF MOUNTING BRACKET

Number of Boxes	1 to 2	3 to 5	6 to 7	8 to 10
Length of Bracket	Number of boxes times 12.75"	Number of boxes times 13.00"	Number of boxes times 13.125"	Number of boxes times 13.125"
Number of Anch. Bolts	2	3	4	5
Location of Anch. Bolts	3" from the edges	6" from the edges + one in the middle	6" and 30" from the edges	12" and 36" from the edges + 1 (middle)

- Use gloves when handling or installing mounting bracket, sharp edges can cause injuries.

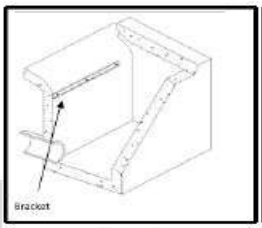


Figure 1

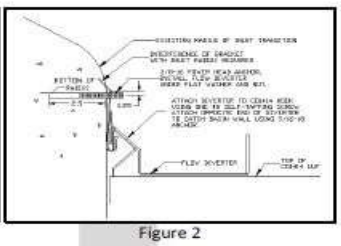


Figure 2

3. Installation of Mounting STET

- Cross-sectional view shown in Figure 2 gives the suggested elevation of anchor bolts and the interference between the bracket's flange and the inlet radius.
- UUF Box(es) should be installed so that there is always a 2"-3" clearance between the bottom of the catch basin and the bottom of the box.
- Use 3/8" Wedge Anchor bolts, 3.75" long.

4. Installation of the UUF Boxes

- UUF boxes should not be installed in areas where they could cover inlet-outlet pipes.
- After installation of the units, remove necessary Over-Flow Cut-outs to provide openings for lateral overflow between boxes.
- Install U-shaped Clips over the overflow cut-outs.

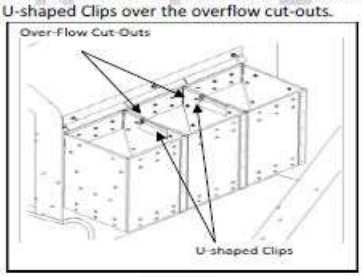


Figure 3

CO1414 ULTRA URBAN FILTER

INSTALLATION INSTRUCTIONS

5. Installation of Flow Diverter (FD)

- When determining the length of the Flow Diverter, 2" must be added to over-flow the Ultra Urban Filter box.
- Table 2 is intended to provide suggestions. Users are encouraged to develop and follow their own procedures and safety protocols.
- The folded down flange of the Flow Diverter should engage the bracket and sit on top of the hook of the UU box.
- At approximately 1.5" from the overhanging edge, vertically cut the higher side of the Flow Diverter to approximately 3/16" below the first bend.
- Use gloves when handling and installing the Flow Diverter, sharp edges can cause injuries.

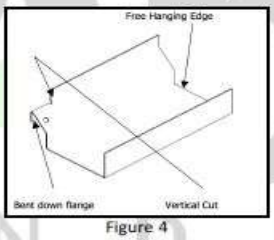


Figure 4

- Bend down the cut portion of the flange, as shown in Figure 4.
- Use 5/16" Wedge Anchor bolts, 3.5" long.

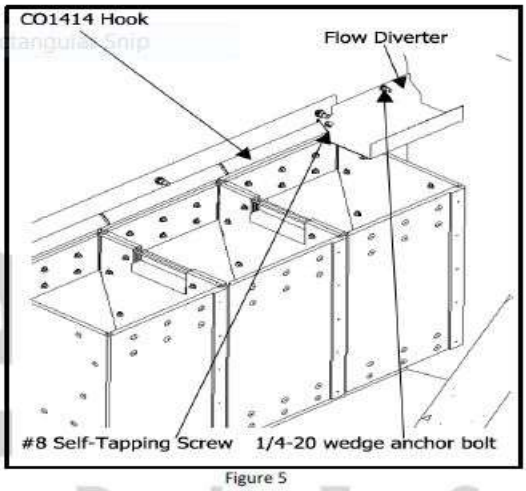


Figure 5

- Attach Flow Diverter to CO1414 Hook using one #8 Self-Tapping screw as shown in Figure 5.
- Clean up the area and make sure that tools and debris have been removed from the catch basin.
- Replace the cover to the drain and secure as needed.

Appendix H: Millsaps Report for Particle Size Filtration (<5mm)

MILLSAPS COLLEGE

Final Report:
Sediment Removal from Simulated Stormwater Runoff by Abtech Industries, Inc. UltraUrban Filter-CO in Laboratory Flume Tests

Millsaps College
Jackson, Mississippi,

Stan Galicki, Ph.D.
Hunter C. Berch

December 9, 2009

Introduction

AbTech Industries, Inc. in Scottsdale, Arizona manufactures catch basin inserts (Ultra-Urban® Filter) which qualify as stormwater Best Management Practice (BMP) device for the removal of oil, grease, and trash and debries from stormwater. AbTech contacted the Millsaps College Sorbent Laboratory in Jackson, Mississippi and requested independent testing of the Ultra-Urban Filter's potential for Total Suspended Solid (TSS) removal in simulated stormwater conditions. AbTech provided Ultra-Urban Filter CO1414N. The Millsaps College Sorbent Laboratory was to evaluate the potential of the 14" Ultra-Urban Filter Series for removing sediment from stormwater runoff.

Testing was conducted in October and November 2009 on a flume (Fig.1) which was designed to evaluate the efficiency of the UUF (Fig.2). The storage tank has a maximum capacity of 275 gallons with discharge rates ranging up to 130 gallons per minute (gpm).

Methods

Sediment retention tests were conducted using three grain size fractions at a flow rate of approximately 17.5 gpm with a total suspended sediment (TSS) load of approximately 300 ppm. The first round of tests were done using fine grained sand ranging in size from less than 0.212 mm to greater than 0.180 mm (-70/+80 U.S. Mesh). The second round of tests was done using medium grained sand which was less than 0.425 mm and greater than 0.300 mm (-40/+50 U.S. Mesh). The third round of test was done using medium grained sand which was less than 0.355 mm and greater than 0.300 mm (-45/+50 U.S. Mesh).

A "test series" consisted of five consecutive two minute runs during which 40.25 g of sand was added to the 35 gallon discharge flowing across the flume and through the filter. Each series resulted 201.25 g of sand added to a total discharge of 175 gallons of water. The 35 gallon discharge from the UUF was collected in a holding tank and permitted to settle. The water was drained off and the test repeated until all five runs had been completed. The sediment passing through the UUF for the series was collected, dried, and weighed. The difference in weight between the sand added to the flow stream and the sand recovered from the holding tank was the amount of sand removed from the discharge by the UUF. The results from each individual series and the cumulative results from all five series for each grain size are provided in Table 1.

Results

As displayed in Table 1, the UUFs efficiency to remove fine sand (0.212-0.180 mm) steadily decreased from an initial value of 82.01% to a minimum of 29.04%. The overall fine sand retention by the UUF for the five series was 47.07%, however, because fine sand was released during a final flush, and fine sand was recovered during the tests using medium sand, the overall efficiency decreases to 39.47%. Figure 3 displays the volume of sediment passing through the filter following each of the series. No sediment accumulation was visible in the UUF at the completion of the tests.

The UUFs retention of medium sand (0.425-0.300 mm) ranged from 92.93 to 86.56% with an average retention of 90.35%. After accounting for all medium and fine grained sand released during the medium sand test series and during the 2nd flush, the overall sediment retention efficiency of the UUF for medium sand was 88.74%. Figures 4 and 5 display the volume of sediment passing through the filter following each of the medium sand series. Figure 6 displays the sediment buildup in the UUF following tests.

The UUFs retention of medium sand in the 0.355-0.300 mm range varied from 80.15 to 86.96% with an average retention of 81.48%. After accounting for all medium and fine grained sand released during flush, the overall sediment retention efficiency of the UUF for medium sand (0.355-0.300 mm) was 80.29%.

Discussion

Based on this simulated runoff testing the UUF-CO was capable of removing fine sand between 0.212 to 0.180 mm (-70/+80 U.S. Mesh). However, the continuous decrease in retention during the fine sand testing, and presence of fine sand in the material collected during the medium sand testing suggests that particles smaller than 0.180 mm are not effectively removed from the simulated stormwater discharge with this device (UUF). The additional fine grained sand released from the filter during the medium tests actually lowers the removal efficiency for fine sand to 39.47%. The UUF is capable of removing up to 92.93% (an average 88.74%) of medium grained sand between 0.425 mm and 0.300 mm, and 80.29% of medium grained sand between 0.355 mm and 0.300 mm.

Conclusion

UUF performed well and is found to be effective at removing above 80% of sediment with a particle size of 0.300 mm or larger.

Figure1.
Flume with Ultra Urban Filter - CO in place.

Figure 2.
AbTech Ultra UrbanFilter ®

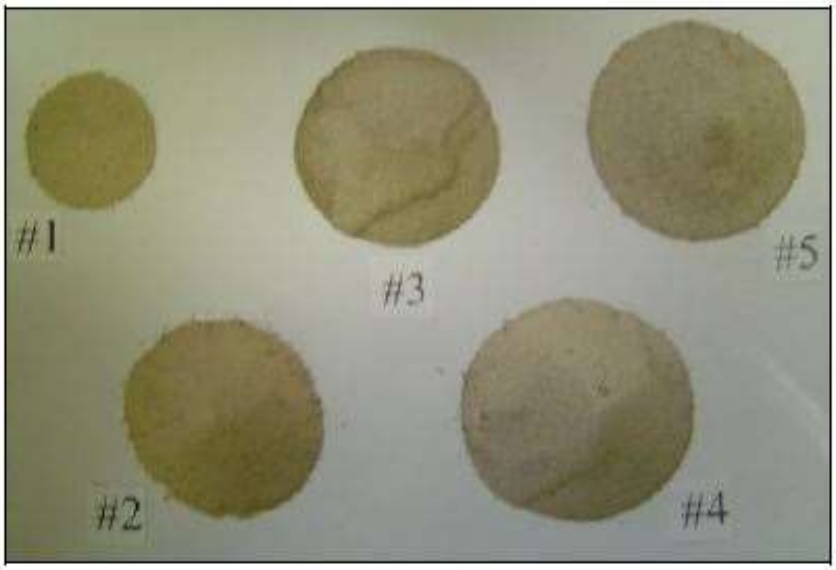


Figure 3.
Fine sand passing through the UUF during each of the first five series.
Series numbers are approximately 1" wide.

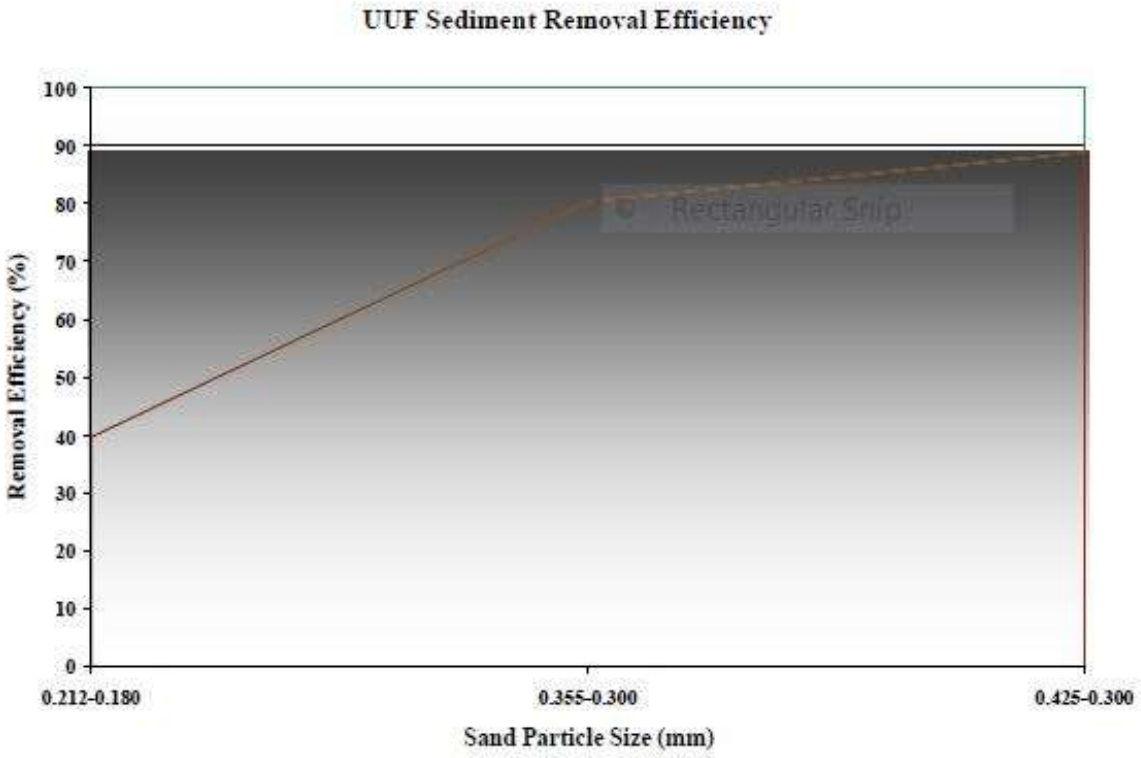
Figure 4.
Medium sand (0.425-0.300 mm) passing through the UUF during each of the five series. Fifty one percent of the sand displayed was actually fine sand initially retained by the UUF in previous testing but released during medium sand tests. Series numbers are approximately 1" wide.

Figure 5.
Medium sand (0.355-0.300 mm) passing through the UUF during each of the five series. Series numbers are approximately 1" wide.

Figure 6.
Top view photo of UUF with retained medium grained sand following testing.

Table 1. UUF Sediment Removal Efficiency Data

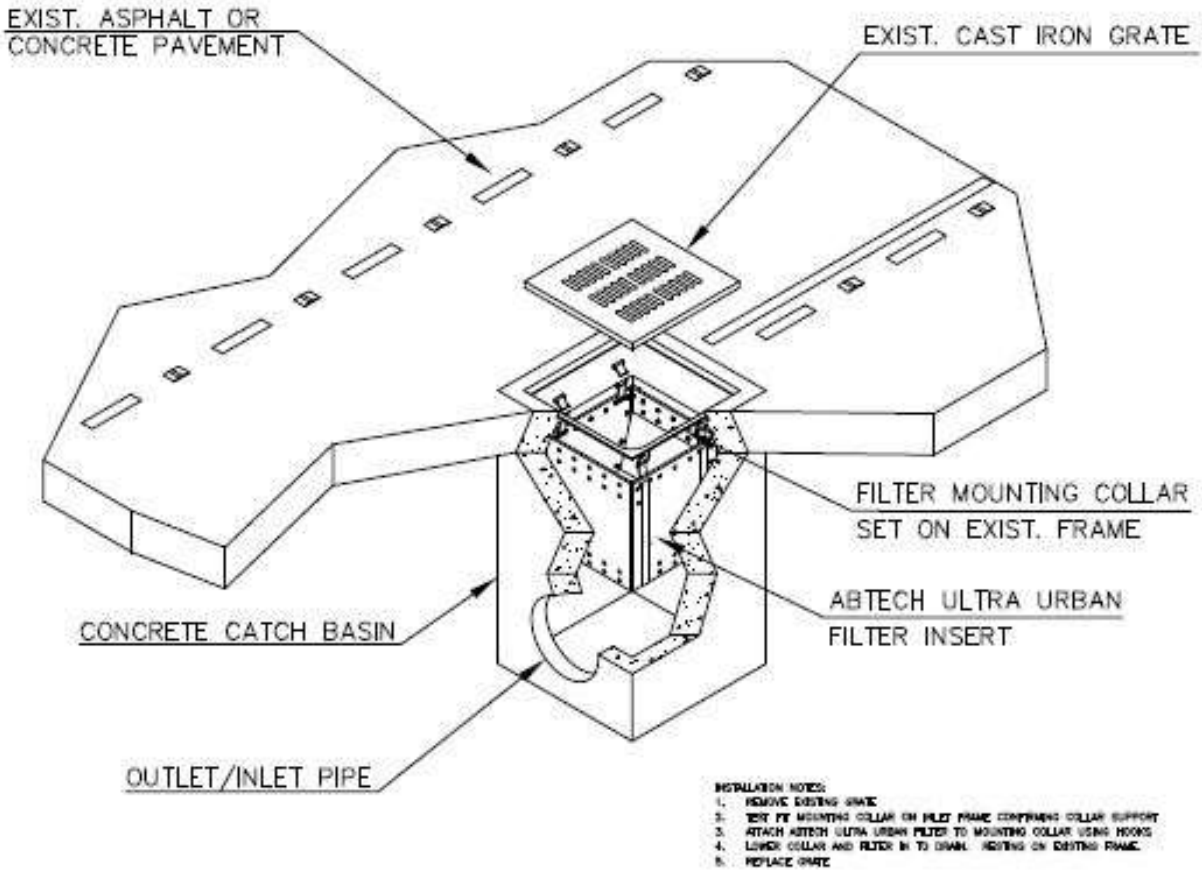
	Fine Sand (0.212-0.180 mm)		Medium Sand (0.425-0.300 mm)		Medium Sand (0.355-0.300 mm)	
Series	Series Retention (%)	Cumulative Retention (%)	Series Retention(%)	Cumulative Retention (%)	Series Retention(%)	Cumulative Retention (%)
1	82.01	82.01	91.93	91.93	86.96	86.96
2	52.34	67.17	88.40	90.16	73.34	80.15
3	44.37	59.57	92.93	91.09	80.15	80.15
4	27.57	51.57	91.93	91.30	85.35	81.45
5	29.04	47.07	86.56	90.35	81.61	81.48
Final Retention		39.47		88.74		80.29


UUF Sediment Removal Efficiency
Removal Efficiency (%)
100
90
80
70
60
50
40
30
20
10
0
Rectangular Strip
0.212-0.180
0.355-0.300
0.425-0.300
Sand Particle Size (mm)

Appendix I: UUF Spec Sheet

ABTECH ULTRA URBAN® FILTER

PERMANENT STORMWATER TREATMENT FOR SQUARE AND RECTANGULAR DROP INLETS



PRODUCT SIZE CHART

PRODUCT CODE	DIMENSIONS	APPROX. TREATMENT FLOW RATE	STANDARD COLLAR DIMENSIONS*
DI1414N	13¼ " X 14¼" X 21⅛"	280 GPM	27" X 27"
DI1414H	13⅛ " X 14¼" X 13"	190 GPM	27" X 27"
DI1420N	14 " X 19¼" X 21⅛"	350 GPM	20" X 25.875"
DI1420H	13¼ " X 19¼" X 13⅜"	240 GPM	20" X 25.875"
DI1616N	16" X 16" X 21⅛"	360 GPM	27" X 27"
DI1616H	16" X 16" X 13⅜"	270 GPM	27" X 27"
DI2020N	19¼ " X 19¼" X 21⅛"	500 GPM	27" X 27"
DI2020H	19¼ " X 19¼" X 13⅜"	370 GPM	27" X 27"

*CUSTOM COLLARS AVAILABLE - CAN BE SIZED TO FIT ANY DRAIN INLET

DRAIN INSERT
- SIZE AS REQUIRED -
INDUSTRIAL/MUNICIPAL/MARINE/AVIATION/SPECIALTY

DRAWING D-2 | DATE JAN. 13, 2009

ABTECH INDUSTRIES
4110 N. SCOTTSDALE ROAD SUITE 235
SCOTTSDALE, AZ 85251
480.874.4000 800.545.8999
WWW.ABTECHINDUSTRIES.COM

AbTech INDUSTRIES

Appendix J: Ultra Urban Filter Technical Specification

Ultra Urban Filter Technical Specification

Part 1 GENERAL

1.1 Description

The contractor shall furnish and install the Ultra Urban Filter (UUF) stormwater treatment system, complete and operable as shown and specified herein, in accordance with the requirements of the plans and contract documents.

1.2 Manufacturer

- Manufacturer of UUF shall have been in business for a minimum of (10) years in the design and manufacture of stormwater treatment products, and shall provide proof of third party testing of UUF performance by an independent applied engineering and/or physical sciences testing organization.
- UUF treatment system shall be of a type that has been installed and successfully in use for a minimum of five (5) or more years.
- UUF treatment system shall be supplied by AbTech Industries, Inc., 4110 N. Scottsdale Road Suite 235, Scottsdale, AZ 85251 (Tele: 800-545-8999) or equal.

1.3 Submittals

1.3.1 The contractor shall be provided with dimensional drawings of UUF and accessory equipment for installation.

1.3.2 The contractor shall be provided with an Operation and Maintenance Manual upon request.

1.4 Quality Control Inspection

The quality of materials, the process of manufacture, and the finished UUF shall be subject to inspection by the Engineer at the place of manufacture. UUF shall be subject to rejection within the warranty period should it fail to meet agreed upon specification requirements. Product rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. UUF damaged beyond repair during delivery will be rejected and replaced entirely at the Contractor's expense.

Part 2 PRODUCTS

2.1 Description

DI Series UUF stormwater treatment systems shall provide street-level access without OSHA confined space entry requirements. Confined space entry is typically needed for curb opening installations, as you climb through the manhole and are inside the curb opening catch basin for installation; overflow bypass shall be included to allow for a minimum of 10 times the design flow for to prevent localized flooding during peak rain events; shall be designed for use in storm drains that experience trash, sediment, oil, grease, phosphorus (including dissolved phosphorus), fecal coliform and heavy metals. UUF shall not allow mold or mildew growth; shall not cause localized flooding or standing water; be unaffected by freeze-thaw and have a typical life expectancy of three to five years.

- UUF shall consist of an innovative BMP that helps meet NPDES requirements with effective filtration, efficient application and minimal maintenance.
- UUF shall treat total first flush and offer overflow capability.
- UUF shall remove trash, sediment, oil, grease, phosphorus (including dissolved phosphorus), fecal coliform and heavy metals from stormwater runoff before it enters the storm drain system.

- UUF shall come in two standard designs; one a modular unit geared toward curb inlet openings, and the other a single unit designed for typical drop-in catch basin drains.
- UUF shall help meet and/or exceed stormwater NPDES permit requirements of the federal Clean Water Act with effective filtration, absorption, life expectancy and maintenance costs.
- No units using geo-textiles as capture mechanisms relying on the catch basin grating for holding the structure is not acceptable.

2.2 Materials

2.2.1 Corrugated plastic

Corrugated plastic sheet made of a minimum 20% recycled corrugated plastic material (5 millimeters thickness) shall be in the shape of a flexible canister. This canister shall be configured to suspend on a bracket in a storm drain adjacent to a curb inlet and shall have a side cutout that permits lateral overflow from one of the modular units to an adjacent one.

2.2.2 Filter Mesh Screen

Filter mesh screen shall be made of plastic material with a conveyance rate of first flush flow; shall be used to enclose the filtering media on the top (three filtering surface areas) and on the bottom of the UUF. The internal mesh basket shall collect trash and debris.

2.2.3 Filter media

Filter media shall be provided and supplied by AbTech Industries, Inc., and must be a compliant, hydrophobic, oil-absorbent, heavy metals sorbent, phosphorus sorbent, and chemically treated copolymer material with bulk density ranging from 0.27 to 0.40 gr/cm³, and be able to reduce the proliferation of microbial organisms. Filter media must have passed Method 1131 TCLP, EPA Publication SW-846, tested by an independent applied engineering and/or physical sciences testing organization.

Filter media should be built into the insert, and not be free floating (pouch, pillow or similar tied down absorbent). This will ensure active filtration and greater contaminant removal versus passive filtration for greater contaminant reduction.

2.2.4 Brackets

The UUF for curb inlets shall be suspended from a bracket attached to the drain wall. The bracket shall be modified to fit the dimensions of a particular storm drain. The brackets shall be stainless steel alloy 304 or 304L or zinc coated material.

2.2.5 Collars

The UUF installation mechanism for drain inserts shall be manufactured with straps and hooks to be suspended from the collar/funnel fit under the drain grate. The collar/funnel shall be made of a minimum 14 gauge 304L stainless steel in accordance with the contractor's requirements on the contract documents.

2.2.6 Fasteners, Rivets

All fasteners, rivets, and rims used on the UUF units shall be stainless steel alloy 304, 304L or zinc plated steel.

2.3 Performance

Independent testing performed by a qualified third party independent applied engineering and/or physical sciences testing organization shall confirm the ability of UUF to:

- Remove
  - > than 80% Total Petroleum Hydrocarbons (TPH)
  - > than 50% Microbial Pathogens
  - > than 90% Trash and Debris (floatables)
  - > than 80% Total Suspended Solids (TSS)
  - > than 40% Total Phosphorus
- Deploy filter media with:

- trash and debris capacity of equal to or greater than 1.3 cubic feet
- contain no hazardous materials, chemicals, pesticides or non-woven fabric or materials. The Smart Sponge Plus media is a categorized as a pesticide due to its antimicrobial effects.

- Deploy filter media that shall:
  - be unaffected by salinity or temperature
  - inhibit the growth of mold or mildew
  - not incorporate moving parts and/or require electricity.
- Capture oil that becomes permanently bonded within the filtering media, eliminating leaching and providing for easy disposal of the filtration media.
- Achieve at installation flow rates:
  - minimum 280 gpm for the curb inlet type (per unit)
  - up to 500 gpm for the drop-in catch basin filters series

2.4 Technical data (See appendix A)

Part 3 INSTALLATION

Design of the UUF stormwater treatment system unit typically shall be installed in one (1) hour or less without the need for weight handling equipment. UUF installation instructions shall be customized to meet requirements of the plans and contract documents between contractor and manufacturer to guarantee complete and operable final product.

Part 4 MAINTENANCE

The sediment and debris from UUF stormwater treatment system can be quickly vacuumed out of the UUF with conventional maintenance equipment. For example: a curb inlet with four to five UUF stormwater treatment modules shall be serviced in 10 minutes or less in a typical installation. Upon sorbing a minimum of one times its own weight in hydrocarbons, the spent UUF shall be changed.

4.1 Maintenance Procedure

The stormwater treatment system shall be serviced as needed to remove sediment and debris, according to expected debris accumulation. Under normal operating conditions the system should be replaced every three to five years. The UUF stormwater treatment system shall have street-level access for inspection and cleaning.

4.2 Disposal

The polymers used within the system shall transform liquid hydrocarbons into a stable solid[1].
The following waste disposal and resource recovery industries will accept spent filter media for disposal and/or recycling.

- Waste-to-Energy Facilities: A specialized segment of the solid waste industry will use the filter media as an alternative fuel in the production of electricity. WTE is acknowledged at the federal level as a renewable energy source under the Federal Power Act, Title IV of the Clean Air Act. WTE is a participant in the Department of Energy's National Renewable Energy Program.
- Cement Kilns: This industry will use the spent filter media as an alternative fuel in the production process of Portland Cement. This process is considered a beneficial reuse of waste products.
- Landfills: The ability of the filter media to transform liquid hydrocarbons into a solid waste makes for less expensive and easy disposal. Spent filter media generated from laboratories have been classified as a solid waste and are acceptable at Subtitle D Landfills[2].

[1]Generators of spent filter media will need to have their waste analyzed, tested, and classified to determine the generator's particular waste. According to testing performed for AbTech Industries, spent filter media soaked with petroleum hydrocarbons are transformed into solid wastes. AbTech Industries does not take any responsibility for the generator's waste classification for handling, transport and the ultimate disposal or recycling of the waste. The generator must always classify and characterize its own waste.

[2]Spent filter media generated from the AbTech Industries laboratories with a multitude of liquid petroleum hydrocarbons have passed the EPA Toxicity Characteristic Leachate Procedures and Paint Filter Test. These tests are used in determining the amount of liquid waste and any free liquids present that may be released into the landfill environment.

Part 5 WARRANTY

Seller warrants to Buyer that the Equipment shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship. If Buyer gives Seller prompt written notice of breach of this warranty within 18 months from delivery or 1 year from acceptance, whichever occurs first (the "Warranty Period"), Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the subject parts or refund the purchase price. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Equipment in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller). THE WARRANTIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

Appendix A

Description	Dimensions	Packaging	Filtration media (pounds per unit)
Curb Opening (CO) Module, Normal Size	13¼ " x 14¼" x 22½"	1 unit	15
CO Module, Half Size	13¼" x 14¼" x 13"	1 unit	9.5
CO Module, Normal Size, Trash & Debris	13¼ " x 14¼" x 22½"	1 unit	N/A
CO Module, Half Size, Trash & Debris	13¼" x 14¼" x 13"	1 unit	N/A
Flow Diverter	N/A	5 feet/unit	N/A
Mounting Bracket	N/A	5 feet/unit	N/A
Drain Insert (DI) Module, Normal Size	13" x 8½" x 13½	1 unit	6
DI Module, Half Size	13" x 8½" x 8½	1 unit	4.5
DI Module, Normal Size, Trash & Debris	13" x 8½" x 13½	1 unit	N/A
DI Module, Half Size, Trash & Debris	13" x 8½" x 8½	1 unit	N/A
DI Module, Normal Size	13¼" x 14¼" x 21 1/8 "	1 unit	15
DI Module, Half Size	13¼" x 14¼" x 13"	1 unit	9.5
DI Module, Normal Size, Trash & Debris	13¼" x 14¼" x 21 1/8 "	1 unit	N/A
DI Module, Half Size, Trash & Debris	13¼" x 14¼" x 13"	1 unit	N/A
Collar, Trimmed	22.75" diameter	1 unit	N/A
Collar, Untrimmed Style	27" x 27"	1 unit	N/A
DI Module, Normal Size	14" x 19¼" x 21 1/8"	1 unit	18.5
DI Module, Half Size	14" x 19¼" x 13 3/8"	1 unit	12.5
DI Module, Normal Size, Trash & Debris	14" x 19¼" x 21 1/8"	1 unit	N/A
DI Module, Half Size, Trash & Debris	14" x 19¼" x 13 3/8"	1 unit	N/A
Collar, UNTRIMMED	20" x 25.88"	1 unit	N/A
DI, Normal Size	16" x 16" x 21 1/8"	1 unit	17.5
DI, Half Size	16" x 16" x 13 3/8"	1 unit	11.5
DI Module, Normal Size, Trash & Debris	16" x 16" x 21 1/8"	1 unit	N/A
DI Module, Half Size, Trash & Debris	16" x 16" x 13 3/8"	1 unit	N/A
Collar, UNTRIMMED	27" x 27"	1 unit	N/A
Drain Insert Module, Normal Size	19¼" x 19¼" x 21 1/8"	1 unit	28
Drain Insert Module, Half Size	19¼" x 19¼" x 13 3/8"	1 unit	17
DI Module, Normal Size, Trash & Debris	19¼" x 19¼" x 21 1/8"	1 unit	N/A
DI Module, Half Size, Trash & Debris	19¼" x 19¼" x 13 3/8"	1 unit	N/A
Collar, UNTRIMMED	27" x 27"	1 unit	N/A

Appendix K: Ultra Urban Filter Operations and Maintenance Manual

AbTech INDUSTRIES

Ultra-Urban® Filter / Smart Sponge® Technology:

OPERATION, MAINTENANCE & CHANGE–OUT

Ultra Urban Filter Inspection

Deployment methods of the *Ultra Urban Filter*, in either the Drain Inlet (DI) or the Curb Opening (CO) configuration, allow for similar inspection protocols. The frequency of inspection and established guidelines for inspection are discussed.

1. Frequency

Inspection scheduling is site specific as it needs to take into account local weather pattern, site/watershed profile and contaminants loading. In general, inspections should be conducted at least as often as:

- Twice per year – within 60 days of the rainy start date and within 60 days after the rainy season ends.
- Quarterly – once each calendar year quarter.
- After major storms.

1.1 Items for inspection

The goal of the inspection is to assess the accumulation of any trash, debris, or particulate matter in the inlet basket and assess the viability of the filtration media to conduct water.

Always employ proper traffic management and handling procedures for all inspections where vehicles and pedestrians have access.

If contained in a Catch Basin, remove manhole/ lid(s)/ grate(s) and observe from above:

1. The inlet basket for settled trash and debris inside.
2. The inlet basket for standing water.
3. The inlet basket for the high water line.
4. The *Ultra Urban Filter* structure for any abnormalities, damage, or deterioration
5. Replace manhole/ lid(s) / grate(s) as appropriate.

4110 N. Scottsdale Rd., Suite 235 Scottsdale, AZ 85251 USA
Phone 480.874.4000 **Toll Free** 1.800.545.8999 **Fax** 480.970.1665 **Web** www.abtechindustries.com

smart sponge

Do not adjust or inspect unit during periods of rain or when the system is actively working (releasing of stormwater through the unit). Always employ OSHA regulated rules for confined space when working inside below ground structures.

Inspect:

1. Anything not observable from above (see previous list).
2. The inlet grid and inlet face of the media for "fouled" media due to the clogging of pores from trash or other particulate matter (the outside surface of the media may be a brown color or otherwise obviously clogged with particulate matter).
3. The inlet face of the media for "fouled" media due to the absorption of hydrocarbons (the outside surface of the media will be a black color).
4. For DI deployments make sure the collar straps are attached properly to the *Ultra Urban Filter*. On CO deployments the *Ultra Urban Filter* needs to be secured to the mounting bracket and that all flow diverters, if any, remain intact.
5. Replace manhole/ lid(s)/ grate(s) as appropriate.

1.2 Inspection Documentation

Complete the *Ultra Urban Filter* Inspection and Maintenance Report. This report will assist in the decision process to initiate appropriate maintenance activities.

Ultra Urban Filter Maintenance

Proper maintenance of an *Ultra Urban Filter* is essential to retain the overall pollutant removal capabilities of the individual devices. The guidelines for the creation of a routine maintenance cycle for a specific site are outlined below.

2. Guidelines

The primary purpose of the *Ultra Urban Filter*, like any effective filtration system, is to filter out and prevent pollutants from entering our waterways. Accordingly, the pollutants being captured by the *Ultra Urban Filter* must be periodically removed. The goal of the maintenance activities is not only to repair or extend the functionality of the filtration media, but also to prevent malfunctions of the media before they occur. As previously noted, trash, debris, and other particulate matter are detrimental to the proper function of the media; therefore, maintenance activities focus primarily on these types of contaminants.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site.

Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is also good practice to inspect the system after severe storm events.

2.1 Types of Maintenance

Currently, two types of maintenance have been defined:

- Ordinary/minor maintenance
- Major maintenance

Ordinary maintenance activities are often combined with inspection and will require the use of a vac-truck.

Ordinary/minor maintenance typically involves:

- Inspection of the installation itself
- Removal of vegetation, trash and debris and sediment by vac-truck

Major maintenance typically includes:

- Sediment removal
- *Ultra Urban Filter* cleaning/hydraulic testing (once a year)
- Unit replacement

Important: Applicable safety (OSHA) and disposable regulations should be followed during all maintenance activities.

Two to four scheduled inspections/maintenance activities should take place during the year.

First, an inspection/minor maintenance activity should be done. During the minor maintenance activity (routine inspection, debris removal), the need for major maintenance should be determined and, if disposal during major maintenance will be required, samples of the sediment and media should be obtained.

Second, if required, a major maintenance activity (replacement of the *Ultra Urban Filter(s)* and/or associated sediment removal) should be performed. Major maintenance may also be required if, from visual inspection, the integrity of the *Ultra Urban Filter* unit is damaged.

In addition to these two scheduled activities, it is important to check the condition of the *Ultra Urban Filter(s)* after major storms for damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary

to adjust the maintenance activity schedule depending on the actual operating conditions encountered by the system.

In general, minor maintenance activities will occur late in the rainy season, and major maintenance will occur in late summer to early fall when flows into the system are not likely to be present.

2.2 Hydraulic Testing

As identified earlier, the objectives of the *Ultra Urban Filter* are to filter out contaminants from high speed stormwater runoff. The primary effect, as well as, ongoing effect of the *Smart Sponge* filtration media will be the accumulation of sediment at the inlet basket and on the *Smart Sponge's* polymer components, therefore causing a sizable reduction of the hydraulic conductivity of the *Ultra Urban Filter*. It is therefore suggested that, at least once a year and preferably during a major maintenance event, a hydraulic conductivity test of the *Ultra Urban Filter* is carried out. Due to flow patterns, it is expected that the *Ultra Urban Filter* inlet basket will be more heavily impacted by sediment accumulation and hydrocarbon coating.

Following the above mentioned guidelines, upon inspection of the *Ultra Urban Filter*, the operator should have these materials on hand and follow the testing procedure below:

List of Materials:

1. *Ultra Urban Filter(s)* in question
2. Two buckets marked at 5 gallons
3. Chronometer or watch with second's hand
4. Disposal container in compliance with local regulations for the expected contaminants
5. Rubber gloves
6. Hand towel

Testing procedure:

1. Remove sediment, trash and debris from the inlet basket and verify the overall integrity of the *Ultra Urban Filter*.
2. Remove *Ultra Urban Filter* from catch basin or curb opening.
3. Position the plastic container (with 5 gallons mark) underneath the *Ultra Urban Filter* for collecting the test water.
4. Fill a 5-gallon container with tap water; pour it over through *Ultra Urban Filter* and measure the time elapsed from the start of the pour-through until the 5 gallons have been collected in the plastic container below the filtration bed.
5. Repeat steps 4 and 5 at least 3 times and calculate the average.
6. If collecting time is:
    (a) below 20 seconds, the *Ultra Urban Filter* at that point on is still operating within its design parameters.
    (b) above 20 seconds, the *Ultra Urban Filter(s)* tested need to be replaced.

2.3 Frequency of Replacement

The primary factors for controlling timing of maintenance for the *Ultra Urban Filter* are sediment accumulation and media fouling/saturation.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media. The flow through the system will naturally decrease as more and more solids are trapped. Eventually the flow through the system will be low enough to require replacement of the *Ultra Urban Filter*. It may be possible to extend the usable span of the *Ultra Urban Filter* by proper street cleaning and land management techniques upstream from the stormwater management system.

Site conditions greatly influence maintenance requirements. *Ultra Urban Filters* located in areas with erosion or active construction should be inspected and maintained more often than those in fully stabilized areas.

The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after large storms.

Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual sub-catchment. It is recommended that the maintenance entity develop a database to properly manage *Ultra Urban Filter* maintenance for each installed unit.

Prior to the development of the maintenance database, the following maintenance frequencies should be followed:

- Inspection/minor maintenance
  - One time per year
  - After major storms
- Major maintenance
  - One time per year
  - In the event of a chemical spill

Frequencies should be updated as required. Sediment removal and unit replacement are recommended on an annual basis until sufficient information has been obtained about a particular system to justify a different replacement schedule.

Once an understanding of site characteristics has been established, maintenance may not be needed for one to two years, but regular inspection should continue.

3. *Inspection and Maintenance Documentation*

Complete the *Ultra Urban Filter* Inspection and Maintenance Report. This report will assist in the decision process to initiate appropriate maintenance activities.

As it is well known in the regulatory environment, properly inspecting and maintaining treatment devices may not always be enough. The facility owners are often required to document that the ease of review and demonstration, one should develop an Inspection and Maintenance Process to retain inspection and maintenance records for any treatment device employed for the facility.

An important part of the record keeping will be the development of an inspection and maintenance database. For the ease of review and demonstration, a *Maintenance Report* and *Inspection and Data Sheet* (like the ones in Appendix A and B) that summarize all inspection and maintenance activities should be developed.

Appendix A

Ultra Urban Filter
Inspection Data Sheet

Date:_____ Personnel: _____

Location:_____ System Size:_____

System Type:

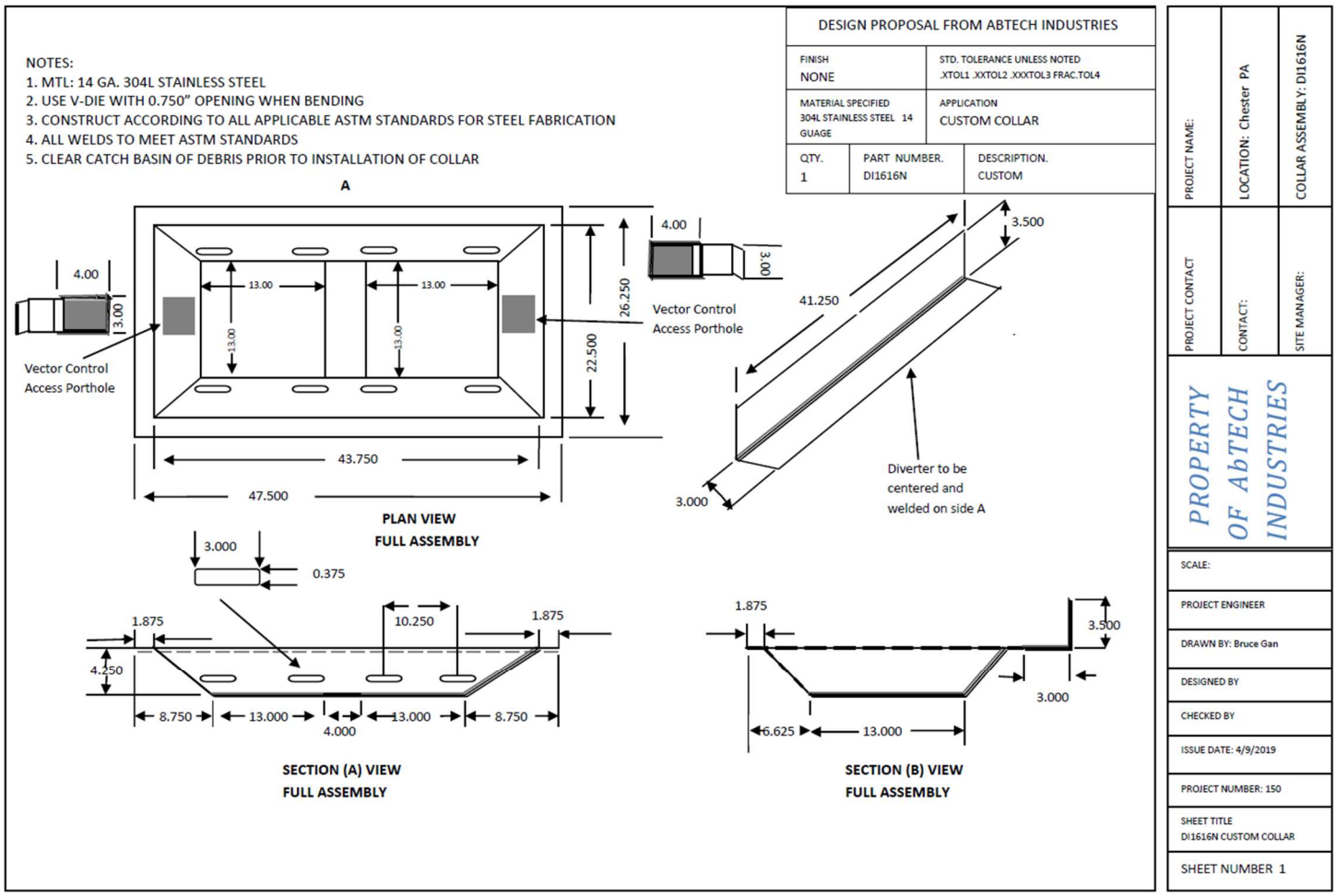
No.	Inspection Item	
1	Is settled trash, debris, and/or sediment in the inlet basket area?	YES ☐ NO ☐
2	Is water trapped in the inlet basket or is there evidence of the high water mark above the water level difference (WLD) barrier?	YES ☐ NO ☐
3	Is the inlet basket structure clean and free of abnormalities?	YES ☐ NO ☐
4	Is the Ultra Urban Filter structure damaged or deteriorated, or is there evidence of leaky joints?	YES ☐ NO ☐
5	Is the inlet basket above the media clogged with trash or other particulate matter?	YES ☐ NO ☐
6	Is the media just below the inlet basket a black color due to hydrocarbon absorption?	YES ☐ NO ☐
7	Are there any obvious, above ground sources of contamination entering the system?	YES ☐ NO ☐

Appendix B

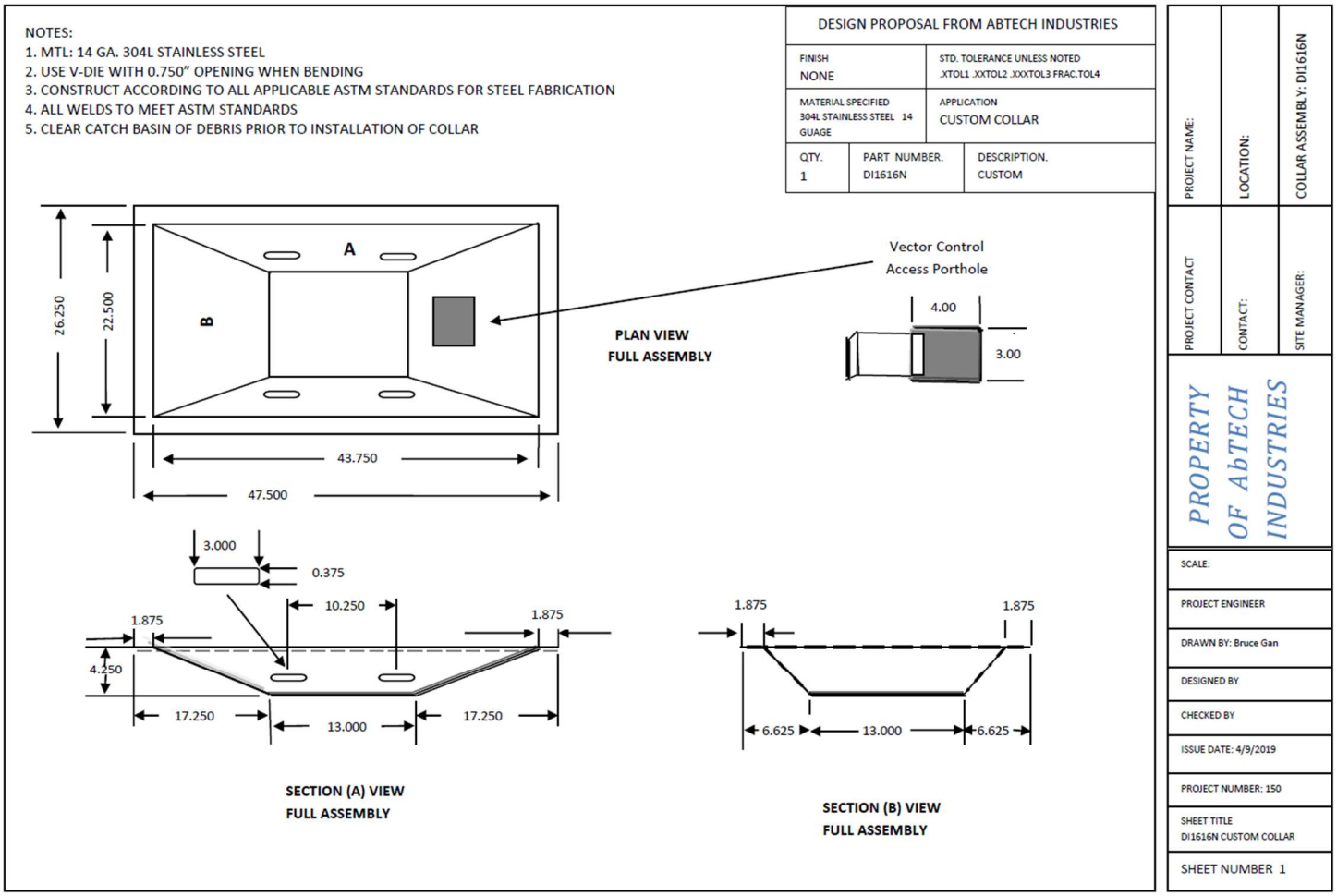
Ultra Urban Filter
Maintenance Report

No.	Maintenance Activity	Date Done
1	Collect and remove trash, debris, etc.	
2	Remove water as required.	
3	Clean up inlet basket, and inspect for sources of abnormalities.	
4	Repair or replace damaged or deteriorated structural components.	
5	Remove obstructions from the inlet basket.	
6	Conduct O&M procedures as needed for the other devices. Repair or replace as needed.	
7	Notify Agency or owner representative.	

Appendix L: Ultra Urban Filter Unit Drawings with Collar Vector Access Porthole



- Double Collar with Vector Control Access Porthole on each side
- No viewport is needed for curb opening units.



- Single Collar with Vector Control Access Porthole
- No viewport is needed for curb opening units

Appendix M: MVCAC Approval Letter for Abtech Ultra Urban Filters (UUFs)

One Capitol Mall, Suite 800 • Sacramento, CA 95814 • p: (916) 440-0826 • f: (916) 444-7462 • e: mvcac@mvcac.org

Abtech Industries, Inc.
4110 N. Scottsdale Rd
Scottsdale, AZ 85251

March 23, 2020

Dear Mr. Lolling,

Thank you for the submission of the Ultra Urban Filter for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has reviewed the conceptual drawings for the Ultra Urban Filter Grate Inlet and Curb Inlet configurations and verifies that provisions have been included in the design that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes.

As a point of clarification, the Grate Inlet configuration shall include at least one Vector Control Access Port for each collar or filter basket installed as indicated in Section 5.D. and Appendix L of the Ultra Urban Filter trash device application.

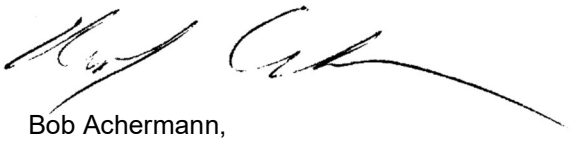
While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with all the Ultra Urban Filters as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example, if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,



Bob Achermann,
MVCAC Executive Director