Highland Tank | TechNews

Solids Control Unit for Stormwater Systems

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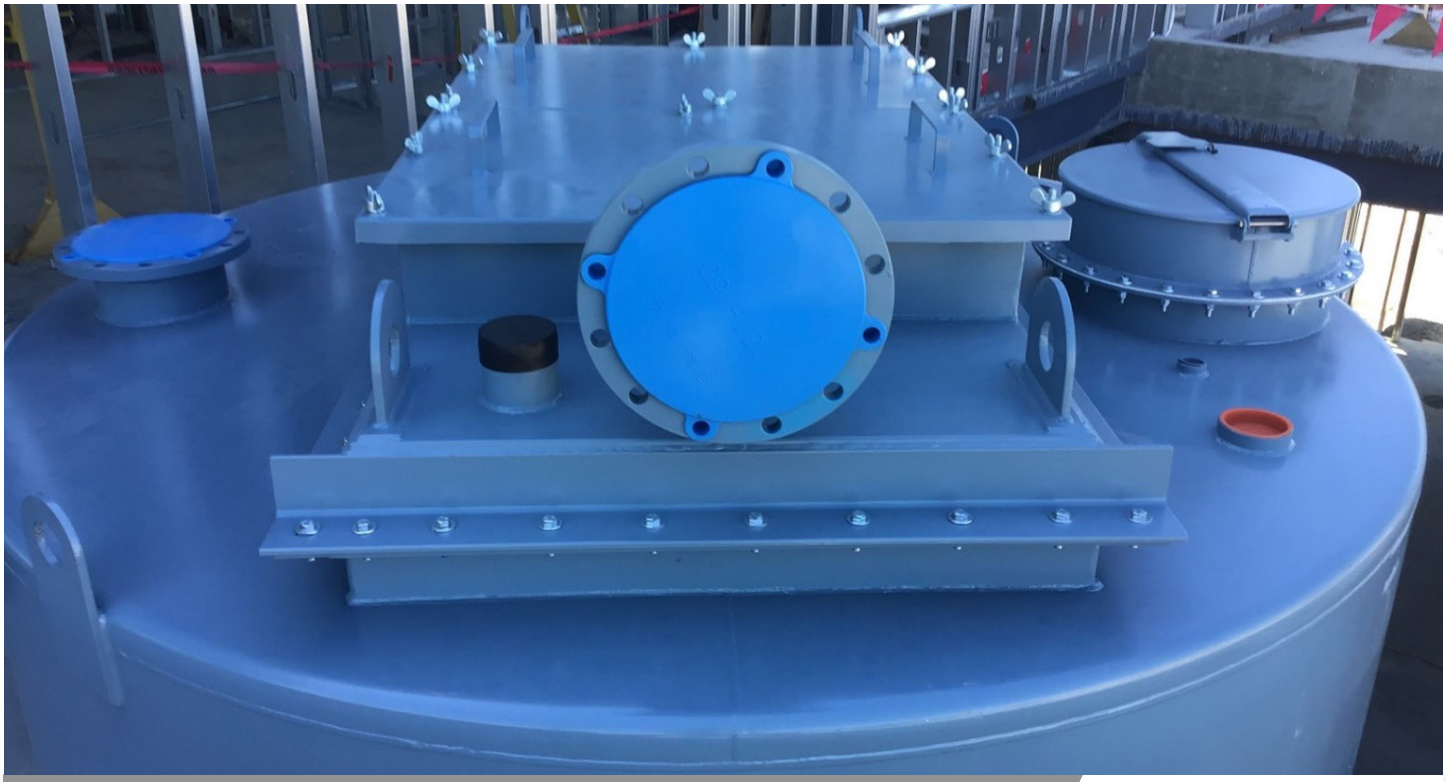

Pictured above is a Highland Tank Solids Control Unit Integral to Cistern.

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DESIGN & OPERATION

Solids Control Unit
The Highland Tank Solids Control Unit (HT-SCU) is designed to protect the downstream storage components for storm/rainwater management systems.

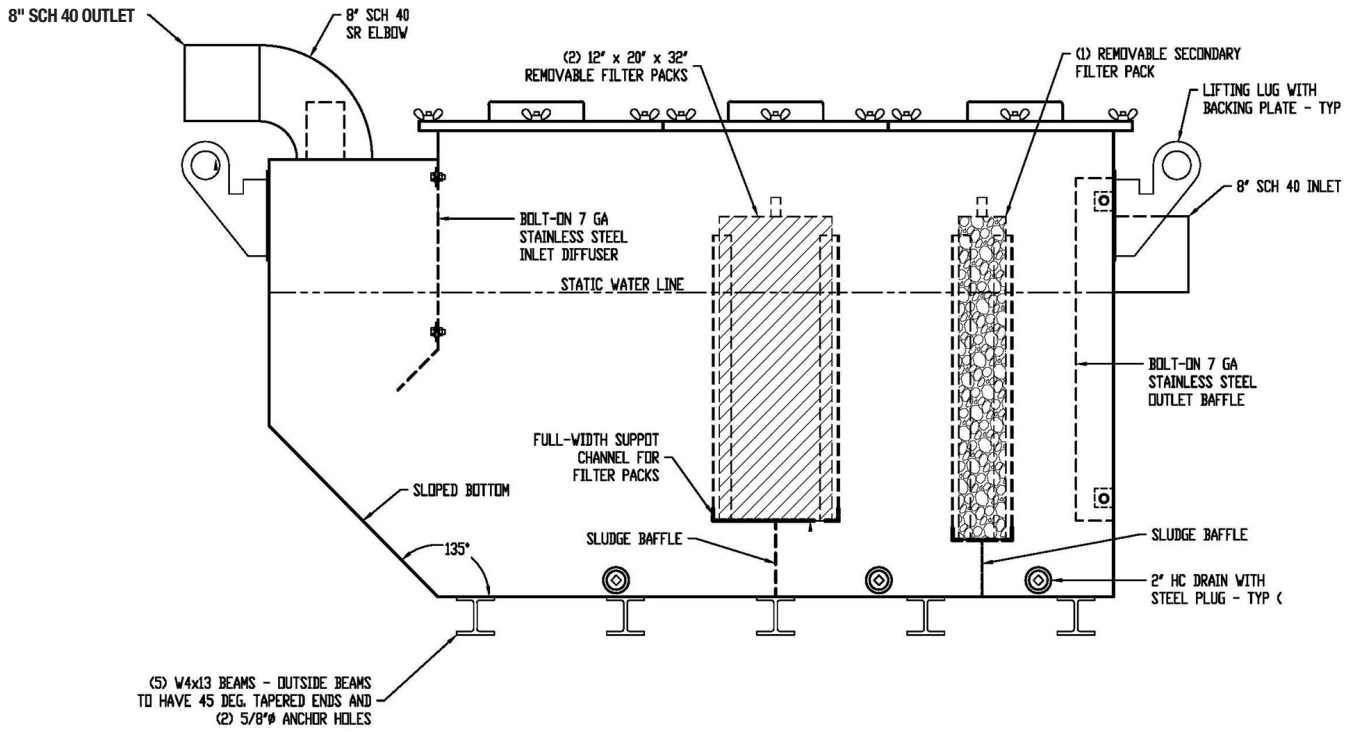
The HT-SCU technology removes sediment and other contaminants from parking lots, roof decks, and most hard surfaces.

The HT-SCU is engineered for site specific removal applications to meet the water quality needs of the associated cistern storage system.

Key benefits of the HT-SCU include:
- 100% treatment, with no bypass function, during all types of rainfall events
- Treatment technology provides downstream protection and reduces maintenance costs
- Designed to remove a broad range of particles and organics
- Designed to remove a specific size particle when using both primary and secondary media
- Minimal elevation between inlet and outlet minimizing head loss to near 0 psi
- Above/below grade and/or integral to stromwater retention/detention systems (see image above)

Flow enters the HT-SCU via a patented diffuser which spreads the flow out evenly across the inlet chamber. The patented diffusion baffle also slows incoming runoff, reduces velocities, and promotes laminar flow to allow floatable debris to rise and sediment to settle.

Flow
Flow continues through the inlet chamber to the primary media clarifying pack(s). The clarifying media, depending on the treatment capacity and required water quality, is sized for the loading rate based on the site-specific rain fall calculation for both low and high intensity rain events for that region.



If the operational hydraulic loading rate is high a secondary clarifying media pack(s) may be required (see example drawing above). The secondary media pack provides a biological filter element that enhances debris removal and the breakdown of organics. The system design takes into account variable flow rates including intense peak flows with corresponding calculations to prove efficiency and particle removal size.

Sizing

Highland Tank utilizes a site-specific program to determine the size of the HT-SCU to meet the water quality objectives set by the regulators, engineers and AHJ. Through years of experience with storm water management of large industrial/commercial/institutional sites, Highland Tank can engineer the appropriate clarifying system to meet the site-specific treatment needs.

These conditions include, type of impervious surface, potential for particle loading, stormwater conveyance system, water quality required, particle micron size for removal.

The guide on the right shows an example of a sizing calculation for a specific particle size, SG, and flow rate for a site. The formula is a modified API 421 spreadsheet that determines the amount of media surface area needed to treat a certain size particle.

HT MODEL SCU- 12 WITH CLARIFYING MEDIA
DESIGN CALCULATIONS

Calculation of Minimum Effective Surface Area Required to Remove a 120 Micron Particle in a Model HTSCU- 12

Influent Conditions			Solids Treatment Separator Properties:		Customer Information:
SCU 12			Inlet/Outlet Size:	12"/12"	
Volume:	494	Gallons	Construction Type:	cs	
Qm:	2,000	GPM	Shell Thickness:	1/4"	
Solids Type:	2.4-2.8		Head Thickness:	1/4"	
Influent Temp:	40 to 120		Exterior Coating:	PolyU	
Wastewater Ph:	N/A		Interior Coating:	PolyU	

Qm/Ah = Surface Loading Rate (assuming a design mean particle diameter of 120 microns)

Qm/Ah = 0.00772[(Sw - So)/u

Qm = Design Flow (cu. ft./min)
Ah = Horizontal Separator Area (sq. ft)
Sw = Specific Gravity of Wastewater's Aqueous Phase
So = Specific Gravity of Wastewater's Solids Phase
u = Wastewater's Absolute (dynamic) Viscosity (Poise)

Sw =	0.998	
So =	2.600	
u =	0.0100	Poise
Qm =	267.38	cu. ft./min
Qm/Ah =	1.2371	ft/min
Ah =	**216.1**	**sq. ft.**

The Vertical Settling Rate of the Particle is as follows:
Vt = Qm/Ah = 1.2371 ft/min
Vt = Qm/Ah = 14.8456 in/min

Therefore, to remove a 120 micron dia. particle, the clarifying media must have a minimum of 216.13 sq. ft. of effective surface area (clarifying media).

Calculation of Effective Area for the Crossflow Clarifying Media

When using Accu Pack CF 1900 Clarifying Media

CF 1900	3/4" open channel	Effective Surface area-	48	ft²/ft³
Black Matala	92% open channel	Effective Surface area-	58.00	

216.1 sq. ft/	48	ft²/ft³	4.502688	cu.ft. of media required
216.1 sq. ft/	58.00	ft²/ft³	3.726362	cu.ft. of media required

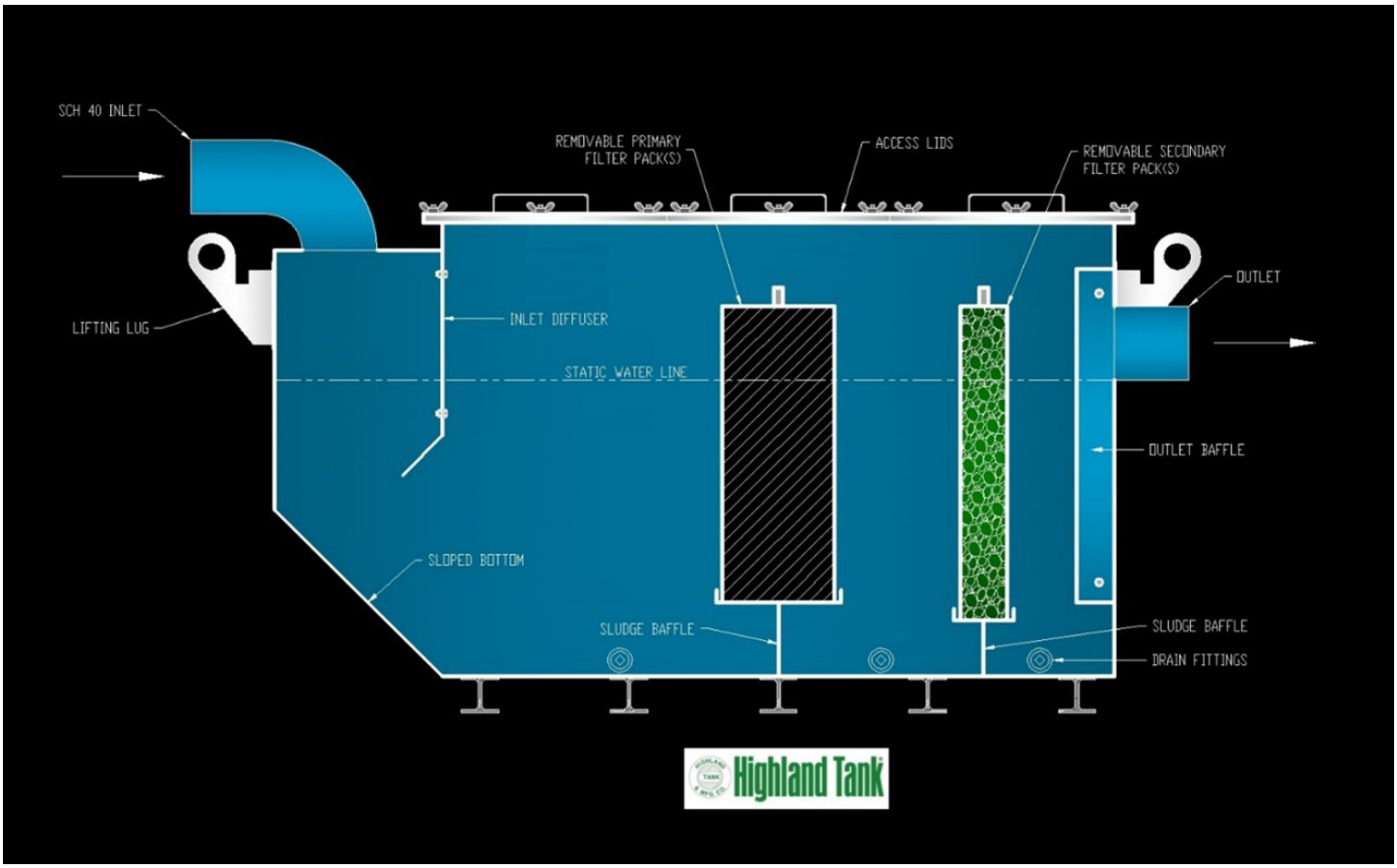
Effictive area of pack CF1900 9.96 cu. Ft. Effective area Matala 4.380953 cu. Ft.

Total Effective Surface Area Clarifying Media = 732.175245 sq. ft.

Clarifier Pack Dimensions: CF1900			Matala	Column1
Plate Framework Width (W)	1.66	ft.	3.375	ft.
Plate Framework Height (H)	3.00	ft.	3.166	ft.
Plate Framework Length (L)	1.00	ft.	0.41	ft.
Plate Angle (a)	60	degrees	0	o degrees
Plate Spacing (Ps)	3/4"	inches	92%	open area

Since the Solids Treatment Systems Clarifying Media meets required total effective surface area of 732.1752 sq.ft. per Stokes Law then the HT SCU Model- will remove a particle 120 microns in diameter and greater at an infuent rate of 2,000 GPM

* Please note that Highland Tank & Mfg. Co. based these calculations on the influent wastewater characteristics shown above. If the conditions on-site are different than those shown, it is the responsibility of the contractor or customer to inform Highland Tank so that design changes can be made if necessary.



Maintenance - Inspection
The HT-SCU system should be checked periodically to determine if excessive amounts of solids and/or debris have accumulated. Solids accumulation if left unchecked will impact the performance of the clarifying media both primary and secondary.

Regular inspection and maintenance will keep the HT-SCU working efficiently and effectively as engineered.

After the first six (6) months of operation the HT-SCU inlet chamber should be inspected as follows:

1. Remove inlet chamber wing nuts and cover
2. Check for floating debris/oils
    a. If significant oil is present call Clean Harbors to remove.
3. Drain inlet chamber by opening drain valve on bottom side of HT-SCU
4. Clean the inlet chamber by flushing with a power washer
5. Remove any sediment with a vacuum truck or positive dis placement pump if hardened and/or solid.
    a. Make sure to measure and record depth of sediment. If higher than 12” or more then cleaning interval should be shortened to 3-4 months. If less than increase to 9 months.
6. If unit has a secondary clarifying chamber, then remove cover and repeat steps 2-5 above.
7. Check the outlet chamber for sediment. There should not be any signs of significant sediment build if the unit is working as designed.
   Note: Always record oil/sediment levels during inspection.

Maintenance - Cleaning
The clarifying media can be cleaned in place and/or after removal from the system.

Cleaning in place:
1. While covers are off use a hose or pressure washer to spray the media down. Wash down should be directed from the back of the media towards the front of the media as it slants from back to front. This method will also capture any sediment that may be removed for inspection.

2. Vacuum or flush out any sediment that may be washed from the media

3. If there is a secondary clarifying pack, then the same wash down process can be implemented. The media in the secondary pack has a spaghetti like texture so it is not as important the direction of wash down

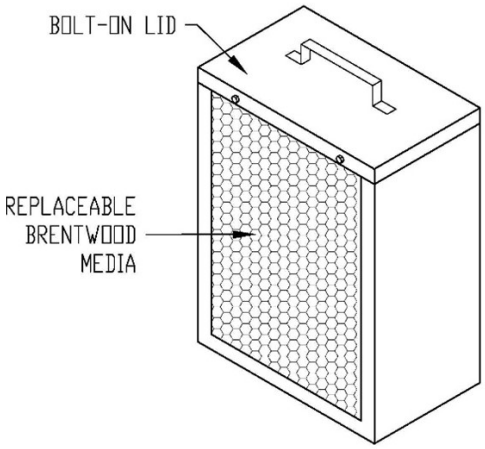
Cleaning by removing clarifying packs:
1. Pump/drain all water from the HT-SCU

2. Remove the clarifying media pack back hooking onto the stain less-steel frame

a. There may be up to 3 packs depending on size of unit.

3. Place media on impervious surface lined with 6 mil plastic sheeting so all wash water is captured

4. Flush media with a hose or pressure washer to remove any sludge and/or build up



(2) PRIMARY FILTER PACKS
14 GA STAINLESS STEEL

5. Inspect media for degradation, fractures, clogged or broken tubes.

a. Media can easily be replaced at this time if significant failure has occurred.

b. Unbolt frame top to access and replace media

6. Remove secondary clarifying media if installed. Repeat steps 2-5 above.

Call 814-893-5701 today or visit us at www.highlandtank.com for more information.

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