Introduction

Prinsco’s underground retention/detention systems provide a solution to effectively manage and store stormwater runoff utilizing a series of chambers and/or pipes and fittings. As the stormwater moves through the retention/detention systems, sediment and debris will tend to settle out of the water and collect within the system. This will require the system to be regularly inspected and cleaned in order for the system to perform as originally designed. Designing a system that is conducive to regular maintenance will allow the system to function efficiently and extend the service life.

System Accessories

A good maintenance program is just as important as proper design and installation. There are several components that can be incorporated into a system that are conducive to regular maintenance. These components may be used exclusively or in tandem to allow for ease of maintenance.

Pipe Retention / Detention Systems:

Risers – Risers are placed within a pipe retention/detention system to provide manned access to key parts of the systems. Risers are typically 24” diameter or larger and are located on the laterals adjacent to the manifolds.

Cleanouts – Cleanouts are typically placed on the manifolds. Common sizes for cleanouts are 6- or 8-in diameter pipe. Cleanouts provide an access point for vacuum or water-jetting hoses used to clean the retention/detention system.

Chamber Retention / Detention Systems:

Inspection Ports – Inspections ports are not required for chamber systems but may be installed to monitor the sediment levels, particularly in the sediment row. Inspection ports are 4” PVC risers and are to be installed in the valley between the corrugations on the HS180 chambers or in the circular cut out point at the center of HS75 chambers. A 6” or 8” PVC inspection port can also be placed on the end cap for the HS180 chambers.
Pre-Treatment Device - The use of a pre-treatment unit is recommended for all retention or detention systems. This is particularly essential for Hydrostor chamber systems as debris and sediment buildup in the system will clog the stone void space under the chambers and the storage performance and service life of the system will be compromised. A pre-treatment unit is designed to capture a majority of the sediment and debris before it is able to enter the retention/detention system. This will reduce the maintenance and cleaning requirements of the systems and also reduce pollutants from reaching nearby waterways.

Prinsco’s Stormwater Quality Unit (SWQU) is designed to remove debris collected in runoff including trash, sediment, oils and other suspended solids. Prinsco’s SWQU is a cost-effective alternative to other units and removes 80 percent of total suspended solids, oil and grease. Prinsco’s SWQU is an effective solution for both pipe and chamber systems.

Another option for HydroStor chamber systems that can be used in conjunction with a SWQU or by itself is a Sediment Row. The sediment row consists of a series of chambers installed directly on top of two layers of a woven geotextile. The geotextile serves as a filter and prevents the sediment from clogging the bedding. The specified geotextile is also durable enough to withstand cleaning and maintenance procedures using water jet technology.
The sediment row will typically be located in the first row of chambers and connected to a control structure. This connection is made with a short stub of 18” for HS75 chambers or 24” pipe for HS180 chambers and will be the point of access for cleaning and maintenance procedures.

Figure 4 – Chamber Sediment Row

Retention/Detention System Maintenance
Maintaining a clean and obstruction-free retention/detention system is essential to ensuring the system performs as designed. Buildup of debris in a pipe system can obstruct flow through the laterals or block the entranceway of the outlet in a retention or detention system. Buildup of debris in a chamber system may result in ineffective operation or complete failure of the system. Additionally, surrounding areas may potentially run the risk of damage due to flooding or other similar issues.

Initial System Inspection
An initial inspection should be performed before the retention/detention system is put into operation. It is best to create an Inspection and Maintenance log sheet at this time. An example of an Inspection and Maintenance log sheet can be found at the end of this tech note (Figure 6). Included with the log sheet should be a layout of the system with the invert elevations at all the riser and cleanout locations, prior to sediment accumulation. Initial measurements can be taken with a large stick or piece of string with a flat weight on the end. These measurements will allow for future sediment height measurements to be taken from outside of the system, eliminating the need for manned entrance.

Inspection Frequency
Inspection frequency will vary based on the system design and requirements. A system inspection schedule should be developed for each individual system, with the industry standard being a minimum of once per year.
After the inspection schedule is established for the system, it should be tracked on the Inspection and Maintenance log sheet.

During the first year of operation, more frequent inspections should be done, due to construction activities. Construction sediment and debris loading can be minimized if the Stormwater Pollution Prevention Plan (SWPPP) plan for the construction site is followed. After the first year of operation the rate at which the retention/detention or pretreatment system collects soil/pollutants will be heavily dependent on the site activities. During winter months, in geographical areas where sand is applied to road surface, systems may see increased sediment loading. Other increased loading areas are present with vehicle or equipment wash-down areas.

During inspections, elevations of sediment height should be taken from each riser, cleanout or inspection port. These elevations should be recorded on the Inspection and Maintenance log sheet. Also during the inspection, personnel should be looking for blockages to inlet or outlet stubs or any other evidence of system malfunction. Inspection of the pre-treatment unit upstream of the system should always be inspected at this same time.

**Maintenance Frequency**

Cleaning frequency will vary for each system based on the system design. It is at the sole discretion of the inspector to determine if or when the system will require cleaning. The following are recommendations of when the system should be cleaned:

- If the system is experiencing an unusual amount of silt and soil build up, the pre-treatment device should be investigated and or cleaned.
- When the outlet stub becomes blocked or flow is impeded with sediment or debris.
- If the system does not drain to the lowest pipe elevation during dry conditions.
- If the system reaches a sediment height between 10 and 20 percent of the pipe diameter or 1”-3” in the chamber sediment row, the inspector should recommend cleaning.
- If the system reaches a sediment height greater than 20 percent of the pipe diameter or 3” in the chamber sediment row, the system should be clean at the soonest opportunity.

**System Cleaning**

There are typically two ways that a system is cleaned. The first, and most common method is done by using a high pressure water jet and a vacuum truck. The high pressure nozzle with rear facing jets is attached to a hose and drug downstream, washing sediment and debris downstream with it. The vacuum truck would then be located on the downstream end and remove the sediment and debris with its vacuum hose. It should be noted that multiple passes of the water jet may be needed to clean the run, dependent on the amount of soil loading. For a chamber sediment row, the sediment should be directed to the inlet control structure sump and vacuumed out. The second method used is a manual hands-on cleaning method which is very labor intensive. This method is only recommended with larger diameter pipe retention or detention systems or HS180 chamber systems. Care needs to be taken to insure damage to the inside liner of the pipe or to the geotextile fabric does not occur when removing sediment and debris. Strategically placed risers and cleanouts will make this process as easy as possible.

Before the system is cleaned, the following considerations should be made:

1. The system will be much easier to clean when there is little to no flow into the system and the system does not have any standing water. For this reason, system cleaning should be scheduled around dry weather.

![Figure 5 – Vacuum Truck Removing Sediment and Debris](image-url)
2. Before cleaning begins, all outlet stubs should be blocked off. This includes the outlet from the diversion structure to the chamber system. If this is not done, sediment loading could back up or plug downstream pipelines adding to cleaning expenses. This is also done to prevent any of the debris or pollutants from washing into downstream waterways.

3. When beginning the cleaning process all upstream pipelines and pre-treatment units should be cleaned prior to starting on the retention or detention system.

4. When cleaning a pipe retention or detention system, it is best to start at the highest elevation of the system and work towards the lowest elevation. Stationing the vacuum truck above the downstream manifold and jetting the debris from the laterals to the downstream manifold, provides an effective capture point for the vacuum line.

Safety

Before entering a retention or detention system, ensure all OSHA and local safety regulations are being followed. Only personnel with appropriate confined space permits and personal protective equipment should be allowed to enter the system.

| Type of System: 60” Corrugated HDPE Pipe | Location: Minneapolis, MN |
| Notes/Comments: | |
| Ports / Cleanouts / Manholes | Invert Depth | 84” | 84” | 86” | 87” | 88” | 89” | 90” | 91” |
| Initial Inspection Date | Sediment Depth | | | | | | | | |
| 3/10/13 | | | | | | | | |
| Inspector Name: | Tom Brady | Maintenance Performed/Notes: |

| Date: 8/10/13 | Depth to Sediment | 81” | 81” | 81” | 82” | 84” | 84” | 85” | 85” |
| Sediment Depth | 3” | 3” | 5” | 5” | 4” | 5” | 5” | 6” |
| Inspector Name: | Brett Favre | Maintenance Performed/Notes: |

| Date: | Depth to Sediment | |
| Sediment Depth | |
| Inspector Name: | Maintenance Performed/Notes: |

| Date: | Depth to Sediment | |
| Sediment Depth | |
| Inspector Name: | Maintenance Performed/Notes: |

Figure 6 – Example of an Inspection and Maintenance Log Sheet