

Sorbtive[®] Vault Operations & Maintenance Manual





Overview

These instructions provide a description of the operation, inspection and maintenance aspects of Sorbtive® Vault.

Safety Notice

Jobsite safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice. OSHA and Canadian OSH and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those Safety Practices are the responsibility of the Owner(s), Manager(s), and Contractor(s).

Confined Space Entry

Secure all equipment and training to meet applicable local, OSHA and Canadian OSH regulations regarding confined space entry. It is the Contractor's and entry personnel's responsibility to proceed safely at all times.

Personal Safety Equipment

Contractor is responsible to provide and wear appropriate personal protection equipment as needed including, but not limited to, safety boots, hard hat, reflective vest, protective eyewear, respiratory protection, and fall protection equipment. Make sure all equipment is operated and installation procedures performed by trained or certified personnel.

Sorbtive® Vault Description, Function, and Pretreatment

Sorbtive Vault is similar to a precast sand filter structure in which Sorbtive Media, rather than sand, is used as the filtering media. Sorbtive Media is a granular engineered media with exceptional dissolved phosphorus adsorption capacity, and is generally used in stormwater treatment applications requiring a high degree of phosphorus removal.

Typically, a pretreatment device such as Jellyfish[®] Filter is installed upstream of Sorbtive Vault. The purpose of the pretreatment device is to remove floatable trash and debris, oil, and a high percentage of sediment (TSS) from stormwater runoff prior to treatment by Sorbtive Vault. Pretreatment minimizes contamination of Sorbtive Media with these pollutants and extends the service life of Sorbtive Media. By minimizing the occlusion of the surfaces of Sorbtive Media granules by oil and sediment, pretreatment allows Sorbtive Media to be more effective and longer-lasting as an adsorbent of dissolved phosphorus. Therefore, it is very important to perform regular inspection and maintenance on pretreatment devices as well as on Sorbtive Vault.

Geotextile Mat

Sorbtive Media Bed

Deflector Plate



Figure 1 – Inside view of Sorbtive Vault

Sorbtive Vault Operation



Refer to Figure 2 for a general section view of Sorbtive Vault.

Figure 2

Operation of Sorbtive Vault is as follows:

- Pretreated water enters Sorbtive Vault through the inlet pipe and is directed downward into the inlet bay by a deflector plate. The inlet bay slows the water velocity and spreads the flow across the inlet bay weir. The inlet bay also serves as a sedimentation area for sediments that are not captured by upstream pretreatment.
- Water flows across the inlet bay weir and onto the media bed. A geotextile mat (Pyramat[®] or equivalent) protects the top of the media bed from being scoured by water inflow. Depending on the influent flow rate and the hydraulic conductivity of the media bed, a pond height (freeboard) of up to 12 inches may occur over the top of the media bed. Water elevation in excess of 12 inches over the top of the media bed results in bypass of excess water over the outlet bay weir and into the outlet bay, from where it passes downstream through the outlet pipe.
- Water flows downward through the geotextile mat and through the Sorbtive Media layer. Fine sediment not captured by pretreatment are trapped in the media bed and dissolved phosphorus is adsorbed by the Sorbtive Media granules.
- Water flows downward through the geotextile fabric (Geotex® 351 or equivalent) and

through the underlying gravel layer, and enters the perforated underdrain pipe.

- Water moves through the perforated underdrain pipe section and into the solid pipe section downstream of the outlet bay weir. Treated water overflows the top of the vertical standpipes and spills into the outlet bay. The tops of the vertical standpipes are at the same elevation as the top of the media bed, which helps ensure full wetting of the Sorbtive Media bed and maximum contact time of the water with the media, which improves dissolved phosphorus removal performance. Some of the treated water exits the 1-inch diameter ball valve(s) at the tee beneath one or more of the vertical stand pipes, which serves to drain down the entire water volume from the media bed after a storm event subsides. The ball valve(s) should normally be in the fully OPEN position.
- Water flows from the outlet bay into the outlet pipe and on downstream.

Inspection and Maintenance Overview

As with any stormwater treatment system, regular inspection and maintenance of Sorbtive Vault and upstream pretreatment devices are required to insure proper functioning of the system.

Maintenance requirements and frequency are dependent on the specific pollutant loading 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 a good practice to inspect the system after major storm events.

Inspection of Sorbtive Vault is typically performed from the surface, while proper maintenance requires a combination of procedures conducted from the surface and with worker entry into the structure. Maintenance activities typically include:

- · Removal of sediment from the inlet bay
- Removal, rinsing, and re-installation of the geotextile (turf reinforcement mat)
- Raking, removal, and replacement of any sediment- or algae-occluded Sorbtive Media
- Backflushing of underdrain pipes and 1-inch ball valve(s)
- · Replacement of spent Sorbtive Media and geotextile mat

Sorbtive Vault is typically inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of sand filters, underground tanks, sewers and catch basins. Since some of the maintenance procedures require manned entry into the Sorbtive Vault structure, only professional maintenance service providers trained in confined space entry procedures should enter the structure.

Please refer to the following information and guidelines prior to conducting inspection and maintenance activities.

Inspection Timing

Inspection of Sorbtive Vault and upstream pretreatment devices is important to determine the maintenance requirement and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below:

⁴ Sorbtive® Vault O & M Manual

- Post-construction inspection is required prior to putting Sorbtive Vault into service. Any construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired, prior to commissioning.
- A minimum of two inspections are recommended during the first year of operation to assess the sediment accumulation and hydraulic performance. Ideally, at least one inspection should be performed during wet weather to observe flow characteristics and relative water elevations within the system.
- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation, but generally should be performed at least once per year.
- Inspection is recommended after each major storm event.
- Inspection must be performed immediately after an oil, fuel or other chemical spill.

Inspection Tools and Equipment

The following equipment and tools are typically required when performing a Sorbtive Vault inspection:

- Manhole access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Deflector Plate

Sorbtive Media Bed

Geotextile Mat

Inspection Procedure

Sorbtive Vault is typically inspected from the surface. The following procedure is generally recommended when performing inspection:

- Place safety cones and caution tape around the inspection area as required. Redirect vehicle traffic if necessary.
- Open all covers and hatches to provide maximum ventilation and light into the structure.
- Determine sediment depth in the inlet bay with a sediment probe. Lower the probe through the water column and carefully push through the accumulated sediment in the sump until contact is made with the floor of the structure. Retrieve the probe, measure sediment depth, and repeat in multiple locations within the inlet bay. Note the range of sediment depths. Sediment depth of 6 inches or greater indicates the need for maintenance removal of accumulated sediment.
- Inspect the inlet pipe and deflector plate in the inlet bay and the standpipes and 1-inch ball valve(s) in the outlet bay for any obvious damage such as cracked or broken components. If damage is present, maintenance repair is required.



Figure 3

- Dry weather inspection
 - Inspect the Sorbtive Media bed (Figure 3) compartment for standing water above the media bed. Normally, there will be no standing water above the media bed in dry weather. If standing water is present, it may indicate occlusion of the geotextile mat and/ or first few inches of Sorbtive Media with accumulated sediment or algae. In either case, maintenance is required.
 - Inspect the media bed compartment for gaps in the geotextile mat where media is exposed. If gaps are present, maintenance is required.
 - Inspect the outlet bay for standing water. If standing water is present, it may indicate a backwater condition due to downstream blockage or high receiving water elevation.
 - Inspect the standpipes for standing water. If water elevation in the standpipes is higher than the 1-inch ball valve(s), it may indicate a blockage in the ball valve, in which case maintenance is required. Ball valve(s) should normally be in the fully OPEN position.
- Wet weather inspection
 - Observe the water flow rates entering and exiting the Sorbtive Vault, and note the pond height above the media bed. For low influent flow rates, water should be flowing from the 1-inch ball valve(s) in the outlet bay. For higher influent flow rates, water should be flowing from the 1-inch ball valve(s) and overflowing the standpipes in the outlet bay. If no water is flowing from the fully OPEN 1-inch ball valve(s), it may indicate blockage in the ball valve, and maintenance is required.
 - Note if any water is bypassing across the top of the outlet bay weir. If water is bypassing with relatively little inflow to the inlet bay, it may indicate occlusion of the geotextile mat and/or first few inches of Sorbtive Media with accumulated sediment or algae, or possible blockage of the underdrain pipes. In either case, maintenance is required.
 - Note the water level in the outlet bay. If water does not appear to drain freely from the outlet bay into the outlet pipe, it may indicate a backwater condition due to downstream blockage or high receiving water elevation.
 - If required for phosphorus monitoring purposes, influent and effluent samples may be collected and analyzed by a qualified laboratory or technician to determine phosphorus removal performance. If sampling and analysis of multiple successive storm events demonstrates low phosphorus removal and exhaustion of the phosphorus adsorption capacity of the Sorbtive Media bed, maintenance is required.

Maintenance Tools and Equipment

The following equipment and tools are typically required when performing Sorbtive Vault maintenance:

- Vacuum truck with water hose and spray nozzle
- Manhole access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Rake
- Shovel
- Bucket
- Tape measure
- Marker

- Knife or scissors
- Flashlight
- Camera
- Inspection and maintenance log
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, respiratory protection, and hearing protection for service providers
- Proper safety equipment for confined space entry, including ventilation equipment
- Crane or forklift to unload and position supersacks of Sorbtive Media (Figure 4)



Figure 4

Maintenance Procedure

The following procedures are generally recommended when maintaining Sorbtive Vault:

- Place safety cones and caution tape around the maintenance area as required. Redirect vehicle traffic if necessary.
- Open all covers and hatches to provide maximum ventilation and light into the structure.
- Observe all appropriate confined space entry procedures, including use of ventilation equipment if required.
- Dispose of sediment, spent media, spent geotextile fabric, and water according to local regulatory requirements.
- For installation of new Sorbtive Media, refer to the Imbrium document titled *Installation Guideline: Installing Sorbtive® Media in a Sorbtive® Vault.*
- <u>Chemical Spills</u>
 - <u>Caution</u>: If a chemical spill has been captured by Sorbtive Vault and/or upstream pretreatment devices, do not attempt maintenance. Immediately contact the local hazard response agency, and contact Imbrium.

Maintenance Requirement

The required maintenance for Sorbtive Vault is based upon results of the most recent inspection and historical maintenance requirements for the specific site. In general, the required maintenance will be some combination of the following maintenance activities:

- Sediment must be cleaned out of the inlet bay once the sediment depth reaches 6 inches of accumulation. This may be performed by vacuum hose or by shovel and bucket.
- Geotextile mat must be removed, rinsed and re-installed, or replaced, if occluded by accumulated sediment or algae.
- Geotextile mat must be repositioned and anchored with paver stones if there are gaps and Sorbtive Media is exposed.
- Media bed must be raked and the first few inches of Sorbtive Media removed and replaced if media is occluded by accumulated sediment or algae or contaminated by oil.

- 1-inch ball valve(s) must be flushed if blocked. Insert a low pressure water hose into the valve and perform a gentle backflush.
- Underdrain pipes must be flushed if blocked. Insert a low pressure water hose into the standpipes and perform a gentle backflush.
- The entire Sorbtive Media bed and the geotextile fabric must be replaced if influent and effluent sampling and analysis indicate that the media's phosphorus adsorption capacity has been exhausted and phosphorus removal performance is no longer sufficient to achieve water quality objectives.
- Damaged inlet and outlet pipes, deflector plate, standpipes, and ball valve must be repaired or replaced.
- The media bed must be inspected for contamination, and Sorbtive Media replaced if needed, immediately after an oil, fuel or chemical spill.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Sorbtive Vault's long and effective service life.

Ordering Sorbtive® Media and Replacement Parts

Sorbtive Vault replacement parts and Sorbtive Media can be ordered by contacting:

 Imbrium Systems

 1-888-279-8826
 (USA)

 1-800-565-4801
 (CANADA)

 + 1-416-960-9900
 (International)



CANADA: (800) 565 4801 | USA: (888) 279 8826 | INTERNATIONAL: +1 (416) 960 9900 | www.imbriumsystems.com