



## **INSTALLATION GUIDE**

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retain-it ®

## **Installation Guide**

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## **General**

### **Description:**

retain-it ® is a subsurface Storm Water Management system constructed of precast concrete structures. They are installed in a side by side configuration creating a continuous internal flow channel integrated throughout the system. Systems are constructed with designated inlet and outlet modules, some with multiple inlets and outlets depending on the site storm water system layout. Infiltration systems typically have an inlet and sidewalls/ base constructed on a stone infiltration blanket. Geofabric is installed at the interface to the native soils. Other systems incorporate outlet flow control devices. Detention systems are typically lined with a watertight membrane, have inlet and outlet control devices.

The retain-it ® system consists of different system layouts to fit site variations. No two projects are the same, but the installation procedure is generally similar.

### **Engineering Design Specifications:**

The installation contractor shall be familiar with the engineering design specifications. Contractor shall obtain the approved drawings, specifications and calculations for review. Although, most systems are similar in design and installation, some have design specifics that may require special installation procedures.

The contractor shall be responsible for knowing the site specific characteristics such as the storm water drainage design, utility and structure locations, soil and ground water data, grading, and elevations.

Contractor shall obtain all permits, arrange for inspections, schedule with the precast vendor for delivery, storage, staging and installation.

Contractor shall schedule a preconstruction meeting with precast vendor field technician, engineer and local inspectors prior to construction.

The retain-it ® vendor shall schedule a field technician to consult during the installation.

## **System components**

The systems are broken down into modules designed for various applications. The following generally describes the basic modules and related functions. See plan for system layout.

**Standard Structure modules:** consist of varying configurations of a similar precast concrete structure. In general, the footprint of all modules is 8' x 8'. The height is determined by the hydraulic design requirements and is typically manufactured in 3', 4' & 5' ID (or custom heights per design) increments. The roof/base is an H-20 loading, 8" thick (roof)/6" thick (base) in some cases cast into the legs (walls) of the structure. In other cases, the unit will be specified to be installed "upside down" with a separate 8" thick slab applied as a roof section. It is not uncommon for an access hole to allow for maintenance to be specified in the units' roof sections. Wall sections typically include some combination of solid or perforated sections with beams, weirs, orifices or an open window section developing internal flow channels within the system. Depending on the design, any possible combination can be found, and shall be referenced on the design drawing.

Typically, the all modules are placed on 6" of structural stone leveling pad wrapped in a Mirafi 140 N (or 160 N) geofabric. Detention systems require a minimum of a 24 mil HDPE water tight liner with padded material to protect against rips or tears.

**Inlet/Outlet modules:** consist of a modified standard structure designed to receive the on-site drain pipes, directing flows into or out of the system. They may also consist of a structure with an integrated inlet grate installed directly on top of the roof slab. In some cases the module shall be installed "upside down" with a separate roof slab.

Depending on the design application, the modules may specify additional "sump" depths at a lower elevation than the rest of the system, the installation of precast concrete splash pads, outlet elbows and tees, or flow splitter devices. Other modules may have a trash rack grate or filter installed. Outlet modules typically have flow control devices such as riser pipes with orifices and overflow weirs. Some have connections to under drain systems installed in the stone base.

Typically the inlet/outlet pipes will be installed in precast holes with size, location and elevation as determined by design. On watertight systems (detention) a rubber boot shall be supplied for a watertight connection between the structures, the water tight membrane and the pipe. On recharge systems (infiltration) a hole will be supplied and a masonry filled joint will suffice. On internal elbows and tees a hole will be supplied per specification and a masonry filled joint or an optional rubber boot shall be used for fastening pipes.

These modules generally are supplied with a minimum 24" diameter access manhole to grade for inspection and maintenance purposes. Design options may specify alternative access methods, including larger diameter manholes, hatchways, ladders and safety features. Please note that entering a completed system is considered a "confined space" is governed by all pertinent OSHA requirements for entry.

**Storage and Attenuation Channel modules:** consist of a standard structure with varying configurations of solid/perforated walls, internal beams, weirs, and open “windows” as per design specification. All internal flow control devices’ sizes, locations, shapes, elevations and general configurations shall be per design specifications. Internal flow channel configuration shall be per hydraulic design. Storage modules number and size are designed to contain a given volume, whereas the layout configuration determines the hydraulic flow routing.

In general, the storage and attenuation channel modules dictate the average module height. Note that the “base” of the system is thus designated as the bottom of the module structure, where addition depth below the “base” indicates the structural stone leveling layer with the fabric wrap and shall be credited for additional storage volume. All elevations above the “base” describe the module storage volume, the structure column and cover requirements to finish grade.

**Treatment and Specialized Modules:** consist of standard structures that have been modified to perform some form of water quality treatment or the conditioning of flow characteristics for a specific application. Configurations including elevation and dimensional specific locations, hydraulically sized control piping, under drains, pumps, flow control devices, or solids/liquid storage areas specified to design.

In storm water management applications, treatment units are used for oil and water separation, trash and debris collection or suspended solids separation. But configurations for advance treatment may incorporate chemical additive pumps, recirculation pumps, screens, filters, absorbent pads, sand or media filters or other design specifications.

Others system types include pumps for water harvesting, sumps, flow splitters, velocity reduction inducers or other configurations per design specification.

These modules shall all be equipped with a minimum 24” diameter access manhole for inspection and maintenance.

## **Installation**

### **Tools Required:**

The manufacture recommends the following list of equipment and tools for most installations. The contractor may not need and can vary from the intended methods depending on the contractor’s resources.

**Track excavator or crane:** capable of lifting the maximum pick weight of the heaviest piece and the ability to extend it over the excavation pit at a given angle of operation and to swing the load freely from the unloading staging point

**Lifting gear:** with a minimum of a triple chain sling with sling hook adjuster. Sling shall be rated to meet OSHA regulations and shall have said certification. An additional steerage control rope is recommended with sufficient length and strength to attach to two points on lifted structure to counter steer into place.

**Transit, level and measuring tools:** tape measure (100' and 25'), 4' level, string line, stakes and spray paint...these items help to make an accurate layout of system

**Hand tools:** 10lb mallet, 5' steel pry bar, misc screw drivers, hammer, chisel for installing boots and gaskets

**Concrete tools:** for masonry pipe joints, cutting and drilling power tools

**Yard tools:** 4' landscape rake, dirt rake, shovels and pad leveling tools, wheelbarrow

**Membrane filter fabric tools:** cutter blade, fasteners tools ( 22cal impact nailer tool, Hilti hammer drill), grab tool

**Sealant, Gaskets, Rubber Pipe Boots:** or approved equals may be used, Sikaflex 1a construction sealant caulking, ConSeal CS-212 Polyolefin backed exterior joint wrap "ribbon tape", ConSeal CS-102 "rope tar" and Kor-N-Seal rubber pipe boots.

### **Site Preparation:**

Excavation shall be per approved engineering design plans, specifications and calculations. Contractor shall be familiar with site benchmark elevations and shall layout and install system per line and grade established per engineering plan.

Contractor shall layout system footprint (outside overall size) with offset stakes to control line and grade. Contractor shall layout using transit/level, string line with stakes, or spray paint layout line to establish line grade and straight wall line of structure placement.

Contractor shall excavate the site to design elevations. Excavation depth shall consider the precast concrete retain-it ® structure height, the over excavation depth related to the stone pad and the geofabric or membrane liner as specified in the engineering drawings.

Contractor shall comply with all local regulations, OSHA requirements for excavations and building requirements (and any other regulations required by contract or law pertaining to excavation activities), including benching, shoring and ditch protection as required by the site safety officer.

Contractor shall finish the base of the excavation to a continuous even and level grade compacted to a minimum of 95% optimum density, free of rocks over 3"+, sharp objects, trash, debris, deleterious material or organic materials.

If any water is located (groundwater or runoff water collected in the excavation) the base should be sufficiently dewatered to accomplish the 95% compaction. Dewatering should be performed continually during the installation process. Dewatering can be accomplished by installing a dewatering well, excavating a sump pump, installing an under drain or approved equal process per local regulations.

#### **Membrane or Filter Fabric Installation:**

Contractor will install membrane or filter fabric in base of excavation per manufactures recommendations. See notes concerning fabrics and membranes. Membranes and filter fabric shall be installed carefully so as to not tear or rip fabric during process. Membranes and fabrics shall be centered so as to position for wrapping up and over structures. Fabrics shall be placed with a minimum 12"-18" of overlap between sheets. Membranes shall be installed between two layers of 8 oz. filter fabric pads (sandwiched) to protect against tears and rips.

Membrane note: contractor is advised to install the membrane sandwich with the aid of 2"x6" batter board containment surrounding the outside dimension of the structure footprint. Batter board containment surround shall consist of a continuous length of boards installed with stakes controlling the line and grade such that the top of the boards are equal to the base of the retain-it ® structure design elevation. The boards will be placed on the outside of the membrane, with the stone pad installed inside the membrane. The boards shall be installed sufficiently stable enough to contain and hold the membrane and stone pad during installation. After completion of the installation the batter boards shall be removed prior to backfilling the system.

#### **Base Stone Pad Installation:**

Base pad stone shall be installed per design plan specification, depth and elevations. In general, clean and sized stone shall be placed in a continuous level pad compacted to 95% of optimum density. Stone pad should be oversized a minimum of 6" larger than the structure footprint perimeter.

### **retain-it ® Module installation:**

retain-it ® modules shall be identified by unique codes related to the unit type and in coordination with the design layout plan supplied by the engineering drawings or the project shop plan layout. Note that the code is usually an alphabet letter or combination of such; *A,AA,B,BB,C.....* as related to the specific corner, side and mid sections, stenciled on the sides of the unit.

retain-it ® modules are manufactured in different heights, and the contractor shall verify that the design specified units are to be installed on the site. In general, a majority of the units delivered shall be of the same height, with the exception of specialized units that may be designed as an inlet/outlet sump unit. Others may consist of a unit installed “upside down” with a top slab supplied. See the engineering or shop drawings for specifications.

Some designs will specify the installation of concrete pads, roof sections or optional splash pads.

Standard “footprint” of all retain-it ® modules is 8' x 8' outside dimensions, 7' x 7' inside dimensions. Heights vary from common 2', 3', 4', and 5' (or special order) tall inside dimension. All roof/ base dimensions are an 8" thick (roof)/6" thick (base) H-20 loading slab sections.

retain-it ® modules are installed by lifting equipment (excavator or crane) of sufficient size to lift the heaviest pick weight, to swing it from the staging area and to extend it over the excavation area. Alternate methods allow for a track excavator to “walk” the modules into place.

Module installation should start at a designated “layout” corner, and proceed outward from that point. After the corner piece has been installed, all other pieces shall be placed in a sequential pattern per proper line and grade. Delivery and staging of specified units should be coordinated with the intended sequence of installation.

Care should be taken to align the first units in a consistent straight, square and level fashion. Subsequent units can easily be placed against the installed units to maintain the layout. Note that units should be placed with an average  $\pm \frac{1}{4}$ " gap or less, not to exceed a maximum of  $\frac{1}{2}$ " gap. Top slab surfaces should be plumb and level with  $\pm \frac{1}{2}$ " maximum difference, unless otherwise noted.

After all the modules have been placed, a layer of ConSeal CS-212 Polyolefin backed exterior joint wrap “ribbon tape” shall be securely applied on the outside top surfaces along all joints between units. Surfaces shall be clean and dry prior to placement.

For infiltration system, where a perimeter stone section wrapped in geofabric has been specified, contractor shall place the specified minimum volume of stone and pull the geofabric wrap up and over the top leading edge of the structure. Contractor should fasten the geofabric in place by means of a mechanical fastener or adhesive. Fastening shall be sufficient to hold the materials in place during the backfilling operation.

For detention systems requiring the watertight membrane installation, membrane shall be wrapped up the sides and over the top leading edge of the structure. When wrapping the material up, over and around corners, the material shall be folded (like a hospital bed sheet corner) so as to provide a sealed edge with no seams open to allow water to penetrate below the top surface of the structure. Note that some designs shall require a separate membrane cover be placed over entire top of system. Contractor should fasten the membrane in place by means of a mechanical fastener or adhesive. Fastening shall be sufficient to hold the materials in place during the backfilling operation.

NOTE: Care should be taken to protect the watertight integrity of the membrane during installation avoiding tears or ripping of the material. If one should occur, then the contractor shall refer to the manufactures recommendations for repair.

### **Pipe Installation:**

Installation of the inlet/outlet pipes with a membrane system shall incorporate a watertight rubber boot and flange gasket kit supplied by the vender. The rubber boot shall be installed inside the pipe hole cut into the structure wall. Hole shall be clean and smooth and free of loose or foreign material. The rubber boot should fit tightly and snug against the receiving concrete wall section. The internal metal expansion ring should be tightened to the manufactures recommended torque. The pipe should be slipped into the rubber boot and the external metal pipe clamp should be tightened down to the manufactures recommended torque. When using corrugated pipe, the pipe trough shall be filled with a pipe adapter supplied by the pipe vendor to fill the cavity and produce a flat surface to connect the pipe boot to. Those materials may be a ConSeal CS-102 “rope tar” or ConSeal CS- 212 “ribbon tape” material or a watertight caulking such as Sikaflex 1a construction sealant.

Watertight detention systems will require the installation of a flanged gasket plate sealing the membrane against the wall of the concrete structure. The flange plate consists of a flange ring with an inside hole dimensioned larger than the pipe OD, and predrilled holes to insert the Power-Studs through.. Contractor shall place a minimum of one layer in a continuous band of ConSeal CS-212 “ribbon tape” applied against a clean smooth structure outside wall. The membrane shall have a hole cut large enough to fit the OD of the pipe thru at the location of the pipe protrusion. The membrane can then be pressed against the band of the CS-212, compressing and adhering the band to the

membrane. The flange ring can then be placed around the opening in the membrane, pressed into place and then fastened by Power-Stud threaded expanded fastener. Use minimum number #4 for smaller diameters and as many as required to ensure ring seats in a flat watertight fit. Torque down nuts to hold in place. Note that any wall perforation holes that are visible between the ID of the ring and the OD of the pipe shall be filled with a waterproof grout mix.

For infiltration systems a masonry grout filled pipe hole is sufficient.

For internal piping configurations, a rubber boot system or masonry grout filled pipe hole is sufficient.

**Backfill and finish grading:**

After the fabric or membrane is securely in place and all pipes have been installed, the contractor can precede to backfill the structures. Backfill material shall consist of select native, clean or structural fill material free of rocks larger than 3", sharp objects, deleterious materials, trash, debris or organics. Backfill shall be compacted in 9" lifts to a 95% optimum density.

Contractor shall install access riser structures, inlet grate structures, vents, observation pipes or other design specified items per location and finish grade as shown on the design plans.