

20. Proprietary Systems

Description

A proprietary system is a manufactured device which treats stormwater before discharge to another BMP or to the receiving water. This is a broad category of BMPs with a variety of pollutant removal mechanisms and varying pollutant removal efficiencies.

Regulatory Credits

Pollutant Removal varies with the type of device and its sizing.

- varies Total Suspended Solids
- varies Total Nitrogen
- varies Total Phosphorus

Water Quantity effect varies with the type of device and its sizing.

- varies Peak Attenuation
- varies Volume Capture

Feasibility Considerations

- Small Land Requirement
- Med Cost of Construction
- Med-High Maintenance Burden
- Small-Med Treatable Drainage Basin Size
- Med Possible Site Constraints
- Med Community Acceptance

Advantages

- Can be cheaper than traditional technologies for stormwater treatment.
- Typically requires less land surface than traditional technologies.
- May be engineered to target specific pollutants.
- May find applications where available land is extremely limited.
- May allow dual use of the land surface, since some systems are underground.

Disadvantages

- Generally, performance in North Carolina installations is not yet well documented.
- Underground installations are not readily inspected, and typically lack provisions to warn of impending failure.
- Because of reduced size compared to traditional technologies, maintenance actions may be more frequent.
- The additional monitoring requirements placed on proprietary systems can discourage some potential owners.
- Projects featuring proprietary BMPs may take longer to review and approve.

Major Design Elements

<p>Required by the NC Administrative Rules of the Environmental Management Commission. Other specifications may be necessary to meet the target pollutant removal requirements contained in DWQ-administered programs.</p>	
1	<p>Sizing shall take into account all runoff at ultimate build-out including off-site drainage. BMP shall be located in a recorded drainage easement with a recorded access easement to a public ROW.</p>
2	<p>"Innovative systems" (per 15A NCAC 2H .1008(b)) BMPs may not be located within one mile of and draining to waters classified as HQW; including waters classified as ORW, WS-I, WS-II, SA, and Primary Nursery Areas (PNA). BMP technology successfully completing DWQ's PEP program will be treated as "Alternative Design Criteria" systems per 15A NCAC 2H .1008(h), and may be installed without <u>additional</u> receiving water classification constraints: however, in all cases all water classification constraints required within the rules governing the applicable program continue to remain in effect.</p>
3	<p>DWQ may require monitoring to verify the installed performance of the proprietary BMP.</p>
4	<p>Alternative stormwater treatment measures must be available and must be installed, upon DWQ's determination that the proprietary BMP has failed.</p>
5	<p>An operation and maintenance plan is required.</p>
6	<p>The system must be designed by a professional licensed in North Carolina. The design professional must also certify that he/she inspected the system during construction; that the installation conformed to the permitted plans and specs; and that the system meets the requirements of the rules.</p>
<p>Required by DWQ policy. These are based on available research, and represent what DWQ considers necessary to achieve the target removal efficiencies.</p>	
7	<p>Due to the wide variety of potential design concepts and details, additional design, performance, and monitoring requirements may be developed on a case-by-case, or project basis by DWQ.</p>

20.1 General Characteristics and Purpose

Many different proprietary devices, or manufactured BMPs, are available for the treatment of stormwater. Many, although not all, proprietary BMPs can be classified into two major groups: separation devices and filtration devices. Typically separation devices can be further subdivided into two types: chambered and hydrodynamic. In chambered BMPs, runoff passes through several chambers where settling of sediment particles and flotation of hydrocarbons takes place. Hydrodynamic devices typically impart a swirling motion to the incoming flow that aids in settling of sediment particles. Filtration BMPs typically pass runoff through filter cartridges or filter media, thereby removing some fraction of the solid pollutants from the stormwater.

In order to prevent re-suspension and subsequent discharge of the accumulated sediment, many proprietary BMP systems have provisions to allow bypassing of large storm events that are in excess of the design storm.

Regular inspection, maintenance, and clean out of proprietary systems is required. Because many proprietary devices are smaller than traditional BMPs, more frequent maintenance should be expected. As with all BMPs, proprietary systems should be inspected after large storm events.

Proprietary devices may be designed as stand-alone BMPs, achieving complete stormwater treatment and control as required by the regulatory program or jurisdiction governing the installation of the unit. Or, they may also be designed as part of a stormwater treatment and control train, in combination with other BMPs.

20.2 Meeting DWQ Regulatory Requirements

To obtain a DWQ permit for a project that includes the installation of a proprietary stormwater treatment system, the proprietary system must meet all of the Major Design Elements listed in the beginning of this section. Since individual proprietary systems are extremely variable in design details, design concepts, and pollutant removal mechanisms, it is not currently possible to provide a category-wide set of detailed design parameters for proprietary systems. DWQ typically approaches permitting requirements on a case-by-case basis, and determines additional requirements in accordance with the receiving water classification, the site conditions, the specifics of the device, the target pollutants and removal rates, and any other rule requirements of the DWQ-administered regulatory program.

20.3 The Preliminary Evaluation Period Program (PEP)

In 1997 DWQ established the Preliminary Evaluation Period (PEP) program. The PEP program is designed to allow DWQ to evaluate the performance of proprietary devices with the goal of subsequently being able to qualify successful candidate technologies as satisfying the requirements of DWQ-administered stormwater programs.

DWQ's PEP program provides for the installation of the candidate technology at a small, limited number of DWQ-permitted sites. For each candidate technology, DWQ will develop the PEP requirements applicable to the technology. Further, DWQ requires an installation-specific project plan, a monitoring plan, and an interpretation of the collected data from the permitted site. In past PEP projects DWQ has required a year of data, with an established minimum number of qualifying storm events. DWQ's favorable interpretation of the first data set allows the candidate technology to continue in the PEP program, but at another in-state location. After a small number of data sets are in hand, DWQ will establish the assigned removal rates, design loading limitations, and design particulars for the candidate proprietary technology. The intent is that with the performance characterizations and constraints derived from the test locations, DWQ can then provide qualified approval of the equipment for use in DWQ-administered stormwater control programs.

Despite having the outline of the PEP program in place since 1997, there have been few enrollees in the program. The program is slowly evolving, and it is likely that DWQ will adjust the technical requirements and the procedural requirements as we gain additional experience in the program. As currently implemented on a case-by-case basis, the PEP process is highly collaborative, with necessary participation by the owner, the designer, the equipment vendor, and DWQ. Because of this, DWQ’s time to review and approve projects with proprietary BMPs should be expected to be protracted beyond the time typically required to review and approve permit applications featuring traditional BMPs.

Two DWQ memoranda from 1997 and 2001 establishing the guidelines of the DWQ PEP program are appended at the end of this chapter.

20.4 Systems Approved under the PEP Program

Caution: This BMP Manual lists proprietary technology that has been tested in North Carolina. The performance has been evaluated based on the equipment specifications below. In addition to conformity with the equipment specifications listed, any stormwater control system must also meet the full requirements of the regulatory program under which it is being installed. *This BMP Manual listing does not supersede, replace, or otherwise invalidate in any way the rule requirements of the governing regulatory program.* See Section 20.2 of this BMP Manual chapter for clarification; see also Chapter 2 of this BMP Manual. In every particular, the selection, installation, operation, and maintenance of proprietary devices by permittees, owners, operators, installers, contractors, and/or designers must comply with **the governing North Carolina Administrative Code rules of the specific regulatory program** under which any proprietary technologies are proposed.

The following proprietary systems are approved via the PEP program for use in DWQ-administered programs. Any DWQ permit applications that use these systems must be based on equipment with the same specifications that were tested for approval. Any future changes to the configuration, design, or technology must be approved in writing by DWQ’s Stormwater Permitting Unit.

DWQ is alert to mixed results from other states as to the success of other programs intended to qualify proprietary devices. Should DWQ conclude that subsequent installations indicate that a PEP-approved technology has not reliably achieved the required results in our programs, we may revisit and revoke our PEP approval.

20.4.1 StormFilter by Contech. PEP trials conducted 2005-2006, and 2011. DWQ approved 9/1/2012.

Regulatory Credits	
<i>Pollutant Removal</i>	
85%	Total Suspended Solids

A StormFilter is a patented treatment BMP that filters water through granular media cartridges. The StormFilter design is based on mass loading calculations that result in an anticipated minimum 1 year maintenance cycle for the system. The systems typically are configured as an underground vault containing cylindrical filter cartridges. The number of cartridges is determined by the site-specific flow rate and flow volume to be treated in accordance with the specific applicable DWQ regulations.

The 85% TSS removal credit is granted for StormFilter units designed and manufactured to the following **equipment specifications**:

- **1 gpm/sf** maximum annular media loading rate;
- Typically, upstream storage in the form of a forebay or other tankage is required to capture the required water quality volume (WQV). For projects regulated under 15A NCAC 2H .1008(h) the required storage is 75% WQV, similar to the sand filter storage requirements reported in Chapter 11.
- **Media:** Perlite
- Cartridges shall be generally configured as shown in Figure 1. DWQ may interpret individual proposed StormFilter installations as to significance and compliance with this equipment specification on a case-by-case basis.

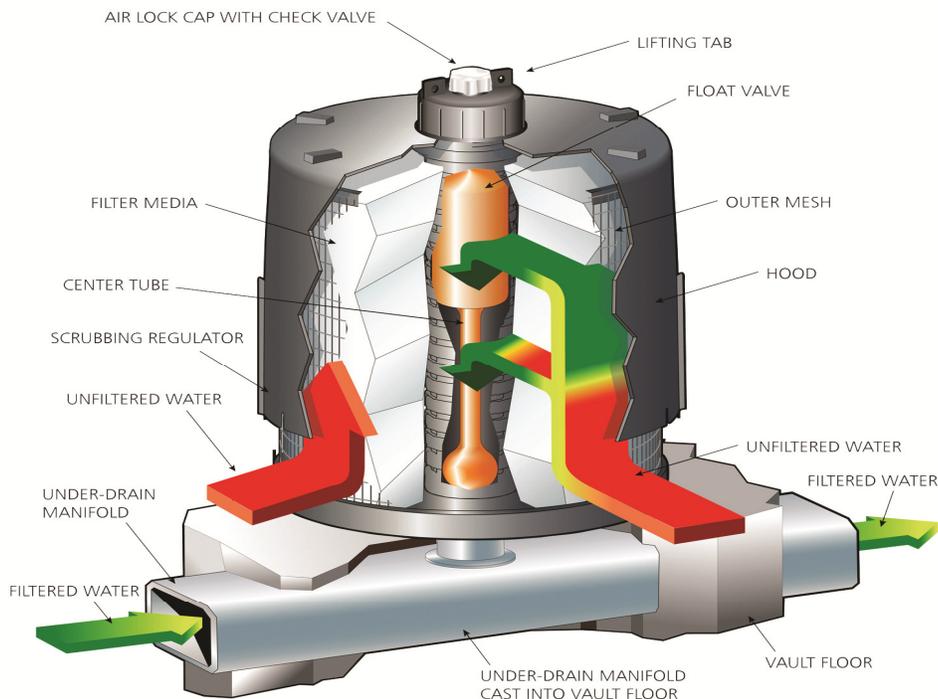


Figure 20-1: StormFilter Cartridge

20.4.2 Reserved for future proprietary technologies.

20.5 Generalized Design Procedure for Meeting Regulatory Requirements for all Proprietary Systems

Proprietary devices installed for stormwater control under DWQ-administered stormwater programs must meet all the requirements of the regulatory program governing the permitted installation, and must meet all the equipment specifications listed herein. In addition, specific manufacturer's installation guidelines must be followed. A generalized design procedure is provided below to assist owners, designers, and installers.

Step 1: Understand the Rule Requirements

The designer must first understand what water quality rules his project is subject to. North Carolina has several overlapping stormwater control regulatory programs, and the designer's misunderstanding on this point can significantly impede DWQ's efficient turn-around of his/her client's permit application.

Step 2: Understand the Approved System

Review the approved equipment specifications and contact the manufacturer for specific design assistance. Determine if, in addition to the approved proprietary technology BMP, the whole stormwater control system requires any additional common stormwater treatment system elements (found in Chapter 5). Evaluate the on-going operation and maintenance burden placed on the owner or operator.

Step 3: Determine the Volume of Water to Treat

Most regulatory programs require the treatment and control of the runoff from a specific size rainfall event, usually described in terms of a rainfall amount, or a rainfall return frequency. Typically the design of the system must provide enough storage for the water quality volume for the design storm (typically 1", 1.5" or pre/post). Chapter 3, Stormwater Calculations, generally presents the volumetric calculations for sizing BMPs.

Step 4: Design the system

Given the fact that approved systems will vary in pollutant removal methods and in proprietary details of the equipment, this section does not provide detail design guidelines. The project designer should rely on DWQ's approved specs and the manufacturer's technical staff for correct equipment design and selection. The project designer should develop construction contract documents establishing the construction sequencing requirements needed to protect the system from overloading during construction. Again, the project designer has the lead responsibility for meeting all regulatory requirements for the jurisdiction and program that has regulatory authority.

Example of permitting requirements under the state Stormwater Management program rules at 15A NCAC 2H .1008(h) – Alternative Design Criteria. Note that the state Stormwater Management program regulates the discharge of stormwater pollutants by requiring certain property development activities to apply for a DWQ stormwater permit. *Again, the reader is cautioned that the following example is illustrative of some of the requirements under 15A NCAC 2H .1000: however for other DWQ projects, other regulatory requirements may pertain depending on the location of the system, and depending on which regulatory program has jurisdiction.*

Example design basis under 15A NCAC 2H .1008(h), Alternative Design Criteria:

- The system design must take into account the runoff resulting from the 1" or 1.5" design storm at the ultimate build-out potential.
- The system must achieve 85% average annual removal of TSS from the stormwater flow.
- **Either:** the discharge rate of the treatment volume shall completely draw down between 2 and 5 days;
- **Or:** the discharge rate from the system must be controlled so that the post-development rate is no greater than the pre-development rate for the 1-year, 24-hour rain event.

In addition, to obtain and comply with the DWQ stormwater permit:

Under 15A NCAC 2H .1000 rules: a site-specific Operation and Maintenance Plan must be included in the permit application submittal to DWQ.

Under 15A NCAC 2H .1000 rules: The system designer must be licensed in North Carolina for the design of the type of system proposed. And, the system designer must subsequently certify that:

- The stormwater system was inspected during its construction;
- The stormwater system has been constructed in substantial conformity with the approved plans and specs;
- The stormwater system complies with the requirements of 15A NCAC 2H .1000.

State of North Carolina
 Department of Environment,
 Health and Natural Resources
 Division of Water Quality

James B. Hunt, Jr., Governor
 Jonathan B. Howes, Secretary
 A. Preston Howard, Jr., P.E., Director



November 24, 1997

MEMORANDUM

TO: Regional Office Water Quality Supervisors
 Branch Heads

FROM: A. Preston Howard, Jr., P.E. *A.P.H.*

SUBJECT: POLICY MEMORANDUM
 PERMITTING NEW STORMWATER TREATMENT TECHNOLOGIES

In recent months there have been numerous requests to permit new stormwater treatment technologies. This policy memorandum is provided in response to these requests and the increasing availability and diversity of new stormwater treatment technologies. New technologies are defined as innovative systems [NCAC T15A: 02H .1008(b)] or alternative designs [NCAC T15A 2H .01008(h)] that the state does not have direct experience with.

A Preliminary Evaluation Period (PEP) shall be established for all new treatment technologies which are found to be of sound principle and concept. The PEP will allow a limited number of projects utilizing the new technology to be permitted and evaluated. The PEP is designed to provide the Division the time and information necessary to assess the effectiveness of the technology in meeting state requirements. All permits issued during the PEP will require analytical monitoring designed to generate a representative data set to evaluate pollutant removal efficiencies. Documentation of studies and information from other permitting agencies will also be used in making a comprehensive evaluation of any new treatment technology. For each new technology, a memorandum establishing a PEP and detailing specific requirements in force during the PEP will be sent to all Regional Offices.

The PEP memorandum will be issued by the Stormwater and General Permits Unit. The following minimum requirements shall be in effect during the Preliminary Evaluation Period:

1. No new technologies shall be permitted in areas draining to ORW, HQW, WS-II or SA waters.
2. All permits shall be signed by the Director.
3. A maximum of five permits per technology will be issued by DWQ during the PEP. Permitting will further be restricted to no more than three innovative

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technology permits in any one geographic region of the state (coastal, piedmont and mountain).

4. A copy of all application and supporting documentation shall be provided to the Stormwater and General Permits Unit for incorporation into a database and for use in overall evaluation of the technology.
5. A minimum of 10 data points for each installation shall be required to be collected to define a representative data set for final evaluation of the system. These data will be used in publishing the Report of Findings and establishing permanent permitting procedures for this technology. These data must be collected over the course of at least one full year with samples collected in each of the four seasons.
6. All permits shall require quarterly analytical monitoring of first flush grab samples. Specific monitoring parameters shall include TSS and flow. All installations draining to NSW designated waters shall include TN and TP monitoring. Additional parameters may be established in the PEP memorandum based upon specific water quality concerns or potential pollutant removal applications beyond the state 85% TSS design criteria.

A facility may opt to monitor more frequently than quarterly in order to generate the required data set in a shorter period of time as long as data is collected over the course of at least one full year with samples collected in each season.

7. All permits shall require that another treatment method be installed in the event that the permitted technology fails to substantially fulfill the state requirements.

The PEP will end when the Division has adequate information to make a final determination on widespread permitting of the new technology. When a final determination is made, the Stormwater and General Permits Unit will issue a Report of Findings for the specific technology. The report will include a summary of the system evaluation and recommendations for future permitting.

Please inform your stormwater staff of this policy, which is effective immediately. If you have any questions please contact Jeanette Powell at (919) 733-5083, ext. 537.

APH:jp

cc: Steve Tedder
Don Safrit
Bradley Bennett
Brent McDonald



NORTH CAROLINA DIVISION OF WATER QUALITY
WATER QUALITY SECTION
STORMWATER AND GENERAL PERMITS UNIT

June 13, 2001

MEMO

TO: Stormwater Treatment Technology Vendors
State Stormwater Management Program Staff

FROM: Bradley Bennett *BB*
SWGPU Supervisor

SUBJECT: Permitting Innovative and/or Proprietary Stormwater Treatment Technologies

The Division of Water Quality may approve innovative and/or proprietary (I/P) stormwater treatment technologies on a case by case basis. Each permitted I/P technology shall be subject to a Preliminary Evaluation Period (PEP). The PEP is designed to allow the Division to evaluate the technology, develop appropriate permitting criteria, and allow a limited number of installations. The PEP is terminated when enough information is available for the Division to make a final determination on the treatment technology by establishing permanent permitting criteria or prohibiting the technology from use. I/P treatment technology PEPs will typically include, but are not limited to, the following conditions:

- No I/P technology shall be permitted in areas draining to ORW, HQW, WS-II or SA waters.
- No I/P technology shall be permitted where continuous background flows such as springs are present.
- The facility requesting the use of the I/P technology will provide all pertinent documentation on the system design, system application, and system effectiveness as part of the application process.
- The I/P technology will be subject to a minimum one-year preliminary evaluation period.
- All approved I/P technology systems shall be designed and sized in accordance with the manufacturers specifications.
- Analytical monitoring and the generation of a minimum number of data points shall be a requirement.
- An executed operation and maintenance agreement shall be required.
- The facility will be responsible for installation of another treatment method in the event that the technology fails to substantially fulfill the state requirements it was permitted to meet.

To initiate a PEP for an I/P treatment system, the Division must receive a permit application for a project proposing to utilize the technology. Once an application is received by the Regional Office, the Division will begin research on the technology and develop appropriate interim permitting criteria. This research and the PEP document are generated in the Central Office. Once the PEP document is approved by the Division Director, the Regional Office can proceed with permit issuance. Note that the PEP development process may take six months or more depending on the quality of the permit application, availability of documentation, and availability of staff resources.

September 28, 2007 Changes:

1. Major Design Elements: Reformatted to include numbered requirements.

August 7, 2009 Changes:

1. Potential for protracted review and approval time noted in Disadvantages, and in 20.3.
2. Collaborative nature of the case-by-case development of the PEP program for a particular technology noted in 20.3.
3. Original enabling memos for the PEP program attached for reference.

December 5, 2012 Changes:

1. Added Section 20.4 Systems Approved under the PEP Program, and 20.4.1 for StormFilter.
2. General edits and clarifications throughout chapter.