2.2.25 Proprietary Structural Controls

Description: Manufactured structural control systems available from commercial vendors designed to treat stormwater runoff and/or provide water quantity control

KEY CONSIDERATIONS

DESIGN CRITERIA:

- Independent performance data must be available to prove a demonstrated capability of meeting stormwater management goal(s)
- System or device must be appropriate for use in Rutherford County area

ADVANTAGES / BENEFITS:

- Pre-treat runoff for oil, grit, sand, silt, sediment; these contaminants are concentrated in the devices and are relatively easy to vacuum/remove for disposal
- Capture trash and floatables
- Protect downstream, vegetated stormwater controls from contamination
- Pre-packaged units with known performance and maintenance protocols

DISADVANTAGES / LIMITATIONS:

- Depending on the proprietary system, there may be:
  - Limited performance data
  - Application restraints
  - High maintenance requirements
  - Higher costs than other structural control alternatives
- All persons approving or using the system or device in question must understand installation and operations/maintenance requirements.

STORMWATER MANAGEMENT SUITABILITY

[S] Water Quality Protection for sediment capture, and oil (certain units) and nutrients (certain units)

[S] Detention

IMPLEMENTATION CONSIDERATIONS

[L] Land Requirement

[H] Capital Cost

[M] Maintenance Burden

Residential Subdivision Use: Depends
Hi Density/Ultra-Urban: Yes
Drainage Area: Depends
Soils: No Restrictions

L = Low M = Moderate H = High

2.2.25.1 General Description

There are commercially-available proprietary stormwater controls designed for water quality treatment and/or for detention. The main types are the following:

a) Hydrodynamic systems
b) Filtration systems
c) Prefabricated structures for underground storage/detention of stormwater
d) Pre-designed treatment systems (e.g. planter box for trees; packaged wetland systems)

Common uses and features of manufactured systems:

The most common use of manufactured systems designed for removing pollutants is on small, commercial-use sites where there the cost of land and the intense use of the property leaves little space for stormwater treatment.

Likewise, the underground detention systems are used on the same type of sites.

2.2.25.2 Policy for approval of proprietary or manufactured systems

For the different types of systems, Murfreesboro applies these policies:

a) Hydrodynamic systems

These systems are primarily used for sediment capture, in order to accomplish treatment of the first flush of runoff from rooftops, roads, driveways, parking lots or material handling areas. The mechanism for capture is by gravity and specially designed flow patterns through the device.

Some units have integrated, or optional, features that will capture leaves and brush, floating trash, oils and may have filter screens or fabrics.

As for the performance of these units, the City refers to the approval protocols of the New Jersey Department of Environmental Protection, which has well-developed standards for evaluating and certifying these types of devices. As of the date of this writing, these protocols demand that the devices be tested according to objective standards and that performance be verified by a third, independent party. The verification involves flow rates and maintenance protocols.

We recognize the certifications of the NJDEP and approvals of Metro Nashville, with the same effective dates and performance levels as expressed in those certifications and approvals.

http://www.njstormwater.org/treatment.html ; and

Metro Nashville stormwater management manual .

i. Use water quality treatment flow rates as certified by NJDEP (or MWS).

If there are questions as to flow rates, contact the city's Engineering Department and the plans reviewer for clarity.
See next section for method to calculate the water-quality treatment flowrate on which to base sizing of a unit.

ii. Match a particular treatment device to expected site conditions.

The City expects that the design engineer will consider the pollution-generating nature of the property and choose a treatment unit to match those conditions. Based on experience, City stormwater staff may require special features in a device for a given application in the field, or deny use of a unit for a given application. For example, units installed at fueling stations may need features to capture oil.

iii. Place hydrodynamic units as pre-treatment units.

In order to function at its rated efficiency for sediment removal, a hydrodynamic unit must be placed at the front end of a stormwater treatment train. Devices placed downstream of other sediment-removal structures will not be recognized as treatment for sediment removal.

iv. Provide field access by cleaning equipment to the units

Design plans must provide for relatively easy access to the unit – enabling unencumbered cleaning of the unit.

b) Filtration systems

Filtration systems route stormwater flow through a filtering media (e.g., pearlite, activated carbon, zeolite) or fine mesh screen or fabric, to remove fine particles of sediment and/or specific contaminants.

As for the performance of these units, the City refers to the approval protocols of the New Jersey Department of Environmental Protection, which has well-developed standards for evaluating and certifying these types

of devices. As of the date of this writing, these protocols demand that the devices be tested according to objective standards and that performance be verified by a third, independent party. The verification involves flow rates and maintenance protocols.

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If there are questions as to flow rates, contact the city's Engineering Department and the plans reviewer for clarity.
See next section for method to calculate the water-quality treatment flowrate on which to base sizing of a unit.

ii. Match a particular treatment device to expected site conditions.

The City expects that the design engineer will consider the pollution-generating nature of the property and choose a treatment unit to match those conditions. Based on experience, City stormwater staff may require special features in a device for a given application in the field, or deny use of a device for a given application in the field.

iii. Provide field access by cleaning equipment to the units

Design and installation must provide relatively easy access to the unit – enabling unencumbered maintenance and cleaning of the unit.

c) Underground detention

i. Sizing and design

Sizing and design must be according to sound hydrologic and hydraulic engineering practices for determining volumes and flow rates and sizing of pipes and structures.

ii. Pretreatment

As a rule, a pre-treatment unit for capturing sediment and floatables must be placed upstream of the underground treatment unit. Capturing sediment and floatables upstream of the detention will protect the chambers and their function and result in easier maintenance of the system. Pretreatment is a must for underground storage that has infiltration as a key element.

iii. Provide field access to the chambers for inspection and cleaning

Access must be provided so that inspectors can judge the condition of the chambers and the need for maintenance and cleaning.

Access and means for keeping outlets clear of debris must provided and be described in the maintenance plan for the facility.

d) Pre-designed treatment systems (e.g. planter box for trees; packaged wetland systems)

As of the date of writing, these systems are not in widespread use as those listed above, and protocols for establishing performance may not be available.

i. Approvals by the NJDEP will be accepted and applied according to the verified performance:

http://www.njstormwater.org/treatment.html

ii. Systems that have been tested by independent third-parties may submit design standards and performance results for review by City's engineering staff. Staff can request of the manufacturer

further information or testing and can require results from installations in the field. Stormwater staff can issue interim (e.g. one-year) approvals by letter or by posting to the City's stormwater web pages.

iii. In evaluating such systems, where possible, staff will use design tools and methods accepted in Tennessee – by other local governments or by the State's Division of Water Resources – and make comparisons with known similar technologies.

iv. Sizing and design

Sizing and design must be according to sound hydrologic and hydraulic engineering practices for determining volumes and flow rates and sizing of pipes and structures

v. Provide field access by cleaning equipment to the units

Design and installation must provide relatively easy access to the unit – enabling unencumbered maintenance and cleaning of the unit.

2.2.25.3 Calculating water-quality treatment flow rates for flow-through devices

Most proprietary control devices are flow-through types and rated for removal of solids based on a specified maximum flow rate. The water quality volume (WQv) equation – the basis of Murfreesboro's solids-removal standard for treatment of stormwater—establishes a volume that must be treated. In an effort to simulate the WQv approach for proprietary control systems, the following peak flow design equation shall be used for sizing flow-through systems for treatment:

$Qp = C*I*A$

where:

Qp = the peak flow through the control device
C = runoff coefficient
I = rainfall intensity (in/hour)
A = contributing drainage area

Given that these systems are used to treat runoff from impervious areas of less than three acres (+/-), the rainfall intensity to use in the equation is set at 2.45 inches.

2.2.25.4 Contra-indicators to use of a device

Any device found not to meet the certified performance criteria in the field may be removed from the approved list. Murfreesboro may reject the use of an otherwise approved device if in a given application City stormwater staff believe its use will prove unsuitable or prone to dysfunction or poor performance or operation.