

## Stormwater Manufactured Treatment Devices (MTDs)

SCDOT Designation: SC-M-815-13 (07/15)

### 1.0 Stormwater Manufactured Treatment Devices

Stormwater Manufactured Treatment Devices (MTDs) function as stormwater treatment devices before stormwater runoff is discharged off-site or to receiving water bodies, and may be incorporated into a series of water quality best management practices to remove pollutants from stormwater runoff. MTDs are not designed, or intended to store a volume of water for water quality treatment. MTD Pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity and other factors.

Use MTDs that minimize the long term water quality impacts from stormwater runoff from the SCDOT MS4 to the Maximum Extent Practicable (MEP). Use MTDs designed to trap trash, sediment, totals suspended solids (TSS), oil and grease, metals, hydrocarbons and other pollutants. Provide MTDs that combine separation and settling processes into one controlled system. MTDs are classified into two Types:

- MTD Type 1 - Separation Devices (Stormwater MTD)
- MTD Type 3 - Catch Basin Inserts (Unique Project requirements)

### 1.1 Design Criteria

Use MTD Type 1 and MTD Type 3 designed to treat, at a minimum, the peak flow rate of the stormwater runoff from the **1.8-inch, 1-year, 24-hour storm event**, from the project rights of way drainage area to the MTD. This is defined as the water quality event (WQE). This water quality event is distributed into the rainfall intensities in Table 1.

**Table 1: Water Quality Event (WQE) Design Intensities**

Frequency	a	b	c	$i^1$ ( $t_c$ 5 min) (in/hr)	$i^1$ ( $t_c$ 10 min) (in/hr)	$i^1$ ( $t_c$ 15 min) (in/hr)	$i^1$ ( $t_c$ 30 min) (in/hr)
Water Quality Design Storm	135.65	40.2	1.0863	2.16	1.93	1.74	1.34

<sup>1</sup> Where:

$$i = \frac{a}{(b + t_c)^c}$$

i = rainfall intensity (inches per hour)

Tc = time of concentration (minutes)

a, b, c = water quality event (WQE) coefficients

Offsite flows may be directed to and treated by the MTD, or they may bypass the MTD. If offsite flows are directed to the MTD, then the MTD water quality design and overall design must account for the offsite flows.

Use MTDs designed to treat the entire water quality event (WQE) with no by pass for a minimum **80%** Total Suspended Solids (TSS) removal efficiency. The WQE flow rate is a separate flow rate from the storm sewer design flow rate. In addition to meeting the required treatment efficiency for the WQE, the

MTD must be capable of passing the specified storm sewer design flow rate (i.e. 10-year storm event) without causing adverse hydraulic impact to upstream portions of the drainage system and without causing any re-suspension or scour of previously trapped pollutants, or the MTD may be required to be placed off-line.

Ensure site constraints (available right of way and available depth) allow the installation of a single MTD for design peak water quality event flow rates up to 8 cfs. Additional MTDs may be required for water quality event flow rates greater than 8 cfs.

Ensure tail water conditions are accounted for in the MTD design.

## 1.2 MTD Components and Performance Requirements

### 1.2.1 Stormwater Manufactured Treatment Devices (MTDs) Type 1

Use MTD Type 1 (separation devices, also referred to as hydrodynamic separators) designed and sized to treat, at a minimum, the stormwater runoff from the **1.8-inch, 1-year, 24-hour storm event**, to prevent pollutants from being transported downstream.

Use MTD Type 1 as the standard Stormwater MTD for pollutant removal. MTD Type 1 is used for the majority of SCDOT applications. Use MTD Type 1 that contains a sump for sediment deposition with a series of chambers, baffles or weirs to trap trash, oil, grease and other pollutants. MTD Type 1 may include a high flow bypass mechanism for rainfall events larger than the water quality event to prevent scouring and re-suspension of previously trapped pollutants.

MTD Type 1 not providing a high flow bypass mechanism must provide specific lab testing results verifying no re-suspension or scour of previously trapped pollutants during the storm sewer design event for the MTD. Use MTD Type 1 with treatment elements or other upstream BMPs to remove trash, debris and other gross pollutants.

Use MTD Type 1 sized using acceptable scaling methodologies based on the results of laboratory testing with a laboratory maximum Hydraulic Loading Rate of **25 gpm/sf (0.0557 cfs/sf)**. MTDs scaled with higher Hydraulic Loading Rates must provide specific laboratory results verifying the required removal efficiency for the water quality event at the higher Hydraulic Loading Rate.

Use MTD Type 1 with the following properties:

- Designed for a minimum **80%** Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC) of coarse sand (125-micron-mean size, OK-110, or F-95 Silica Sand) for the peak flow rate from the water quality event for average influent concentrations ranging from 100 mg/L to 300 mg/L.
- Use settling, separation, swirling, and centrifugal force techniques to remove pollutants from storm water runoff.
- Contain no moving components that require an external power source such as electricity, gas powered engines or generators.

### 1.2.2 Stormwater Manufactured Treatment Devices (MTDs) Type 3

MTD Type 3 (catch basin inserts) may be needed for unique Project requirements. MTD Type 3 is not applicable for long stretches of linear highway projects containing many stormwater inlets.

Use MTD Type 3 designed for direct installation into storm drain catch basins. Use MTD Type 3 sized for the specific catch basin they are inserted into.

Use MTD Type 3 that may contain filter media including polypropylene, porous polymers, treated cellulose, and activated carbon designed to absorb specific pollutants.

Use MTD Type 3 that provides overflow features that do not reduce the original hydraulic capacity of the catch basin. Pollutant removal efficiencies vary and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity and other factors.

Use MTD Type 3 with the following properties:

- Designed for a minimum **80%** Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC) for one of the following:
  - Post construction phase runoff of coarse sand (125 micron-mean size, OK-110, or F-95 Silica Sand) with average influent concentrations ranging from 1,500 mg/L to 2,000 mg/L using ASTM 7351 or equivalent laboratory testing methods.
  - Street sweeping sediment load (average particle size of 200 micron) with average influent concentrations ranging from 24,000 mg/L to 26,000 mg/L (2.5% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.
  - Sediment-laden construction phase runoff of USDA Sandy Loam or Loamy Sand soil (200 micron mean size) with average influent concentrations ranging from 6% to 8% target sediment to water concentration using ASTM 7351 or equivalent laboratory testing methods.
- Use separation, settling, swirling, centrifugal force, and filtering techniques to remove pollutants from stormwater runoff.
- Contain no moving components that require external power sources such as electricity, gas powered engines or generators.
- Are capable of removing the pollutants of concern for the unique Project requirements.

#### 1.2.4 Quality Assurance

Provide the specific MTD type as shown on the plans from a manufacturer listed on the most recent edition of *SCDOT Qualified Product List 78 Stormwater Manufactured Treatment Devices* in the appropriate category.

At the time of delivery, provide the RCE with a MTD packing list containing complete identification including, but not limited to, the following:

- Manufacturer's name and location.
- Manufacturer's telephone number and fax number.
- Manufacturer's e-mail address and web address.
- MTD name, model, and/or serial number.
- Certification that the specific MTD meets the physical and performance criteria of this specification.

Ensure that each MTD delivered bears identification including, but not limited to, the following:

- MTD name, model, and/or serial number.
- MTD structure number.

## 1.3 Construction Requirements

### 1.3.1 Working Drawings

Submit Working Drawings, material certification, and Certification that the MTD meets the requirements of *QPP 78* and this Specification to the RCE. Ensure the Working Drawings contain at a minimum the project file number, project control number, MTD name and model and/or serial number, MTD dimensioning, MTD and storm sewer invert elevations, installation drawings, and instructions that completely describe the MTD bearing the seal and signature of a *South Carolina* registered Professional Engineer. Do not perform any work on the MTD until the Working Drawings are accepted. Any work done or materials ordered before the acceptance of Working Drawings is at the Contractor's risk.

### 1.3.2 Site Preparation

Proper site preparation is essential for MTD installation. Prepare the site per the Plans, SCDOT Specifications, and the manufacturer's instructions.

### 1.3.3 Precast MTD Type 1 Installation

Perform precast MTD Type 1 excavation, bed preparation, backfilling and compaction as required by **Section 719** of the *South Carolina Department of Transportation (SCDOT) Standard Specifications for Highway Construction, 2007 Edition, or latest revision* for precast drainage structures.

Prepare and compact the MTD Type 1 bed.

Ensure the elevation of the bedding material accommodates the elevation of all pipes connected to the MTD Type 1 and the required MTD Type 1 top elevation.

Place and level the MTD Type 1 according to the manufacturer's requirements and to the elevations shown on the Working Drawings and Plans.

Install pipes and grout in place according to the storm sewer elevations, outfall elevations, pipe sizes, and the layout of the MTD Type 1 as shown on the Plans. Ensure all lifting methods meet OSHA regulations.

Backfill and compact the MTD Type 1 and all pipes as required by **Section 719** of the *South Carolina Department of Transportation (SCDOT) Standard Specifications for Highway Construction, 2007 Edition, or latest revision*.

### 1.3.4 MTD Type 3 Installation

Place and level the MTD Type 3 according to the manufacturer's requirements and to the elevations shown on the Working Drawings and Plans.

### 1.3.5 Assembly

Assemble MTDs in accordance with the manufacturer's written assembly instructions and in compliance with all OSHA, AASHTO, local, state, and federal codes and regulations. Erect shoring, bracing, or other devices necessary to achieve safe working conditions. Ensure the MTD bedding is protected from scour or movement during MTD installation.

Ensure that MTDs are designed and constructed in a manner that will not impact the integrity of the overall Project design and features such as grades, pedestrian facilities and other structures.

A manufacturer's representative is required to provide specific MTD assembly instructions to the Contractor and verify the assembly for each of the manufacturer's specific MTD according to the manufacturer's design and assembly instructions.

Ensure proper site stabilization is achieved so MTDs function as designed. Do not use MTDs to trap eroded sediment from construction operations, unless the manufacturer has approved such use in writing. Install MTDs as the last stormwater runoff structures installed on site, or keep these MTDs off-line or isolated until final stabilization is achieved.

If MTDs are used for sediment control, provide written certification from the manufacturer that the device is clean and operating properly at the time a Notice of Termination is filed for the site.

### 1.3.6 Acceptance

Obtain RCE acceptance and approval of all MTD installations. Obtain a letter from the manufacturer verifying the MTD assembly. When requested by the RCE, ensure that a manufacturer's representative is on-site to provide MTD assembly instructions or ensure the manufacturer has provided assembly training to the contractor for each manufacturer specific MTD. Defective MTDs or MTDs damaged by the Contractor will not be accepted.

### 1.4 Measurement

The quantity of the pay item Stormwater Manufactured Treatment Device (MTD) Type (1 or 3) is measured by each (EA) MTD furnished and installed, complete, and accepted. The RCE may require written verification of the MTD assembly by a manufacturer's representative before the quantity is accepted.

### 1.5 Payment

Payment for Stormwater Manufactured Treatment Device (MTD) Type (1 or 3) is full compensation for installing the MTD as specified or directed and includes furnishing; excavating; providing and placing bedding material; installing; making connection with stormwater pipe or drain including joint sealant; backfilling; disposing of surplus material; during construction maintenance; during construction inspection; documentation of Quality Control and Quality Assurance programs; and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract.

All traffic control necessary to perform MTD installation and post construction inspections are provided by the Prime Contractor. No separate payment is made for this traffic control.

Bid item numbers and descriptions are as follows:

**Table 3: Bid Item Number**

<b>Bid Item Number</b>	<b>Description</b>	<b>Unit</b>
7195551	Manufactured Treatment Device (MTD) Type 1	EA
7195553	Manufactured Treatment Device (MTD) Type 3	EA