NDS, Inc. **March 2019**

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Product Guide Specification

Specifier Notes: This product guide specification is written in Construction Specifications Institute (CSI) 3-Part Format in accordance with *The CSI Construction Specifications Practice Guide,* including *MasterFormat, SectionFormat,* and *PageFormat.*

This section must be carefully reviewed and edited by the Engineer to meet the requirements of the project and local building code. Coordinate this section with Division 1, other specification sections, and the Drawings. Delete all Specifier Notes after editing this section.

Section numbers and titles are based on *MasterFormat 2016 Update.*

1. 33 46 23

MODULAR BURIED STORMWATER STORAGE UNITS

Specifier Notes: This section covers NDS, Inc. “**StormChamber**®**”**. Consult NDS, Inc. for assistance in editing this section for the specific application.

The performance of NDS Stormchamber® is directly correlated to the load bearing capacity, plasticity, and permeability of native soil; frost-heave potential; volume and load-rating of project traffic; installation methods used; as well as the type, gradation, and thickness of the surrounding and overlay rock.

* 1. GENERAL
		1. SECTION INCLUDES
			1. Underground Stormchamber® for detention / retention of facility stormwater runoff.
		2. RELATED REQUIREMENTS

Specifier Notes: Edit the following list of related sections as necessary. Limit the list to sections with specific information that the reader might expect to find in this section, but is specified elsewhere.

* + - 1. Section 31 23 16.10 – Stormwater Excavation: Subgrade preparation.
		1. REFERENCE STANDARDS

Specifier Notes: List reference standards used elsewhere in this section, complete with designations and titles.

* + - 1. ASTM F2922-12: Standard Specification for Polyethylene (PE) Corrugated Stormwater Collection Chambers.
			2. ASTM F2787-11: Standard Specification for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.
			3. AASHTO Method T-99: Standard Test Method for Moisture-Density Relations of Soils using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12-in) Drop; 2018.
		1. PREINSTALLATION MEETINGS

Specifier Notes: Edit preinstallation meetings as necessary. Delete if not required.

* + - 1. Convene preinstallation meeting [1 week] [2 weeks] before start of Work of this Section.
		1. SUBMITTALS

Specifier Notes: Edit submittal requirements as necessary. Delete submittals not required.

* + - 1. Comply with Division 1.
			2. Product Data: Submit manufacturer’s product data, including preparation and installation instructions.
			3. Submit Material Certification / Gradation Analysis for gravel.
			4. Manufacturer’s Certification: Submit manufacturer’s certification that materials comply with specified requirements and are suitable for intended application.
			5. Manufacturer’s Project References: Submit manufacturer’s list of successfully completed StormChamber® projects, including project name and location, name of architect, and type and quantity of StormChamber® furnished.
			6. Warranty Documentation: The manufacturer shall guarantee the stormwater infiltration chamber against all defects in materials and workmanship for a period of twelve (12) months from the date of delivery to the job site. The use of subsurface infiltration chamber shall be limited the application for which it was specifically designed.
		1. QUALITY ASSURANCE
			1. Manufacturer’s Qualifications: Manufacturer regularly engaged, for a minimum of 5 years, in the manufacturing of StormChamber® of similar type to that specified.
			2. Product:

The system shall be designed in accordance with the requirements of ASTM F2922-12: Standard Specification for Polyethylene (PE) Corrugated Stormwater Collection Chambers.

The system shall be designed in accordance with requirements of ASTM F2787-11: Standard Specification for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.

The chambers shall be tested to meet or exceed AASHTO H-20 loading.

The system shall have a sediment collection device placed underneath the floor/bottom of the start and end chambers of the first row of chambers receiving flow. A riser pipe shall be placed vertically above and directly in line above the sediment collection device and attached to the chamber. The riser pipe and sediment collection device shall serve as the maintenance unit from which collected sediment is vacuumed out.

Maintenance of the system shall be occur by lowering a vacuum hose into the riser pipe and vacuuming sediment from the sediment collection device. Flushing water into the system and vacuuming the sediment / sediment-laden water from a separate access structure is not allowed.

* + 1. DELIVERY, HANDLING, AND STORAGE
			1. A full pallet of Stormchamber® will weigh approximately 3,410 lbs and will be about 5 ft wide x 8.5 ft long x 8.5 ft high.
			2. Stormchamber® will arrive either on a flat bed trailer or in an enclosed van. A long chain, metal cable, or strong rope or straps may be needed to drag a pallet from the nose of the van. A forklift is the easiest way to unload pallets of Stormchamber®.
			3. During periods of excessive and/or extended hot weather take one chamber at a time off of a pallet, just before placing it in the trench. Do not allow chambers to be left on their backs, exposing the underlying black color to the sun. If possible, keep pallets of chamber and backfill stone in the shade. Try to restrict chamber installation to the cooler morning periods. Place stone and soil backfill on chambers as they are being installed. If necessary, spray water on the Stormchamber® and stone.
	1. PRODUCTS
		1. MANUFACTURER
			1. Manufacturer: NDS, Inc., 851 North Harvard Avenue, Lindsay, California 93247. Toll Free 800-726-1994. Phone 559-562-9888. Toll Free Fax 800-726-1998. Fax 559-562-4488. Website [www.ndspro.com](http://www.ndspro.com). Email nds@ndspro.com.

Specifier Notes: Specify if substitutions will be permitted.

* + - 1. Substitutions: [Not permitted] [Comply with Division 1].
		1. MATERIALS SUPPLIED BY NDS

Specifier Notes: Specify the StormChamber® that will be used, i.e., **SC-18** OR **SC-34E** OR **SC-34W** OR **SC-44**

* + - 1. **SC-18 StormChamber®**: High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Start, Middle, and End Chambers: 8.58 ft long x 5.0 ft wide x 18 inches tall.

Chamber Storage Volume: 20 cubic feet.

**SC-34E StormChamber®**: High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Start, Middle, and End Chambers: 8.58 ft long x 5.0 ft wide x 34 inches tall.

Chamber Storage Volume: 75 cubic feet.

Chamber Weight: 100 lbs

**SC-34W StormChamber®:** High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Start, Middle, and End Chambers: 8.25 ft long x 5.0 ft wide x 34 inches tall.

 Chamber Storage Volume: 75 cubic feet.

 Chamber Weight: 90 lbs

**SC-44 StormChamber®**: High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Start, Middle, and End Chambers: 7.17 ft long x 6.5 ft wide x 44 inches tall.

 Chamber Storage Volume: 105 cubic feet

 Chamber Weight: 120 lbs

* + - 1. SedimenTrap™ High Molecular Weight, High Density Polyethylene.
			2. 30 inch dia x 20 inch tall HDPE Pipe. Pipe can be cut per Project requirement.
			3. Non-woven polypropylene filter fabric TMG-4ozNWG by TMPG or approved equal
			4. Woven polypropylene filter fabric 300HTM by WinFab or approved equal.
			5. 8-inch dia frame and lid.
	1. EXECUTION

Note for Specifier: Sections 3.1 through 3.6 may be substituted with a note to submit manufacturer’s installation instructions.

* + 1. TRENCH PREPARATION

1. Do not excavate trench until dry weather is forecast long enough to allow at least covering the StormChamber® system with filter fabric prior to raining to avoid soil filling void spaces in the stone.

2. Excavate to a width and length sufficient to accommodate the number of Stormchamber® plus a minimum one foot border around the entire StormChamber® system for the border stone. The bottom of the bed must be level.

3. Excavate a hole approximately 5 ft deep x 5 feet wide wherever SedimenTraps™ are specified. The SedimenTrap™ must be aligned directly below the riser pipe and centered below the top portal of the chamber/riser pipe. Place at least 6 inches of 3/4" – 2” non-calcareous (i.e., no limestone) base stone at the bottom of each excavated hole.

4. If it is not possible to excavate the entire trench from outside the trench, have the excavator back up as it excavates in front of it in order to avoid compaction of underlying soils.

5. If use of heavy equipment on the excavated trench bed cannot be avoided, scarify the trench bottom and break up soil clumps before adding the stone base.

6. Line trench walls with non-woven filter fabric. Overlap adjacent filter fabric by at least 2’.

* + 1. INSTALLING SEDIMENTRAP™

1. Place a SedimenTrap™ in the excavated holes at the first and last chamber of the row(s) receiving the storm water inflow. Only the top corrugation should be exposed above the height of the stone base.

2. Fill around the SedimenTrap™ with the crushed, washed 3/4" - 2" non-calcareous stone.

* + 1. INSTALLING BASE ROCK AND FILTER FABRIC

1. Place 6” of crushed, washed, 3/4” to 2” non-calcareous (i.e., no limestone) stone on the bottom of the trench.

2. If necessary use a light-weight tracked dozer to level the stone. Dozer should not exceed 1,100 lbs /sf, maintaining at least 6” of stone under the tracks at all times to avoid soil compaction.

3. Place the woven stabilization netting / filter fabric underneath the entire row(s) of StormChambers® receiving inflow. Cut a hole so that the netting fits sunggly under the top of the corrugation of the SedimenTrap™.

* + 1. PLACING THE STORMCHAMBER®

1. Cut off the narrow shipping strips at the end walls to allow the chambers to overlap.

2. Place all Start Chambers first. Make sure the closed ends of the Start Chambers are at least 1 foot from the facing trench wall.

3. Build the chamber rows by placing the first rib of a Middle Chamber over the last rib of each Start Chamber. Extend all rows equally rather than one at a time. Finish each row with the End Chamber placed at least 1 foot from the end of the trench.

4. As you overlap the first rib of the next chamber over the last rib of the previous chamber, screw the chambers together at the foot of the overlapped ribs with 3-inch drywall screws. Include one screw on each side, making sure to bring the chambers close enough so that no stone can pass through during the backfilling process.

 To minimize installation time, begin placing pipe and backfilling as the remaining chambers are being placed taking care for worker safety during backfilling.

* + 1. INSTALLING PIPES

1. After placing the Start Chambers, cut open the side portals along the indentation guides for the lateral connecting pipes.

2. Mark the mid points of each lateral connecting pipe and insert them between the adjacent chambers so that the midpoint is centered between the two chambers. The connecting pipe must be inserted about 6 inches into each chamber.

3. Cut out the top portals along the indentation guides for the riser pipes.

4. Install the cleanout risers using 10 inch diameter PVC pipes and manhole frames and lids.

5. If there is more than ½ inch gap between the pipe hole and pipe, cut an “X” sized just short of the hole diameter in one or more pieces of filter fabric and place it over the pipe hole before inserting the pipe. SC-44 does not have a defined top portal. The hole should be centered over the SedimenTrap and sized for the riser pipe.

* + 1. PLACING BACKFILL

1. Deposit 3/4” – 2” crushed, washed, hard stone directly along the centerline of the StormChamber® to evenly flow down each side to keep the StormChamber® in proper alignment. DO NOT use limestone. Limestone gets pasty when wet and will tend to reduce the void spaces in the stone.

2. Level the stone cover with a tracked vehicle not exceeding 1,100 lbs /sf. Make sure to keep at least 6 inches of stone under the tracks at all times.

3. Cover the stone with non-woven filter fabric. Overlap adjacent sheets by at least 2’.

4. Backfill the installation with soil and compact in lifts 6 to 8 inches high to at least 95% of the Standard Proctor Test (AASHTO Method T–99). Crusher run or other suitable backfill material may be used, if approved by the Engineer-of-Record. The same type of stone surrounding the StormChamber® can also be extended up to the pavement sub grade, if desired.

5. Compaction shall be performed with a tracked dozer not exceeding 1,100 lbs /sf, keeping at least 1' of fill under the track at all times. Start at one corner of the system when grading lifts.

6. After compaction of backfill and setting of final grade, avoid parking on or traversing over the StormChamber® installation with heavily loaded trucks and heavy equipment until paved.

* + 1. POST-CONSTRUCT ION PRECAUTIONS
			1. It is highly recommended that the system not be opened to receive stormwater flows until construction of the site has been completed. Even then, all stormwater inlets must be protected from sediment loading until the site is completely stabilized. Complete stabilization implies that the construction site has been cleared of construction-related debris and has incurred at least two storm events sufficient to wash most soil and other particulate matter off impervious surfaces.
		2. MAINTENANCE

1. The system is designed with a defined top portal that can be cut-out to accept a 10-inch diameter riser pipe. The riser is used as an observation well and for access of a vacuum truck tube that can be used to remove sediment.

2. Perform visual inspection through the risers quarterly and after each large storm event. It is recommended that a log book be maintained showing the depth of water in the chamber at each observation in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the system have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.

3. Remove sediment by inserting the vacuum truck tube into the 10-inch riser pipe when deposits approach within six inches of the invert heights of connecting pipes between rows.

Optional Notes for Specifier (see below):

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* + 1. OPTIONAL SEDIMENT REMOVAL DEVICES

1. Under normal circumstances, a pre-treatment device is not necessary. However, under certain conditions, or local requirements, pre-treatment devices can be useful. Filtering, swirl concentrators, or other types of pre-treatment devices can be installed up-stream of the StormChamber® system for removal of sediment, floatables, oil and grease, etc. Their use is particularly helpful for stormwater “hot spot” areas, such as automobile repair shops, where abnormally high concentrations of pollutants such as oil and grease can be expected.

2. The use of inlet structures with a 2-4 foot sump may allow for additional capture of sediment that can easily be removed with a vacuum truck or other device before it gets into the StormChamber® system. A sumped inlet structure placed at both ends of the first row of StormChamber® system can also be used to facilitate sediment removal within the StormChamber® system. Under this alternative, one or more additional chamber(s) is added to the beginning and end of the first row, the end of each being inserted directly into the sumped inlet structures. This provides for physical access into the first row for maintenance.

3. An additional row of StormChamber® can be added for accumulation of sediment with minimal effect on the stormwater storage requirements of the system. This would be utilized as the “first row” of chambers – the row that accepts the stormwater flow from the inlet structures. Because the flow from the first row of chambers will have to make 90 degree turns through connecting pipes into the adjacent row, velocity of flow will decrease and most of the transported sediment load deposits within the first row of the StormChamber® system.

4. The use of fully grated inlet structures will keep the vast majority of debris out of the StormChamber® system. It is suggested that these be placed near the entrance to the establishment being constructed as an incentive for owner maintenance.

**These instructions assume accepted construction procedures and loaded trucks that do not exceed specified DOT load limits. Uncustomary loads or improper load distribution in vehicles may require additional cover. Installations not in compliance with these instructions will void the warranty.**

**END OF CSI SPECIFICATION**