NDS, Inc. **November 2022**

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](mailto:bbb@aaaa.com)

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 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 the Sediment Trap, inflow row, or a separate access structure is 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 flatbed 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 and unload using a forklift. A forklift with extended blades will be needed to unload pallets of StormChamber® from a flatbed trailer.
       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. If possible, keep pallets of chamber and backfill stone in the shade. Restrict chamber installation to the cooler morning periods, when temperature is below 85°F. Place stone and soil backfill on chambers as they are being installed. If necessary, spray water on the chambers 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-44**

* + - 1. **SC-1820 StormChamber®**: High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Chambers: 8.5 ft (101 in) long x 3.2 ft (38 in) wide x 1.5ft (18 in) tall.

Minimum Installed Chamber storage volume with 6” of gravel above and below, 6” between chamber rows, and 12” at each end:

End/Start Unit: 46 cubic feet

Middle Unit: 41 cubic feet

Closed Unit: 68 cubic feet

Chamber weight: 53 lbs.

**SC-3475 StormChamber®**: High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Chambers: 8.6 ft (103 in) long x 5.0 ft (60 in) wide x 2.8 ft (34 in) tall.

Minimum Installed Chamber storage volume with 6” of gravel above and below, 9” between chamber rows, and 12” at each end:

End/Start Unit: 127 cubic feet

Middle Unit: 111 cubic feet

Closed Unit: 179 cubic feet

Chamber weight: 100 lbs.

**SC-44105 StormChamber®**: High Molecular Weight, High Density Polyethylene.

Manufactured Nominal Dimensions of Chambers: 7.5 ft (89.5 in) long x 6.4 ft (76.25 in) wide x 3.7 ft (44 in) tall.

Minimum Installed Chamber storage volume with 12” of gravel above, 9” below, 9” between chamber rows, and 12” at each end:

End/Start Unit: 183 cubic feet

Middle Unit: 153 cubic feet

Closed Unit: 259 cubic feet

Chamber weight: 120 lbs.

* + - 1. SedimenTrap™ High Molecular Weight, High Density Polyethylene.
      2. 30” dia x 20” tall HDPE Riser Pipe for 34” & 44” tall chambers. 24” dia x 12” tall HDPE Riser Pipe for 18” tall chambers. Pipe can be cut per Project requirement.
      3. Non-woven polypropylene filter fabric TMG-4oz NWG by TMPG or approved equal
      4. Woven polypropylene filter fabric 300HTM by WinFab or approved equal.
      5. 10” diameter cast-iron heavy-duty 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 defined top portal of the chamber/riser pipe. The 18” & 44” StormChamber do not have a defined top portal. The installer shall cut a top portal on the crown of the chamber at the defined distance from the end.
       4. Line bottom and walls of trench with non-woven filter fabric, including the SedimenTrap excavation. Overlap adjacent filter fabric by at least 2’.
       5. Place at least 6” of 3/4” – 2” non-calcareous base stone at the bottom of trench each excavated hole for Sediment Traps. Base rock shall be angular stone and washed. Angular stone provides interlocking. Washed stone prevents fines being washed into the outflow.
       6. 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.
       7. 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.
    2. 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.
       2. Fill around the SedimenTrap™ with the crushed, washed 3/4” – 2” non-calcareous stone. Only the top corrugation should be exposed above the height of the stone base.
    3. INSTALLING BASE ROCK AND FILTER FABRIC
       1. Place crushed, washed, 3/4” to 2” non-calcareous (i.e., no limestone) stone on the bottom of the trench per project installation detail. DO NOT use limestone. Limestone gets pasty when wet and will tend to reduce the void spaces in the stone. Rock shall be angular stone and washed. Angular stone provides interlocking. Washed stone prevents fines being washed into the outflow.
       2. If necessary, use a lightweight 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 snuggly under the top of the corrugation of the SedimenTrap™.
    4. PLACING THE STORMCHAMBER®
       1. Cut off the narrow shipping strips at the end walls to allow the chambers to overlap. Do not cut off the weir walls of the Start Chamber.
       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” 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.
       5. To minimize installation time, begin placing pipe and backfilling as the remaining chambers are being placed taking care for worker safety during backfilling.
    5. 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” into each chamber. This will require 3-ft or 4-ft or 5-ft sections of pipe depending on use with SC-18 or SC-34 or SC-44.
       3. Cut out the top portals for the riser pipes. The 18” & 44” tall chambers do not have a defined top portal. The installer shall cut a top portal on the crown of the chamber at the defined distance from the end.
       4. Install the cleanout risers using 10” diameter PVC pipes and manhole frames and lids.
       5. If there is more than ½” 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. Keep repeating this process until the gap is filled and a tight seal is achieved. SC-44 does not have a defined top portal. The hole should be centered over the SedimenTrap and sized for the riser pipe.
    6. Wrapping Inflow (Sediment Trap) Row
       1. Wrap Inflow (Sediment Trap) row with non-woven filter fabric.
    7. 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 and prevent shifting of rows.
       2. Level the stone cover with a tracked vehicle not exceeding 1,100 lbs. /sf. Make sure to always keep at least 6” of stone under the tracks for SC-18 or SC-34 and at least 12” for SC-44.
       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” 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, always keeping at least 1’ of fill under the track. Start at one corner of the system when grading lifts.
       6. After compaction of backfill and setting of final grades, avoid parking on or traversing over the StormChamber® installation with heavily loaded trucks and heavy equipment until paved.
    8. POST-CONSTRUCTION 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.
    9. MAINTENANCE
       1. The system is designed with a defined top portal that can be cut-out to accept a 10” 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 logbook 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” riser pipe when deposits begin to approach within 6” from the top of the Sediment Trap or chamber bottom.

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**