

Modular Buried Stormwater Storage Units



Part 1 - General

1.01 SUMMARY

- A. This section includes specifications for the supply and installation of geocellular stormwater modules, specifically the Stormwater Management System by Wavin (hereafter called AQUACELL).

1.02 RELATED SECTIONS

- A. Section 31 20 00 - Earthwork
- B. Section 32 10 00 - Bases, Ballasts, and Paving
- C. Section 33 14 00 - Water Utility Transmission and Distribution
- D. Section 33 41 00 - Subdrainage
- E. Section 33 41 13 - Foundation Drainage
- F. Section 33 41 16.16 - Geocomposite Subdrainage

1.03 REFERENCES

- A. **ASTM D698** – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
- B. **ASTM D1557** – Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
- C. **ASTM D2321** – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- D. **ASTM D5199** – Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
- E. Manufacturer's product literature and guidelines for the Wavin AQUACELL product.

1.04 SUBMITTALS

- A. Submit product data, manufacturer's installation instructions, and product certifications for the Wavin AQUACELL geocellular stormwater modules.
 - a. **Coordination Drawings:** Showing pipe sizes, locations, and elevations. Show other connecting pipes adjacent and/or connecting to the AQUACELL system. Indicate interface and spatial relationships between maintenance holes/ catch basins, piping, and proximate structures.
 - b. **Profile drawings:** Show system with connecting piping in elevation. Indicate upstream/ downstream piping & structures. Show types, sizes, materials, and elevations of other utilities crossing underground AQUACELL system.
 - c. Product data, including unit weight and compressive strength.
 - d. Product installation instructions.

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1.05 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** The AQUACELL geocellular stormwater modules shall be supplied by Wavin and manufactured in ISO certified facilities.
- a. Manufacturer samples shall be provided to the client & contractor for review upon request.
 - b. If requested by the project owner, a manufacturer's representative is available for pre-construction meetings & site review.
- B. **Installer Qualifications:** Installation shall be performed by a contractor experienced in the installation of geocellular stormwater modules.
- a. Contractor experience requirement may be waived, pending final approval by the client, if the manufacturer's representative provides on-site training and review during pre-construction meeting or during on-site construction.
 - b. Installation should be performed by skilled workers with a satisfactory record of performance on bulk earthworks, pipe, chamber, geocellular units, or pond/landfill construction projects of comparable size and quality.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver the AQUACELL modules to the site in accordance with the manufacturer's recommendations and installation guidelines.
- a. Protect AQUACELL and other materials from damage during delivery by handling with equipment appropriate to the materials and site conditions. Equipment may include handcart, forklift, extension lifts, etc. and using extra care as needed to follow all OSHA site regulations.
 - b. Store the units in a cool dry, flat area, protected from direct sunlight and at a minimum distance of 50 feet from any open flame, welding operations, or other potential heat sources.
 - i. AQUACELL modules can be stored outdoors without protection against the weather elements for up to one (1) year. If possible, it is advised to cover the modules with tarp or external covering.
 - ii. When the air temperature is 40 degrees (f) or below, care must be taken when handling plastics to ensure no cracking.
 - iii. iii. AQUACELL systems should not be installed when ground is frozen or when subgrade is saturated or muddy.

1.07 PRE-CONSTRUCTION MEETINGS

- A. Prior to the start of installation, a pre-construction meeting shall occur with the representatives from the design team, the general contractor, the excavation contractor, the AQUACELL installation contractor, and the manufacturer's representative.
- B. No work can be performed until the required permits and approvals have been secured.

1.08 PROJECT CONDITIONS

- A. **Weather Limitations:** Installation of AQUACELL modules shall not proceed during adverse weather conditions that may affect the product's performance.

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- B. Coordinate installation of AQUACELL with other on-site activities to eliminate all non-installation related construction traffic over the completed AQUACELL system. The AQUACELL system is not designed for excessive weight. Traffic on the system should be limited to the standard AASHTO HS-20 (or HS-25 depending on the project load requirements).
- C. All adjacent construction work should be protected from damage during AQUACELL installation.
- D. All pre-treatment systems supplied by others must be in place and functional before the AQUACELL system operates. Additional pre-treatment measures may be needed if AQUACELL is operational during construction due to increased sediment loads.
- E. The contractor is responsible for any damage that occurs to the AQUACELL system during construction.

Part 2 – Products

2.01 Storm Management System (AQUACELL) by Wavin

- A. Geocellular units shall be constructed of 100% recycled polypropylene (PP) material, providing structural integrity and resistance to chemical corrosion.
- B. Geocellular units shall have a 47.25 in. (W) x 23.62 in. (L) x 16.68 in. (H) configuration, with a minimum void ratio of 95% (variable based number of system layers).
- C. Vertical access into the AQUACELL for inspection and cleanout will be a minimum of 10 inches NPS.

2.02 GEOSYNTHETICS

- A. Provide a non-woven monofilament geotextile fabric with a minimum weight of 8 oz/sq.yd. for wrapping and protecting the AQUACELL modules from abrasion, puncture, and UV degradation before and during installation.
- B. For PVC geomembrane, provide with a minimum thickness of 30 mil and a thickness tolerance of $\pm 5\%$ as defined by ASTM 5199. Material should be puncture resistant and durable. Choose geomembranes based on site specific applications considering Wavin AQUACELL protection and longevity of units.

2.03 BEDDING, BACKFILL & COVER MATERIALS

- A. The type of bedding, backfill and cover material will vary depending on the specific application and the local soil conditions.
- B. Recommended bedding material should be clean and free of debris and placed in a layer with a minimum depth of four inches below the AQUACELL unit (maximum of 12 inches).
 - a. Bedding must be uniform, level, and free of debris.
 - b. Compact subgrade to at least 95% of its standard proctor density. If the design calls for stormwater to infiltrate into the ground below the system, the engineer of record may specify a different compaction level.
 - c. For AQUACELL applications where the unit will be installed in a wet or poorly drained area, it is recommended to place a geotextile fabric layer between the bedding material and the underlying soil.
- C. Recommended backfill material should be clean and free of debris, with a particle size distribution that is appropriate for the specific application.
 - a. For AQUACELL applications where the unit is subjected to heavy loading, such as under roadways or parking lots, a mix of crushed stone with a minimum particle size of $\frac{3}{4}$ inch and a maximum particle size of 2 inches is recommended.
 - b. For AQUACELL applications where the unit is subjected to lighter loading, such as

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under landscaping or green roofs, a well-graded sand and gravel mix with a minimum particle size of 1/8 inch and a maximum particle size of 1 inch is recommended.

D. Recommended cover material should be at minimum six inches of clean and well-graded soil & provides adequate subgrade for the project per engineer's plans (maximum of 14.4 feet for standard applications).

a. Cover material follows backfill materials in section 2.03B

2.04 MANUFACTURER'S INSTRUCTIONS

A. Comply with the manufacturer's installation instructions and guidelines for the Wavin AQUACELL product.

a. AQUACELL units shall be shipped to site on pallets and can be lifted with forks on an excavator or forklift by positioning the forks in the openings of the pallets.

b. When installing the AQUACELL system, it is important to follow OSHA safety guidelines, such as wearing proper personal protective equipment (PPE), using safe lifting techniques, and avoiding working in hazardous conditions.

Part 3 - Execution

3.01 EXAMINATION

A. Verify that the site conditions are suitable for the installation of AQUACELL modules per manufacturer's recommendations.

3.02 PREPARATION

A. Transport Wavin AQUACELL product to site following guidelines in section 1.06.

B. All excavations must meet OSHA safety standards for slopes or shoring. The sides must be angled or supported in a way that prevents cave-ins, and to ensure there is sufficient room for workers to move around safely while installing the system.

C. Excavate the designated area to the required depth and shape to accommodate the Wavin AQUACELL modules and level the bottom of trench when complete.

a. Ensure that the area is larger than the footprint of the complete storage tank to be installed to allow for working room.

b. Lay minimum 4-inch bed of coarse sand, level and compact the designated area (reference section 2.03B)

3.03 INSTALLATION OF AQUACELL UNITS

A. Install a non-woven geotextile fabric in the excavated area to protect the AQUACELL modules from soil and debris infiltration.

a. Reference section 2.02 for recommended minimum material standard.

b. Lay the geotextile fabric and then the geomembrane (if needed) over the base and up the sides of the trench.

c. Seal the geomembrane (if needed) with a welding machine to ensure that it is watertight.

B. Assemble and install the Wavin AQUACELL units according to the manufacturer's instructions and approved drawings.

a. Outline installation area to ensure a straight system.

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- b. Bottom layer
 - i. Mount the bottom plate to the AQUACELL unit and place the base unit in the outlined corner on the bottom of the trench.
 - ii. Place the next (outer) units (including pre-mounted bottom plates) next to the installed units by sliding the integrated connectors into each other.
 - 1. Installing row by row can cause the units to get out of alignment, so subsequent units should be connected in a radial pattern away from the corner to ensure they remain aligned.
 - iii. Repeat this until the full bottom layer is installed.
- c. Vertical inspection
 - i. Follow specific installation guidance as provided by Wavin for providing vertical inspection points on the AQUACELL system.
- d. Next layer(s)
 - i. Mount additional AQUACELL base units directly on the top deck of bottom layer unit(s). Each of the pillars will fall into position and click in the top deck openings of the unit below. No additional bottom plates are needed.
 - ii. Repeat this for all the layers until all AQUACELL units are installed.
- e. Side Panels
 - i. Install AQUACELL side panels by putting hinge pins of the side panel into the hinge pockets of the units at an angle. Next, the panels can be hinged against the pillars of the unit(s). The panel will snap to each unit using minimal push force.
 - ii. Trim side panels as needed.
- f. Pipe Connections
 - i. Each side panel consists of two standard 6-inch inlets with integrated pipe stoppers.
 - 1. For pipe connections < 6 inch, use a reducing coupler as needed.
 - 2. To connect larger diameter pipe, jigsaw a hole in the side plate following the integrated guides and attach a Wavin AQUACELL pipe connector unit (≤ 16 in).
 - 3. For pipe connections larger than 16", pipe abutment to the side plate using a geotextile fabric and/or PVC geomembrane are acceptable.
- g. Wrap the complete system in geotextile (for retention/infiltration) or geomembrane (for detention).
 - i. Reference 2.02 regarding minimum geotextile recommendations.
 - ii. Once wrapped, seal by using a wedge welder to ensure watertightness for geomembrane (as needed), secure geotextile to system using integrated clips.
- h. Inspection & Maintenance Shafts
 - i. Locate points of the AQUACELL system where the vertical adapter will be installed.
 - ii. Two cutouts for installation of the AQUACELL vertical adapter are at the top of each unit.

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- iii. Cut the geotextile or geomembrane on top and install the top connector by placing the 10-inch spigot at the bottom of the top connector in the cut opening of the base unit.
- iv. Next the shaft seal and connector can be installed securing (fixating) the geotextile (retention) or sealing the geomembrane (detention) to the top connector.

3.04 BACKFILLING OF THE AQUACELL UNITS

- A. Back fill the area with soil material in accordance with project specifications.
 - a. Reference recommended backfill materials in section 2.03C
- B. Back fill the trench around the system in lifts of max. 12 inch with the appropriate soil type and compact evenly until level with the top of the system.
- C. The appropriate degree of soil compacting should correspond with the existing soil and water conditions and future external load as specified by the Engineer of Record (EOR).
 - a. It is advised to compact soil at minimum level of:
 - i. 90% standard Proctor (SP) for non-traffic areas.
 - ii. 95% standard Proctor (SP) for roads with limited traffic load.
 - iii. 98% standard Proctor (SP) for roads with heavy traffic load.
 - b. Perform compaction of the backfilled material in accordance with ASTM D698 and ASTM D1557 as applicable.
- D. Take care to ensure that the compaction process does not allow the machinery to come into contact with the AQUACELL system due to the potential for damage to the geotextile (geomembrane) and AQUACELL units.
- E. No compaction equipment is permissible to operate directly on the AQUACELL units.
- F. Back fill the trench evenly on top of the system with a layer of 8 inch without compacting.
- G. Back fill material above the system in layers of max. 12 inch with the appropriate soil type and compact this layer evenly until it is level with the surface.
- H. No machinery should drive on top of the tank until at least 18 inches of backfill and compaction is achieved.

3.05 CLEANUP

- A. Remove all debris and excess material from the site and dispose of it in an approved manner.

3.06 PROTECTION

- A. Protect the installed geocellular stormwater modules from damage during construction activities. Reference sections 3.01 through 3.04.
- B. Repair or replace any damaged units before project completion.

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Part 4 – Inspection and Maintenance

- A. Inspect the AQUACELL system annually for signs of damage, such as cracks, tears, or deformation.
 - a. Inspect the geotextile (geomembrane) fabric wrapping the AQUACELL system for signs of damage, such as tears or holes.
 - b. Inspect the backfill material and cover material around the AQUACELL system for signs of erosion or settlement.
 - c. Inspect the AQUACELL system for signs of clogging or blockages.
- B. Maintenance of the AQUACELL system should be undertaken at least semi-annually through the first year of operation and at least annually thereafter.
 - a. Remove any debris or sediment that has accumulated in or around the AQUACELL system.
 - b. Compact any backfill material or cover material that has eroded or settled.
 - c. Clean the AQUACELL system if it is found to be clogged or blocked.
- C. If any damage or problems are found during inspection, they should be repaired or addressed immediately.
- D. In addition to annual inspection and maintenance, it is also recommended to inspect the AQUACELL system after any major storm event to prevent erosion and damage to the units.



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