SECTION 33 49 23

UNDERGROUND STORM WATER RETENTION CHAMBER

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\*\* NOTE TO SPECIFIER \*\* Invisible Structures, Inc.; Rainstore3 load-bearing plastic structure.
This section is based on the products of Invisible Structures, Inc., which is located at:
3510 Himalaya Rd. Suite 200
Aurora, CO 80011
Tel: 303-233-8383
Email: [request info (sales@invisiblestructures.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Invisible+Structures,+Inc.&coid=33364&rep=&fax=&message=RE:%20Spec%20Question%20(02632inv):%20%20&mf=)
Web: <http://www.invisiblestructures.com>
 [ [Click Here](https://www.arcat.com/arcatcos/cos33/arc33364.html) ] for additional information.
This section covers the Rainstore3 Underground Stormwater Retention System, a plastic structure used to store accumulated stormwater underground. The Rainstore3 system supports an H-20 vehicular loading allowing the construction of driving areas, parking lots, and small structures over the completed system. Panels are 40 inches square by 4 inches deep, with 36 vertical columns of cells. Panels may be stacked to depths up to 98 inches (25 panels) and are 94 percent open, allowing the maximum in water storage or harvesting.

1. GENERAL
	1. SECTION INCLUDES
		1. Water retention cells and accessories.
		2. Excavation and base preparation for support.
		3. Geotextile membrane and geogrid.
		4. Connection of water retention system to piping system.
	2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete sections not relevant; add additional sections as required.

* + 1. Section 31 20 00 - Earth Moving.
		2. Section 33 44 13.13 - Catchbasins.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.
		3. Samples: Submit 2 samples of the following:
			1. Geogrid and Geotextile Membrane: 20 by 20 inches (500 by 500 mm) square.
			2. Panel:At least 10 by 10 inches (250 by 250 mm) square piece.
		4. Material Certificate:Submit material certificates for geotextile, geogrid, base course, and backfill materials.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Protect materials from damage during delivery and store under tarp to protect from sunlight when time between delivery and installation will exceed 7 days.
		2. Store materials on smooth surfaces, free from dirt, mud, and debris.
		3. Use lifting equipment appropriate to size (height) of cells and site conditions, including but not limited to handcart, forklifts, extension lifts, or small cranes. Use care to prevent damage to spacer bars and surrounding cells.
	3. PROJECT CONDITIONS
		1. Review installation procedures and coordinate work with preparation and adjacent work, including but not limited to grading, excavation, utilities, or erosion control. Do not permit construction traffic or loads greater than design loads over completed installation.
		2. Cold Weather:
			1. Do not use frozen materials or materials mixed or coated with ice or frost.
			2. Do not build on frozen work or wet, saturated, or muddy subgrade.
			3. Take precautions when handling membranes and cells when temperatures are 40 degrees F (5 degrees C) of lower to prevent cracking or cracking from brittleness.
		3. Protect work against damage from construction traffic during installation and following completion of backfill. Protect using construction tape, fencing, or other means until construction is complete. Protect adjacent work from damage during installation.
		4. Coordinate location, layout, and installation of piping, inlets, and outlets with final arrangement of utilities as determined in the field.
1. PRODUCTS
	1. MANUFACTURERS

\*\* NOTE TO SPECIFIER \*\* Contact manufacturer for local representative.

* + 1. Acceptable Manufacturer: Invisible Structures, Inc., which is located at: 3510 Himalaya Rd. Suite 200; Aurora, CO 80011; ASD Tel: 303-233-8383; Email: [request info](http://admin.arcat.com/users.pl?action=UserEmail&company=Invisible+Structures,+Inc.&coid=33364&rep=&fax=&message=RE:%20Spec%20Question%20(02632inv):%20%20&mf=); Web: <http://www.invisiblestructures.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
	1. MATERIALS
		1. Water Storage Cells: Invisible Structures Rainstore3 Cells; injection molded plastic panels formed with open structural rings, which are assembled in layers to form vertical columnar structures that hold water.
			1. Panel Size: 39.4 by 39.4 inches (1000 by 1000 mm).
			2. Panel Thickness: 3.94 inches (100 mm).
			3. Unit Weight: 15 pounds (6.8 kg).
			4. Water Storage Capacity: Maximum of 6 percent solid.
			5. Load Bearing Capacity: Provide assembled structure capable of withstanding H-20 vehicular loading without damage.
			6. Height: As indicated on the Drawings.
		2. Geogrid: Tensar TriX 160 or equal.
		3. Geotextile: Nonwoven polypropylene or polyethylene membrane, minimum 8 oz per square yard (0.27 kg/sq m), appropriate for soil type and depth conditions, recommended by storage cell manufacturer.
		4. Backfill: See Section 31 20 00 for additional requirements. Provide structural fill or sand materials, free from lumps and debris or sharp materials.
			1. Side Backfill: Structural fill or sand.
			2. Top Backfill: 3/4 inch (19 mm) minus sandy/gravel roadbase material with fines less than 3 percent; or 2 parts clean 3/4 inch (19 mm) drainage rock to 1 part clean sharp sand.
		5. Utility Marker: Metallic tape.
1. EXECUTION
	1. EXAMINATION
		1. Examine prepared excavation and conditions for smoothness, compaction, and level. Do not commence system installation until unsatisfactory conditions are corrected.
		2. Verify height of high water table; do not install if high water table will be above the bottom of storm water retention chamber.
		3. Verify water retention system does not interfere with new or existing underground structures, utility lines, and piping.
		4. Commencement of installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, notify Architect in writing and request resolution.
	2. PREPARATION
		1. Base of Excavation: Compact excavation base to minimum 90 percent density or as required by Geotechnical Engineer. Use structural fill material to amend structural capacity of soil. Place structural fill on top of geogrid layer if needed. Avoid materials, such as sand and/or drainage rock, that can not be stabilized by compaction. Verify base is smooth soil, level, and free of lumps or debris.
		2. Place geogrid over prepared grade, overlapping joints minimum 12 inches and extending over entire excavation bottom.
		3. Lay out geotextile fabric to cover side so it will extend a minimum of 20 inches under the structure.
		4. Identify outline of structure on floor of excavation, using spray paint or chalk line, to ensure squareness during cell placement.
	3. INSTALLATION
		1. Place water retention cells side by side, grid side down. Place sides of cells without damaged bumpers along outside of structure to resist backfill forces against fabric and liner materials.
		2. Place a layer of geogrid over top of assembled cells.
		3. Place geotextile fabric layer over top and sides to prevent soil entry into chamber.
			1. Use precautions to avoid damage to fabric liner material during placement.
			2. Bring liner material up sides and over top of structure, overlapping or sealing joints in accordance with manufacturer's recommendations.
			3. Fold excess fabric at corners to lay flat against sides of structure, securing folds and seams with staples or other approved method.
		4. Identify locations of inlet, outlet, inspection ports, and other penetrations of liner, securing pipe into prefabricated boots with stainless steel pipe clamps. Support pipe in trenches and during backfill operations to prevent damage to liner or pipe.
		5. For chambers greater than 3.94 feet (1200 mm) deep, place piles of backfill material over closed chamber top surface along edge of chamber to provide vertical load on perimeter cells; verify compression of columns and resistance to side pressures from backfill operations before proceeding.
		6. Backfilling: Backfill using powered mechanical compactor to provide settlement free surface over top and sides of structure. Take care on structure sides to avoid damage to liner while providing required compaction forces to top level of structure.
			1. Backfill along sides of cellular structure in lifts not exceeding 12 inches (300 mm).
			2. Place layer of geogrid over top of structure, extending beyond outside edge of excavation by minimum 40 inches (1000 mm). Overlap joints minimum of 12 inches (300 mm).
			3. Cover top with minimum 12 inches (300 mm) to maximum 36 inches (900 mm) depth of backfill; place in 6 inch (150 mm) lifts and compact with vibrating plates or rollers to minimum of 95 percent, using only low pressure tire or track vehicles.
		7. Place utility marker tape, outlining extent of structure, at not more than 12 inch (300 mm) depth..
		8. Do not permit construction or other traffic within limits of excavation until work is complete and final surface materials are in place.
		9. Place surfacing materials, including groundcovers or paving materials, over structure with care to avoid displacement of cover fill and damage to surrounding areas. Do not use shrubs or trees over or in close proximity with underground water detention system.
		10. Any slopes creating additional overburden above the water storage cells should be carefully located. The toe of said slope should be 10 ft (3000 mm) away from the closest edge of the water storage cell chamber. This will prevent any additional earth pressure on the units.
	4. CLEANING
		1. Perform cleaning during installation of work and upon completion of work.
		2. Legally remove excess materials, debris, and equipment from site. Repair damage to adjacent materials and surfaces.

END OF SECTION