NEW HAMPSHIRE

GST™ Leaching Systems

Design Manual for
Pressure and Gravity Applications

April 2025

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Introduction

The GST™ Leaching System (GST), is an adaptation of the time proven stone leaching system. This traditional leaching system has been improved with the use of a removable form to accurately shape and construct leaching fingers along the sides of a central distribution channel. The fingers are typically constructed with ½" – ¾" washed stone and are surrounded with ASTM C-33 sand. These fingers serve to increase the sidewall surface area by more than six times that of a traditional stone leaching trench. Additionally, the narrow profile of the leaching fingers and central distribution channel, combined with the uniform profile of the sand treatment media, serve to enhance oxygen transfer efficiencies. Enhanced oxygen transfer results in better treatment of the wastewater pollutants and a leach field with a longer lifespan. GST can be configured with standard gravity, pressure and/or time dosed distribution

The GST is available 6", 12", 18", 24", 30", and 36" tall, 37" or 62" wide.

Geomatrix products are the result of intensive research and development, including in-house and third-party testing. Test reports are available by contacting Geomatrix.

While some codes do not require the use of pressure distribution(PD), treatment units, flow equalization or SoilAir, Geomatrix, highly recommends the use of these features to enhance treatment and system lifespan, especially where high flows and challenging waste streams are present.

Designing a GST System

GST Leaching Systems shall be designed in accordance with all State regulations and local regulations. GST can be installed in trench configurations.

Contact Geomatrix with any questions you may have and for design assistance with non-single family residential or commercial applications.

GST is typically constructed with ½" – ¾" washed stone and are surrounded with ASTM C-33 or other approved sand.

When separation distance from the bottom of the GST to the impermeable substratum or estimated seasonal high water table is greater than 4 feet, GST must be installed on top of 2 inches of ASTM C-33 sand or other approved sand. When separation distance from the bottom of the GST to the impermeable substratum or estimated seasonal high water table is less than or equal to 4 feet, GST must be installed on top of 6 inches of ASTM C-33 sand or other approved sand. Except as allowed by Env-Wq 1014.07 or Env-Wq 1014-08, at no time can the bottom of the GST be designed less than 30 inches from the impermeable substratum or the estimated seasonal high water table.

GST can be utilized in H-20 situations, including under driveways and parking areas, provided that a minimum of 12" of suitable H-20 load bearing aggregate fill is utilized above the GST system.

In the instance when GST is installed deep or below impervious areas that limit oxygen transfer, the use of SoilAir should be considered. New Hampshire regulations require that systems with more than 18 inches of cover be vented. Vents must comply with New Hampshire regulations and should be tied to the GST lateral. Geomatrix recommends that a SoilAir unit be installed when the cover exceeds 24 inches and when the GST is installed under a paved surface. It is not recommended to vent GST systems in pump configurations.

Use Tables 1 thru 3 for system sizing.

GST in Trench & Bed Configurations

GST can be installed in a trench configuration in native soil or trench and bed configurations in a sand fill package. GST must be sized in accordance with Tables 1 – 3. A minimum of 2 inches of ASTM C-33 sand or other approved sand should be installed on the sides, ends, and bottom of the GST. A minimum of 6 inches of ASTM C-33 sand or approved sand must be installed under the GST where separation to seasonal high water table and ledge is less than 4 feet.

Gravity or Pressure Distribution (PD) may be utilized. PD can utilize a conventional pump. Geomatrix must review all designs that anticipate a high strength waste water flow.

System Design Steps

1. Determine the required system size in square feet using Table 1.
2. Determine the Length of GST required using Table 2, the GST model, and the square footage of system required, as calculated in step 1. Use the following formula to determine linear feet of GST required:

   System Size in Square Feet / GST Surface Area (SF/LF) = GST Linear Feet Required

3. Determine the sand and stone required based on Table 3. *Note: If bottom of GST is less than 4 feet from the seasonal high water table, also calculate 6 inches of sand under the entire GST system.*

Table 1

System Size In Square Feet

(Env-Wq Table 1016-1 Bed Sizing for Conventional Stone and Pipe Systems In Square Feet for Varying Loads and Percolation Rates)

Percolation Rate in Minutes Per Inch	Single Family and Duplex – Number of Bedrooms Up to 10				Commercial
	2 (300 GPD)	3 (450 GPD)	4 (600 GPD)	Each Add'l Bedroom (+150 GPD)	Per 100 GPD
2	400	560	750	188	125
4	425	617	825	210	140
6	450	675	900	233	155
8	500	750	1000	255	170
10	550	825	1100	278	185
12	600	900	1200	300	200
14	637	955	1275	319	213
16	675	1010	1350	338	225
18	712	1065	1425	357	237
20	750	1120	1500	375	250
22	775	1158	1550	387	258
24	800	1196	1600	400	266
26	825	1234	1650	412	274
28	850	1272	1700	425	282
30	875	1310	1750	437	290
32	900	1348	1800	449	298
34	925	1386	1850	462	306
36	950	1424	1900	475	314
38	975	1462	1950	488	322
40	1000	1500	2000	500	330
42	1050	1575	2100	525	347
44	1100	1650	2200	550	364
46	1150	1725	2300	575	381
48	1200	1800	2400	600	398
50	1350	1875	2500	625	415
52	1300	1950	2600	650	432
54	1350	2025	2700	675	449
56	1400	2100	2800	700	466
58	1450	2175	2900	725	483
60	1500	2250	3000	750	500

Table 2
GST Surface Area / Linear Foot

Product Name	Dimensions (W x H)	Total Surface Area (SF/LF)	Edge to Edge Spacing (inches)	Storage Volume Gallons per LF
GST 6206	62" x 6"	10.3	12	4.52
GST 6212	62" x 12"	17.5	12	9.23
GST 6218	62" x 18"	24.8	12	13.84
GST 6224	62" x 24"	32.1	12	18.45
GST 6230	62" x 30"	39.3	24	23.06
GST 6236	62" x 36"	46.6	24	27.68
GST is also available in 37” width if considering this size please consult Geomatrix for more information				
GST 3706	37" x 6"	6.2	12	3.05
GST 3712	37" x 12"	10.3	12	6.11
GST 3718	37" x 18"	14.4	12	9.16
GST 3724	37" x 24"	18.5	12	22.22
GST 3730	37" x 30"	22.7	24	15.27
GST 3736	37'' x 36"	26.8	24	18.32

Table 3
Sand and Stone Volume Guide

62” series

Product Name	Amount of ¾” Stone Required	Amount of ASTM C-33 Sand Required
	Yards per Linear Foot	
GST 6206	0.20	0.25
GST 6212	0.27	0.35
GST 6218	0.35	0.46
GST 6224	0.43	0.56
GST 6230	0.50	0.66
GST 6236	0.58	0.76

Basic Design Considerations

If the system is configured for gravity distribution, dosing volume does not inherently apply. SoilAir may be used to better distribute a dose to the GST.

In gravity systems, GST pipe will be 2 inch Geomatrix pipe (purchased from Geomatrix or its authorized distributor), 3 or 4 inch SCH40 PVC, or 3 or 4 inch SCH35 perforated pipe. Perforations shall comply with New Hampshire regulations.

A minimum cover depth of 6 inches shall be present above the GST distribution lines. Suitable cover material above the distribution pipe is clean sandy fill and topsoil that is suitable for growing grass.

Minimum perimeter sand fill beyond the GST on a sand bed shall be 2 inches. The cover material should be final graded at a 2% pitch over the GST system and for 24 inches beyond the outermost edge of the GST. If cover material over the GST is above the original grade, it shall maintain the 2% pitch for a minimum of 36 inches beyond the outermost edge of the GST and then run at a 3:1 slope to original grade. A 2:1 slope is allowable as defined by NHDES. This fill extension may include the 2 inches of perimeter sand fill.

Remember to follow these design parameters when designing and installing GST:

- Preservation of the native soil between trenches and minimizing its disruption and compaction during construction is essential to maintaining soil structure and therefore water and gas movement in the soil around the trenches. For this reason, construction is to be trench-by-trench when possible unless a layer of specified sand is utilized as a continuous base beneath, around and covering the GST;

- Try to keep cover depth as consistent as possible over the laterals to balance air flux rates through the soil;

- Keep the bottoms of the GST trenches/beds level;

- Provide for lateral pipe drainage and maintenance access;

- Avoid working soils that are moist or wet because they can easily smear and compact;

- Scarify the drain field base before installing components.

When reviewing a site and developing a design, it is best to position the GST trenches/beds parallel to ground surface contours. This will help make it easier to keep drain field base elevations uniform. Designing perpendicular to a surface contour will mean that the down gradient end of the drain field trench being shallow-placed, whereas the upgradient end will be

much deeper. Leaching systems that are parallel with surface contours also have a larger hydraulic window which minimizes soil saturation.

When PD is used, the requirements of NHDES Part Env-Wq 1019 Pressure Distribution must be followed. Small frequent doses of effluent to the GST are preferred over fewer larger doses; however, rest/reaeration intervals must also be proved for; 4 – 8 doses per day is typical. Pump chambers should preferably be designed with float switches controlling high water alarm, pump on/off and low water/redundant off. A dose counter is recommended. Time dosing can also enhance performance.

Soil excavation and / or plantings within a minimum of five feet of the system are not permitted unless a root barrier is utilized. Contact Geomatrix for design assistance.

Minimum separation distance in Env-Wq 1008.04 Minimum Distances apply.

GST systems may be designed with an irregular shape to fit site specific conditions. If irregular shape is utilized, each length of GST must be designed to accommodate equal flows.

When installed in individual trenches, GST is required to maintain at a minimum of 2 feet of undisturbed soil between trenches pursuant to NHDES Part Env-Wq 1018.03 Width and Spacing of Trenches.

Trenches constructed at different elevations shall be designed to prevent effluent from the higher trench(es) flowing into the lower trench(es).

An inspection port shall be installed on every row of GST. The inspection port – PN: IPGST15 consists of a 4" PVC Tee with two slotted openings on the T ends. A threaded plug on top prevents debris from entering the inspection port. These inspection ports are designed to be stable and not move upwardly or downwardly over the life of the system. This will allow confirmation of the bottom elevation of the leaching system during inspection or at any time afterwards. It is also possible to monitor effluent ponding levels through this port. The inspection ports can be finished in a valve box. The top of the inspection port should be flush with finished grade.

GST Excavation Requirements

The soil between the dispersal trenches shall remain undisturbed when possible. If the presence of boulders or other obstacles make trench construction impractical, the entire leach field area may be excavated as necessary, backfilled with suitable sand fill such as ASTM C-33 or other approved sand to the design elevation of the bottom of trench and the GST constructed and backfilled in ASTM C-33 sand or other approved sand.

Gravity Distribution Design Parameters

Gravity GST laterals shall not exceed 50 feet from the start of the distribution line or 100' if in a butterfly configuration (Figures 4 - 6). When using butterfly configuration, the area under the d-box is not used in calculating the bed area of the system.

Parallel distribution shall be utilized whenever possible. Contact Geomatrix in situations where parallel distribution is not possible. Serial distribution is not allowed.

Distribution laterals for gravity systems are 2 - 4 inch SCH40 or 4 inch SDR35 perforated pipe with minimum ½ inch perforations.

A state approved effluent filter shall be utilized.

Pressure Distribution Design Parameters (PD)

Generally, the pressure transport pipe from the septic tank or treatment unit to the GST is 1½ - 4 inch PVC pipe (Class 200 minimum). The actual pipe size will depend upon such factors as distance, pump head, scour velocity, frictional losses and desired pressure at the distal orifices. The transport pipe should be sloped back to the pump tank or toward the GST to drain the line after each dose. In some cases, it may be better to slope the transport line in both directions. This should be done to prevent freezing in cold weather. An anti-siphon device should be used where any chance of siphoning of the pump tank may occur.

GST distribution manifolds are typically 1 ½ - 4 inch SCH40 PVC. Distribution laterals are typically 1 - 2 inch SCH40 PVC. Size will vary depending on design and site conditions. Distribution laterals should have flow equalization valves installed to provide equal flow of effluent to all rows when GST laterals are at different elevations. Flow equalization valves are often installed in the pump chamber for easy operation, protection from damage and prevention of freezing. A disconnect/throttle valve should be installed downstream of the pump throttle and shut off flow to the GST piping.

PD systems should be designed with less than 10% flow differential from the first to last orifice; software is available from Geomatrix.

Orifice holes should be oriented in a downward (six o'clock) direction and be spaced according to the dosing requirements of the system. During fabrication of the distribution lateral, a new/sharp drill bit should be used to assure as smooth an orifice as possible. Any loose and connected drill shavings should be removed from the pipe with a bottle brush on an extension. Geomatrix GeoGuard™ orifice shields must be installed over the orifice holes and glued in place with PVC primer and glue.

Typical designs should account for a minimum of two feet of head pressure at the distal end of each GST distribution lateral.

Design software for pump, lateral line, transport pipe, manifold, orifice size and additional head loss is available by emailing request to info@geomatrixsystems.com.

Two SCH 40 PVC 45 degree elbows or equivalent 90 degree sweep elbows (also called turn ups) shall be attached to the distal end of each GST distribution lateral to facilitate setting and measuring distal head, maintenance and inspection. A standard 90 degree elbow should not be utilized because it will interfere with maintenance activities. The open end (upward end) of the sweep needs to be closed off with either a ball valve or threaded plug or cap. These turn ups also serve as distal head ports for measuring and setting distal head on the GST laterals at different elevations.

The installation of a pressure filter, approved by Geomatrix, is recommended between the pump and the laterals on PD systems. The Sim/Tech STF-100 is preapproved.

Drain Field Cover

Drain field cover shall be a minimum of 6 inches over the top of the GST distribution pipe, 12" for H-20. Uniform cover depth and composition over the drain field results in consistent oxygen transfer to the entire system. The final grade over and around the drain field should direct storm water sheet flow away from drain field.

The area directly above and adjacent to any septic drain field should be protected from heavy vehicle traffic and excess weight loads before, during and post construction. On all construction projects, it is recommended that the proposed drain field location be staked and flagged/fenced to prevent encroachment. If vehicle encroachment is expected to be a problem before, during or after construction, some structure, such as garden timbers, railroad ties, fences or walls should be used to protect the drain field area (without impacting the required 2:1 slope.) The drain field area should be free of debris and planted with grass. Impermeable materials and structures should not be installed or stored over the drain field unless SoilAir is utilized to enhance aeration. Placing a leaching system beneath the drip line of certain tree species can result in roots growing into the leaching system and/or piping components. Although it is rare that the roots impact the performance of leach fields, if it is a concern, an optional root barrier comprised of polyethylene or a geotextile fabric treated with trifluralin can be installed between the leach field lateral(s) and the applicable tree(s) or shrub(s)(outside of the bed area and without impacting the required 2:1 slope.) Treated root barriers must comply with the New Hampshire Shoreland Water Quality Protection Act, RSA 483-B, including setbacks. Contact Geomatrix with any questions.

Septic Do's and Don'ts

Do:

- Conserve water to reduce the amount of wastewater that must be treated and disposed.
- Repair any leaking faucets and toilets.
- Only discharge biodegradable wastes into system.
- Restrict garbage disposal use.
- Divert downspouts and other surface water away from your drain field & tanks.
- Keep your septic tank cover accessible for tank inspections and pumping.
- Have your septic tank pumped regularly and checked for leaks and cracks.
- Call a professional when you have problems.
- Compost your garbage or put it in the trash.

Don't:

- Flush sanitary napkins, tampons, condoms, cigarette butts, diapers, wipes and such products into your system.
- Dump solvents, oils, paints, paint thinner, disinfectants, pesticides, medications or poisons down the drain.
- Dig in your drain field or build anything over it.
- Plant anything other than grass over your drain field.
- Drive over your drain field or compact it in any way.
- Discharge water treatment systems into your drain field.

GST Schematics

Figure 1

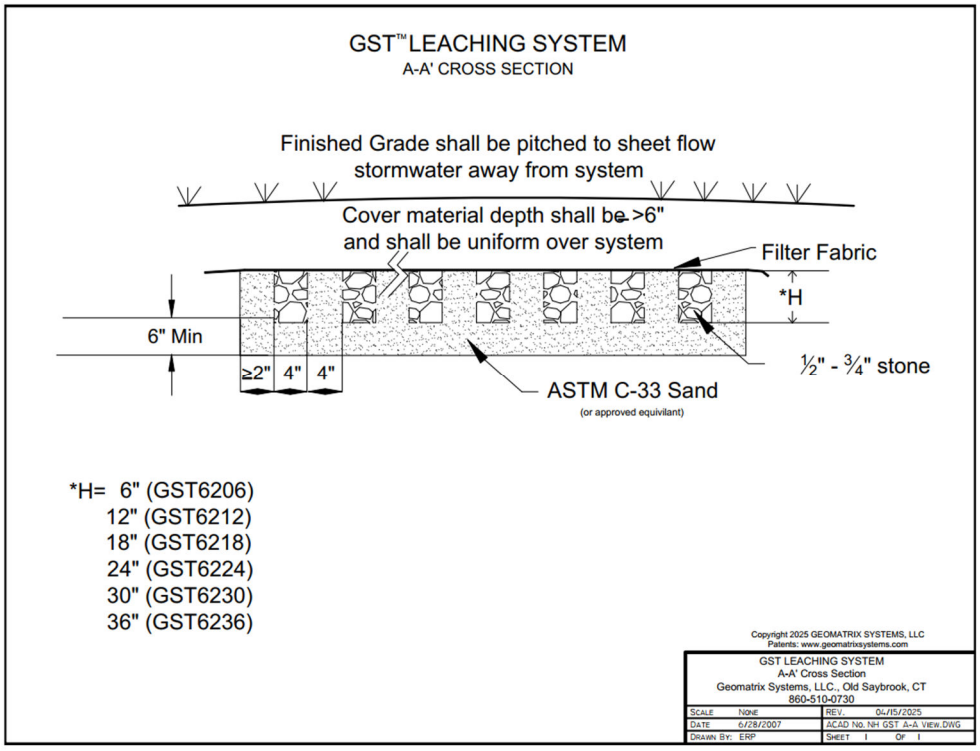


Figure 2

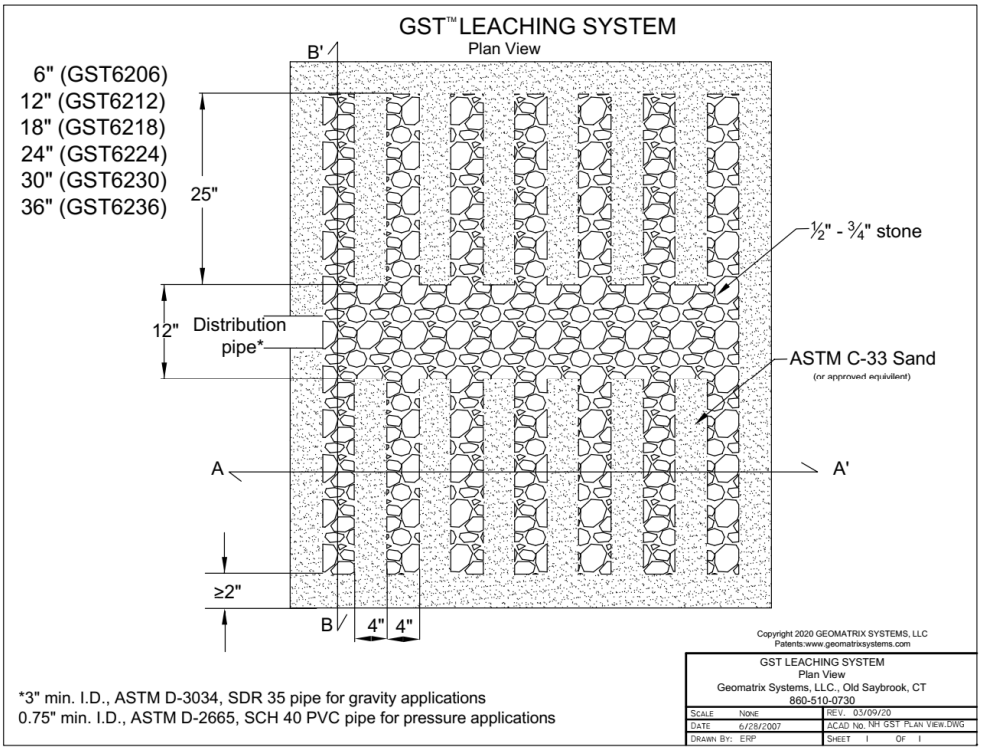


Figure 3

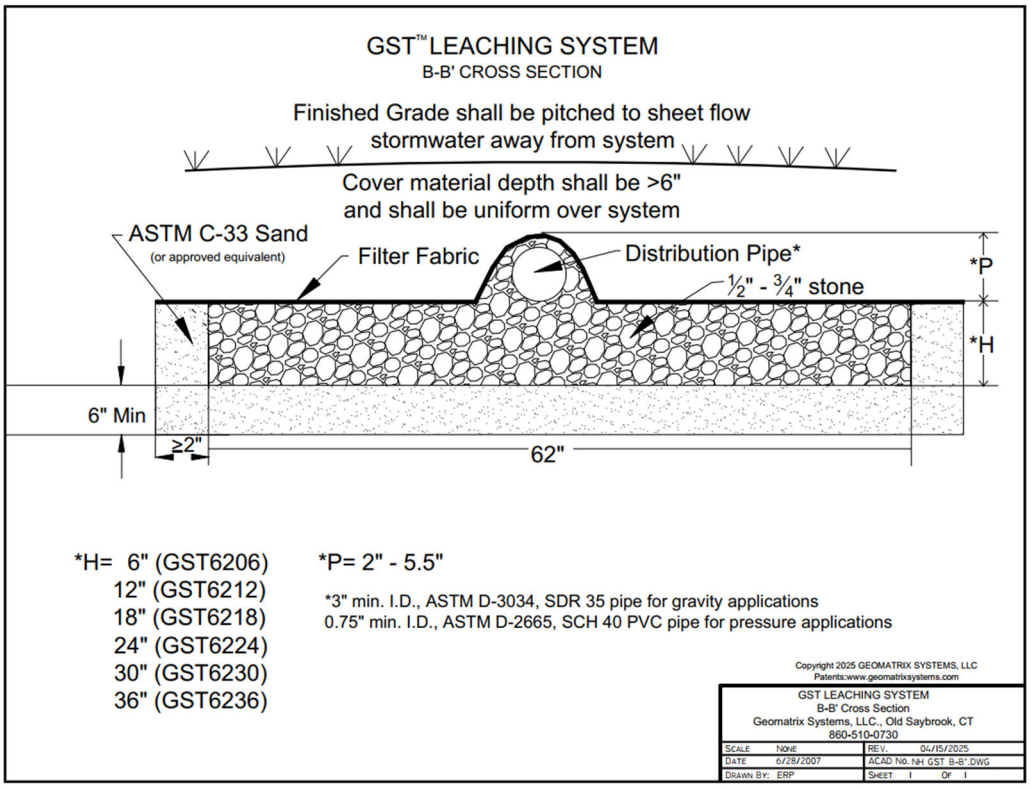


Figure 4

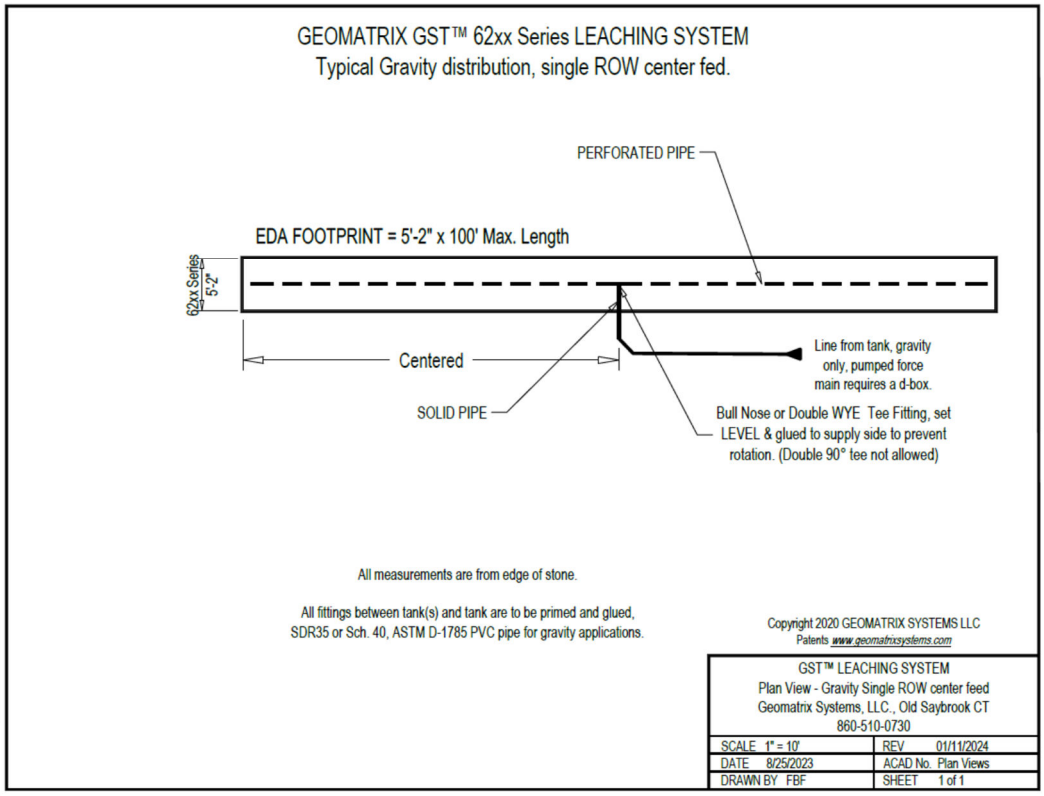


Figure 5

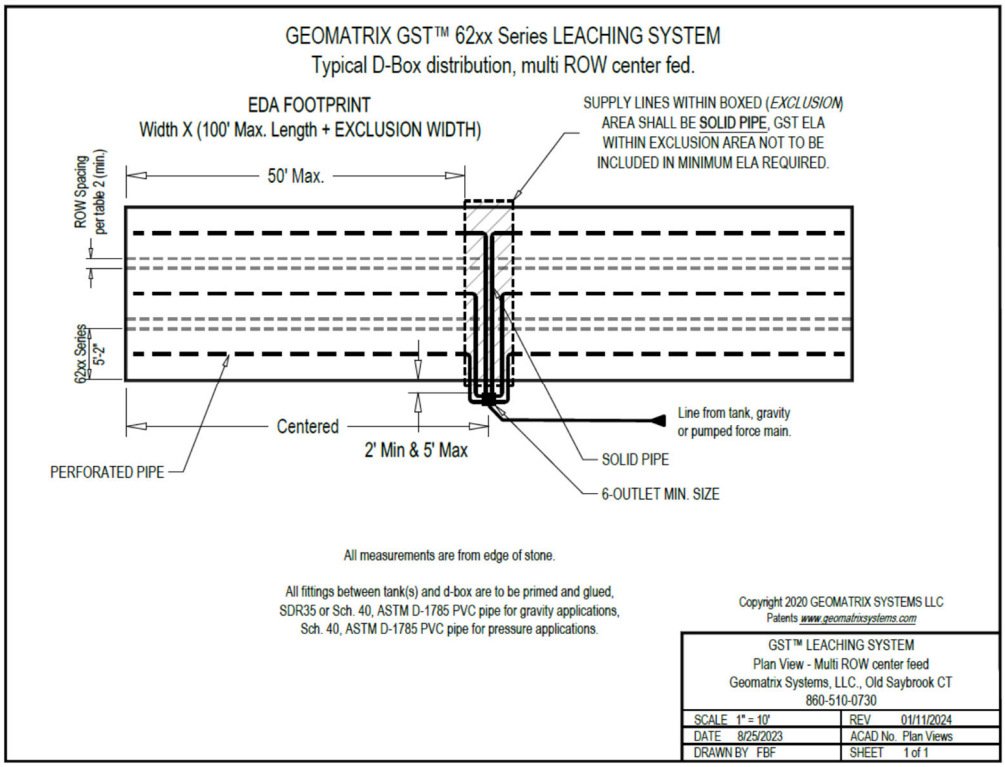
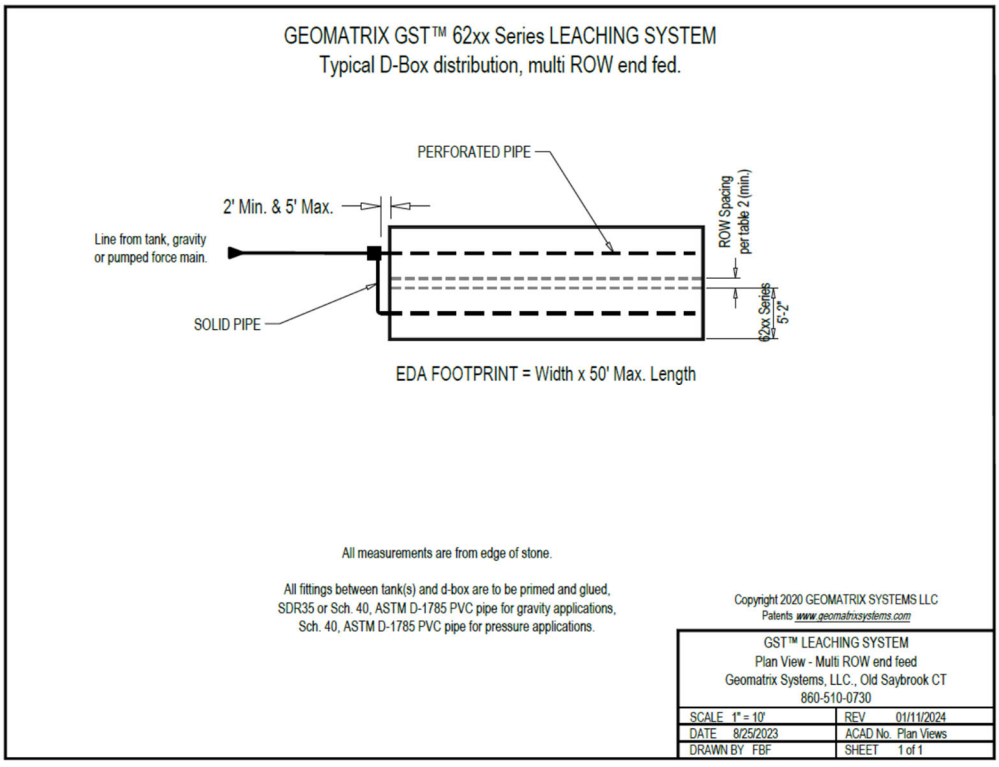


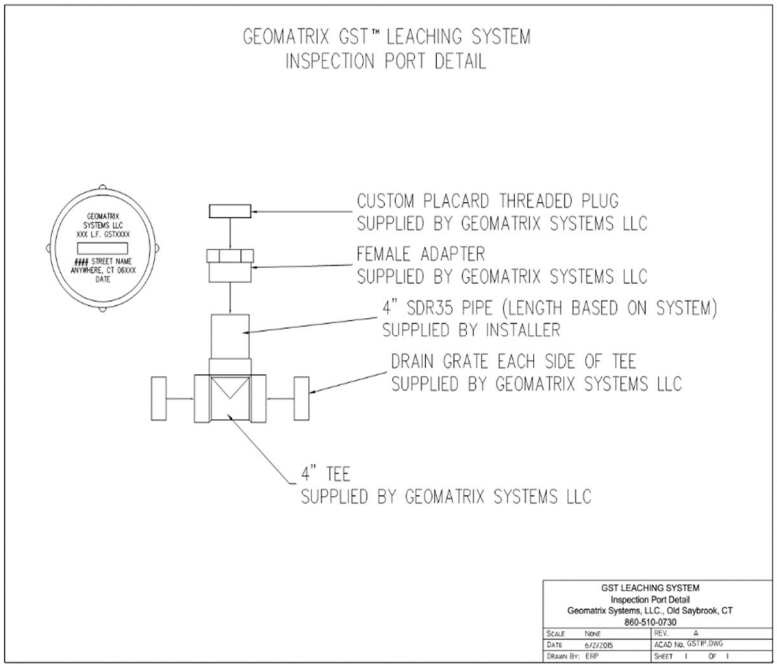
Figure 6

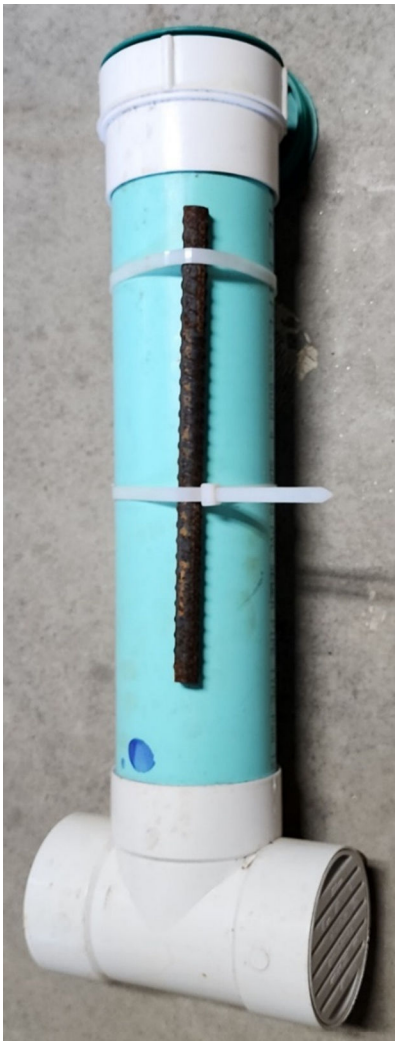


Geomatrix Systems GST Inspection Port

PN: IPGST15

Rebar provided for future locating 4" pipe provided by installer.





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