Rhode Island Design & Installation Manual

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GLOSSARY OF TERMS

CTL 12	96” x 76” x 14”
CTL 18	96” x 76”x 20”
Filter Fabric	The non-woven synthetic filter fabric shall have adequate tensile strength to prevent ripping during installation and backfilling, adequate air permeability to allow free passage of gases, and adequate particle retention to prevent downward migration of soil particles.
Distribution Box	A plastic or concrete box that receives effluent from the septic tank or pump chamber that distributes the effluent flow to one row or multiple rows of CTL 12’s or CTL 18’s.
Specified Sand	ASTM C-33 Sand
H-20	An American Association of State Highway Transportation Officials (AASHTO) standard. It consists of a truck wheel loading of 16,000 lbs.
H-10	Any installation not H-20
Item 4 Stone	A mixture of machine-crushed stones that measure ¾”, along with granular sand.
Interior Unit	CTL 12 or CTL 18 chamber with fins on 2 sides.
End Unit	CTL 12 or CTL 18 chamber with fins on 3 sides.

Please see the following 3 minute video with an overview of installation and system operation.

Link to home page, then click green box ‘watch our video’;

www.GoodFlow.com

Link direct to video on YouTube;

https://www.youtube.com/watch?v=KwEP9VPW_ZY

DESCRIPTION OF TECHNOLOGY

The GoodFlow Solutions System consists of an H20 reinforced concrete chamber that is four feet wide by eight feet long. An ABS plastic injection molded fin structure is placed alongside of each chamber. The chambers are open bottomed with rectangular openings on each side to allow effluent to flow to the fins. The fins are open bottomed and the sides are perforated to allow the effluent to flow out to the surrounding soil. The fins are upholstered with non-woven (NW) filter fabric to prevent soil ingress into the system.

DESIGN & INSTALLATION

1. For ordering contact GoodFlow Solutions at 203-869-2969
2. Surrounding sand of the CTL units shall be ASTM C-33 Sand.
3. The bottom of the CTL unit shall be 3 ft above the Seasonal High Water Table in all designs, however the separation to the Seasonal High-Water Table shall be 4ft in Critical Resource Areas as outlined in the OWTS Rules. The bottom of the CTL unit shall be a minimum of 5ft above a restrictive layer or bedrock.
4. Connections of lines to tanks and distribution boxes, must be made using watertight mechanical seals. Use of any grouting is not permitted.
5. Garbage disposals are prohibited with GoodFlow systems.
6. At no time should water softener backwash be disposed of in the septic system. Water softener backwash should be discharged to a separate soil absorption field.
7. Septic Tank filters are required with all GoodFlow systems.
8. System venting is at the discretion of each system designer unless required by OWTS Rules or in DEM permit requirements.
9. There are two pipe openings at the end of the of the chambers; one opening is used for effluent distribution the other may be used for venting purposes if needed.
10. Edge to edge spacing of CTL 12 and CTL 18 trenches is 6 feet
11. Tables 1 &2 provide system sizing guidelines which are based on system design flow and leachfield loading rates.

INSTALLATION INSTRUCTIONS

1. Preparing Trenches and placing Concrete Chambers

After the work area has been prepared for installation according to approved plans excavate the trench 88" wide. When the trench has been excavated to the plan's specified length and the bottom has been leveled start installing the GoodFlow concrete chambers.

Each chamber has knockouts on the ends and sides. Break out all of the knockouts on the 8' long sides of the chambers. Break out the chamber end knockouts that are to be set against another chamber end. Leave the knockouts intact on the first wall of the first chamber and the end wall of the entire row. This will leave the end walls free from soil migration into the chambers.

2. Preparing the CTL Plastic Fins:

After the chambers have been installed level and in proper alignment, make sure that the side bottom areas are level with the bottom of the concrete chambers. Place the 4' long preassembled CTL plastic fin segments on top of the concrete chambers. Connect the two 4' segments together by using the provided back pieces, top straps and base pieces to create an 8' length.

Pick up each 8' segment and place it alongside the concrete chamber with the fabric covered side facing away from the chamber. Align the plastic with the concrete chamber side so that the ends line up and all the side openings are covered. If any gaps are present between the plastic and concrete part, carefully tap the back piece, tops, and base pieces to close any gaps that may occur.

Repeat these procedures until both sides of the concrete chambers are tightly fitted with the plastic structures to the designated lengths.

3. Backfilling

Once the concrete and plastic parts have been installed properly backfill the system with ASTM C-33 sand. Place backfill material between the fins along the filter fabric wrap and in front of the fins. Backfill in 12" lifts using a modified hand tamper (available from GoodFlow) or equal form of compaction. Compact the material as tight as possible. Be careful not to tear or pull away the filter fabric. Repeat the process until the C-33 Sand is on top of the plastic fins and filled level with the top of the concrete chambers. Cover the entire GoodFlow system with filter fabric including the 2" of Sand on the fins. Then, backfill at a minimum of 12" of cover to the filter fabric on top of the system (see diagrams). The distribution line to feed effluent to the CTL system is a 4" P.V.C. pipe.

4. Effluent Distribution

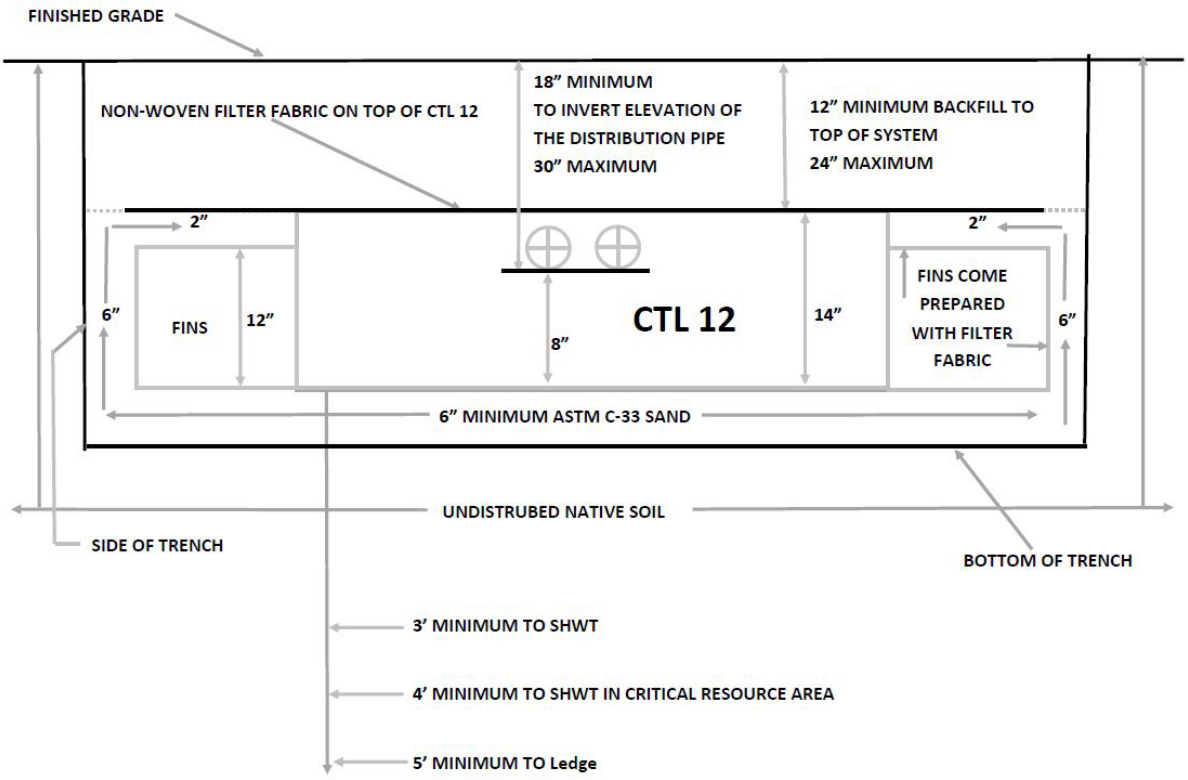
1. The invert of the inlet of the chamber shall be two (2) inches lower than the invert of the outlet of the distribution box.
2. The maximum length of a chamber trench shall be as follows:
   a) Without dosing - fifty (50) feet;
   b) With a tipping distribution box - seventy-five (75) feet; or
   c) With a pump - one hundred (100) feet.
3. For multiple trench concrete chamber leach-fields, the ends of the chamber trenches shall be interconnected with imperforated SDR 35 PVC pipe laid with watertight joints. If the pipe will be subject to vehicular traffic, it shall be Schedule 40 PVC.

H-20 Requirements:

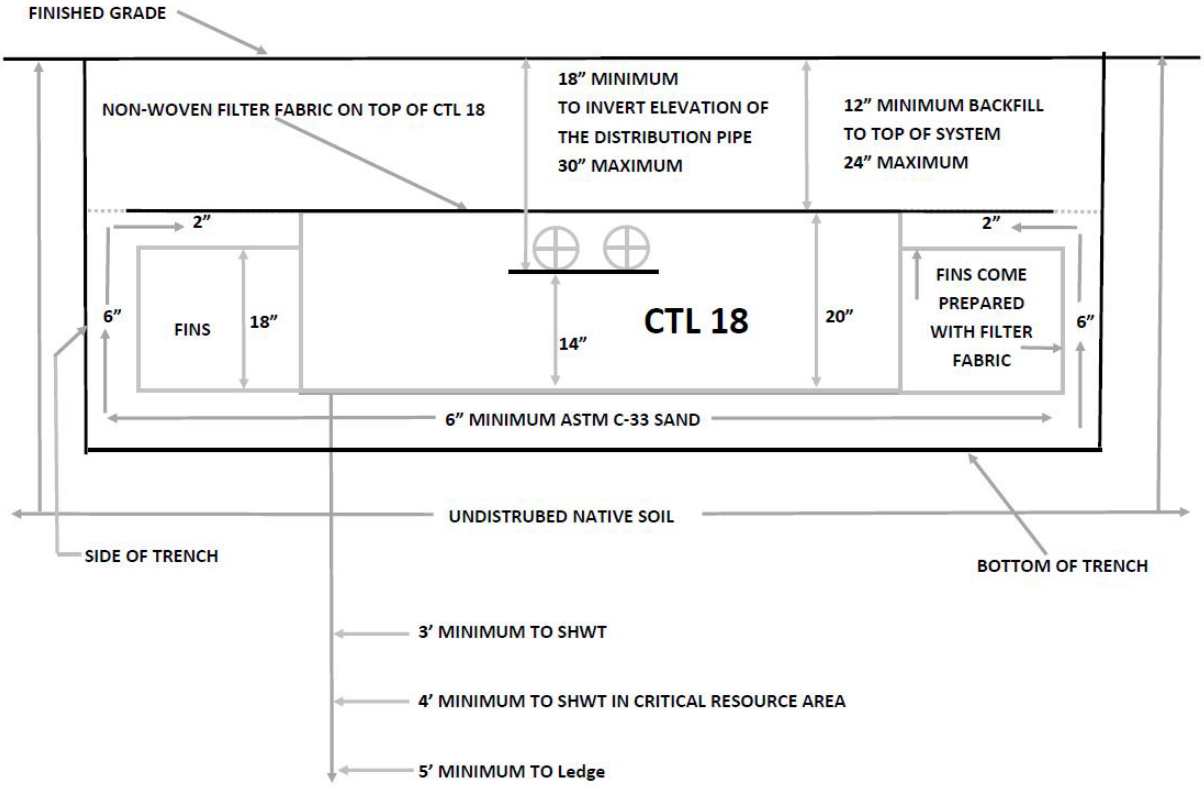
See pages 8 & 9 for details on subsurface prep and backfilling. GoodFlow requires in the H-20 application 2” of ASTM C-33 Sand on top of the fins so the area on top of the plastic fins will be filled level with the top of the concrete chambers. Cover the entire GoodFlow system with filter fabric including the 2” of Sand on the fins. For H-20 installations, backfill with a minimum of 10” crushed gravel, item 4 with a max stone size of 3/4” and 2" hard top.

CTL 12 H-10 & CTL 18 H-10; SUBSURFACE PREPARATION & BACKFILL

CTL 12 H-10 Subsurface Preparation & Backfill



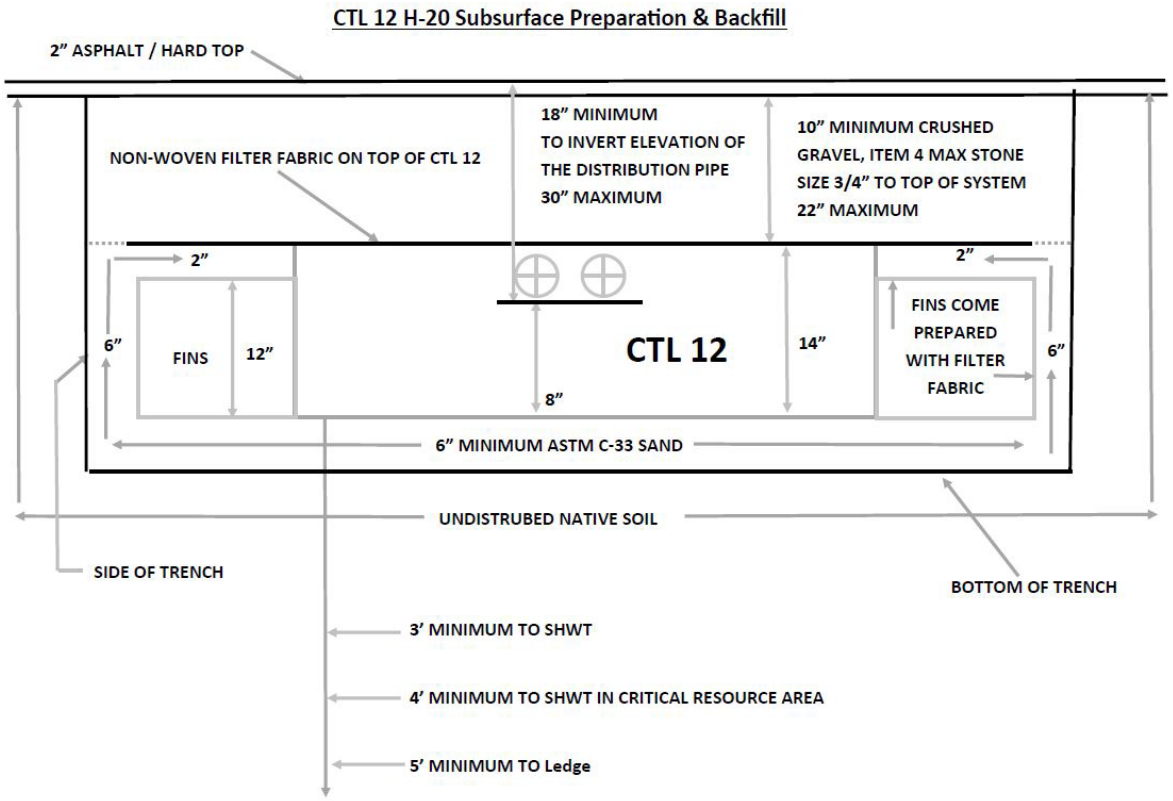
CTL 18 H-10 Subsurface Preparation & Backfill

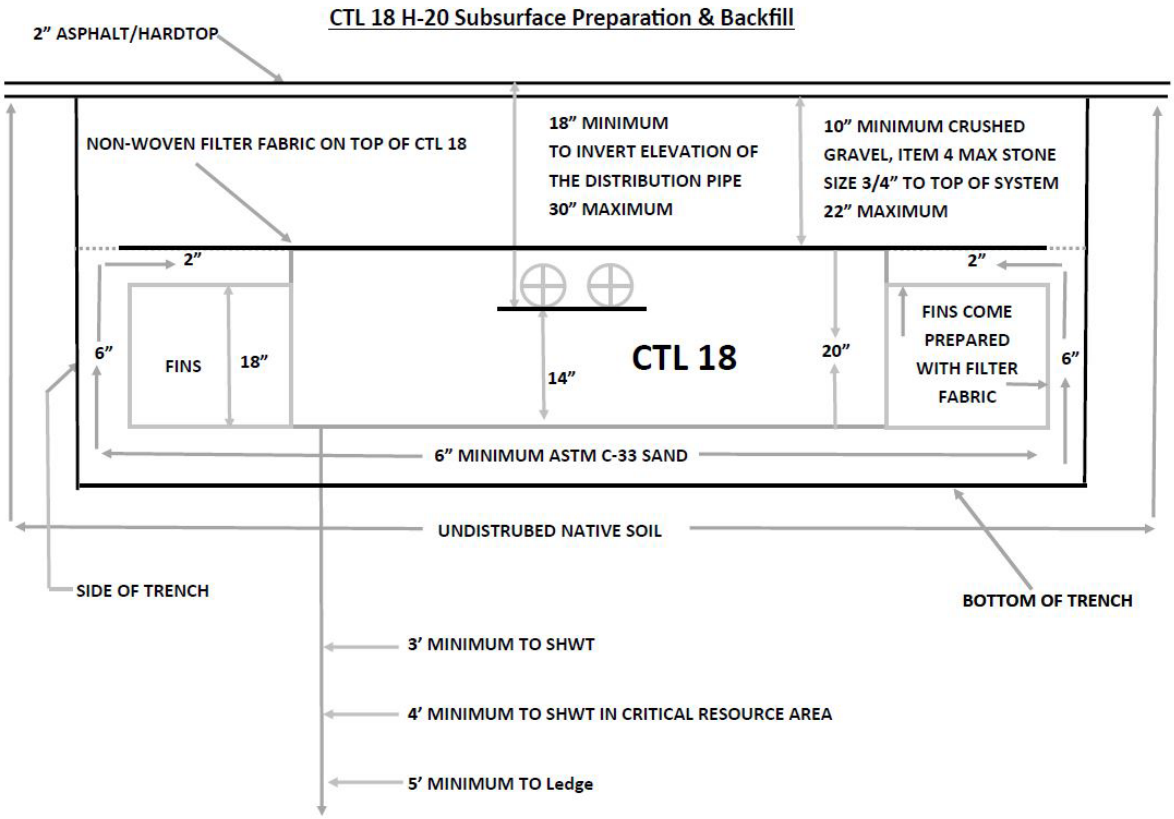


CTL 12 & CTL 18; H-10 SUBSURFACE PREPARATION AND BACKFILL

- Fins come prepared with Filter Fabric on all sides except the bottom – this is separated from the filter fabric on top of the system provided by installer.
- Minimum 6" of C-33 Sand on the bottom of the trench placed on top of undisturbed native soils
- Minimum 6" of C-33 Sand on the sides of the fins and between the fins
- Minimum 2" of C-33 Sand from the top of the fins to the top of the chamber
- Filter fabric is placed across the concrete chamber and on top of the 2" of Sand on top of the fins. The non-woven synthetic filter fabric shall have adequate tensile strength to prevent ripping during installation and backfilling, adequate air permeability to allow free passage of gases, and adequate particle retention to prevent downward migration of soil particles.
- Minimum 12"/Maximum 24" (2" C-33 sand above Fins) Backfill, OWTS Rule 6.33.O - All backfill shall be free of boulders and stones greater than six (6) inches in diameter, frozen clumps of earth, rubbish, masonry, stumps or waste construction materials. Backfill shall be placed carefully to avoid displacement and damage to piping and chambers. Heavy machinery shall not be permitted to pass over the leach-field.
- Minimum 3' separation required from chamber bottom to SHWT with the exception of the Critical Resource Area where a minimum of 4' separation is required.
- Minimum 5' separation required from chamber bottom to Ledge statewideThis technology shall not be permitted where any of the following occur;
  a. The chamber invert would be more than one (1) foot above the original grade;
  b. The chamber inverts would be set at different elevations; or
  c. The seasonal high groundwater table is less than three (3) feet from the original ground surface as defined in OWTS Rule 6.8.A.54.
- Access - The top of the chamber trench shall have an access opening into a chamber at intervals not greater than fifty (50) feet that consists of a removable cover of concrete, iron or other durable material. For OWTSs designed to dispose of up to two thousand (2,000) gallons per day and OWTSs that are not located under a paved area, the top of the access opening shall accommodate a riser and shall be brought to within one (1) foot of the finished grade and properly marked. For OWTSs designed to dispose of greater than two thousand (2,000) gallons per day, commercial OWTSs, and all OWTSs located under paved areas, the access openings shall meet the following requirements:
  a. Access openings shall have a riser and shall be brought to finished grade;
  b. Lids on the top of the concrete chambers should remain in place where practical. Lids for the openings at finished grade shall prevent unauthorized entry by meeting either of the following:
     (1) Lids shall weigh a minimum of fifty-nine (59) pounds and fit tightly into the riser as shown in § 6.64 of this Part, Figure 6; or
     (2) Lids shall be tamper resistant and mechanically fastened.
  c. Surface water shall be diverted away from the access openings

CTL 12 & CTL 18; H-20 SUBSURFACE PREPARATION AND BACKFILL





CTL 12 & CTL 18; H-20 SUBSURFACE PREPARATION AND BACKFILL

- Fins come prepared with Filter Fabric on all sides except the bottom – this is separate from the filter fabric on top of the system provided by installer.
- Minimum 6" of C-33 Sand on the bottom of the trench placed on top of undisturbed native soils
- Minimum 6" of C-33 Sand on the sides of the fins and between the fins
- Minimum 2" of C-33 Sand from the top of the fins to the top of the chamber
- Filter fabric is placed across the concrete chamber and on top of the 2" of Sand on top of the fins. The non-woven synthetic filter fabric shall have adequate tensile strength to prevent ripping during installation and backfilling, adequate air permeability to allow free passage of gases, and adequate particle retention to prevent downward migration of soil particles.
- Minimum 10"/Maximum 22" (2" C-33 Sand above Fins and 2" hard top), Crushed Gravel Item 4, max stone size ¾"
- Minimum 3' separation required from chamber bottom to SHWT with the exception of the Critical Resource Area a minimum of 4' separation is required
- Minimum 5' separation required from chamber bottom to Ledge statewideThis technology shall not be permitted where any of the following occur:
  a. The chamber invert would be more than one (1) foot above the original grade;
  b. The chamber inverts would be set at different elevations; or
  c. The seasonal high groundwater table is less than three (3) feet from the original ground surface as defined in OWTS Rule 6.8.A.54.
- All access manholes in areas subject to vehicular traffic shall be brought to grade with covers and frames capable of withstanding H-20 wheel loads
- Access - The top of the chamber trench shall have an access opening into a chamber at intervals not greater than fifty (50) feet that consists of a removable cover of concrete, iron or other durable material. For OWTSs designed to dispose of up to two thousand (2,000) gallons per day and OWTSs that are not located under a paved area, the top of the access opening shall accommodate a riser and shall be brought to within one (1) foot of the finished grade and properly marked. For OWTSs designed to dispose of greater than two thousand (2,000) gallons per day, commercial OWTSs, and all OWTSs located under paved areas, the access openings shall meet the following requirements:
  a. Access openings shall have a riser and shall be brought to finished grade;
  b. Lids on the top of the concrete chambers should remain in place where practical. Lids for the openings at finished grade shall prevent unauthorized entry by meeting either of the following:
    (1) Lids shall weigh a minimum of fifty-nine (59) pounds and fit tightly into the riser as shown in § 6.64 of this Part, Figure 6; or
    (2) Lids shall be tamper resistant and mechanically fastened.
  c. Surface water shall be diverted away from the access openings.

GoodFlow CTL-12

Table 1: System Sizing

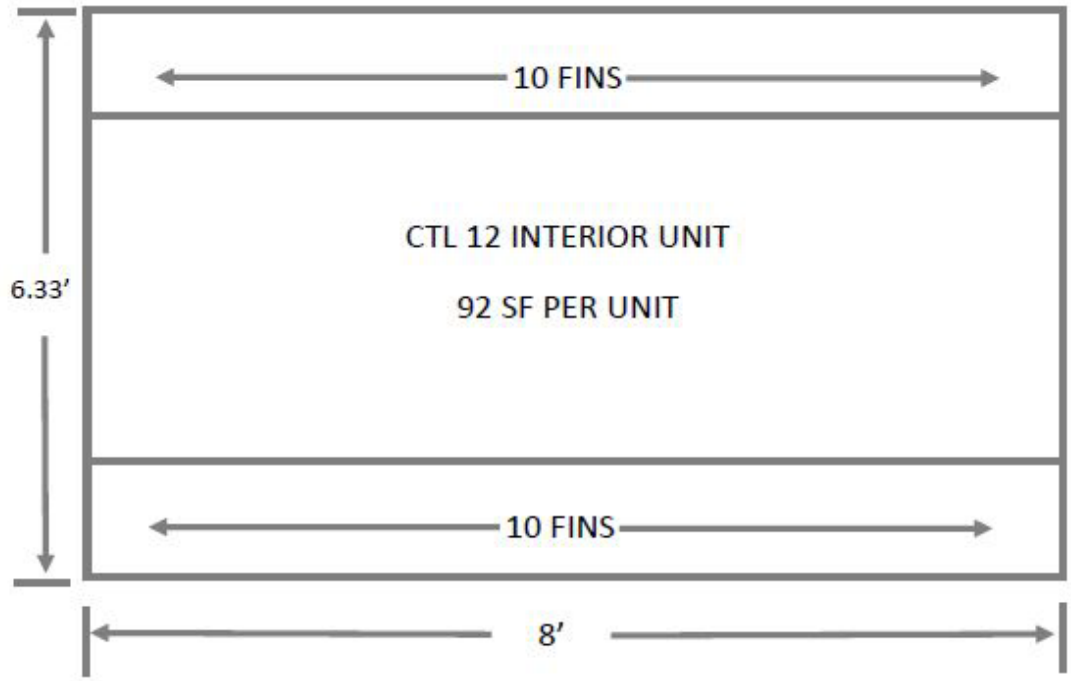
No. of Bedrooms Design GPD	Soil Category See Note Below	Soil Loading Rate GAL/SF	Total Leaching Area SF Required	CTL 12 - Interior Units 92 SF per Units	CTL 12 End Units 106.9 SF per Units	Total Area Provided
One Bedroom 115 Gal/Day	1,3,6m	0.70	164.3	1	1	198.9 SF
	1m, 2, 4, 6, 7m	0.61	188.6	1	1	198.9 SF
	5, 7	0.52	221.2	3	0	276.0 FF
	8m	0.48	239.6	3	0	276.0 SF
	8	0.46	250	3	0	276.0 SF
	9m	0.43	267.4	3	0	276.0 SF
	9	0.40	287.5	2	1	290.9 SF
Two Bedroom 230 Gal/Day	1,3,6m	0.70	328.5	4	0	368.0 SF
	1m, 2, 4, 6, 7m	0.61	377	2	2	397.8 SF
	5, 7	0.52	442.3	3	2	489.8 SF
	8m	0.48	479.1	3	2	489.8 SF
	8	0.46	500	4	2	581.8 SF
	9m	0.43	535	4	2	581.8 SF
	9	0.40	575	4	2	581.8 SF
Three Bedroom 345 Gal/Day	1,3,6m	0.70	492.8	5	1	566.9 SF
	1m, 2, 4, 6, 7m	0.61	565.5	5	1	566.9 SF
	5, 7	0.52	663.5	5	2	673.8 SF
	8m	0.48	718.75	6	2	765.8 SF
	8	0.46	750	6	2	765.8 SF
	9m	0.43	802.3	7	2	857.8 SF
	9	0.40	862.3	8	2	949.8 SF
Four Bedroom 460 Gal/Day	1,3,6m	0.70	658	5	2	673.8 SF
	1m, 2, 4, 6, 7m	0.61	755	6	2	765.8 SF
	5, 7	0.52	885	8	2	949.8 SF
	8m	0.48	959	9	2	1,041.8 SF
	8	0.46	1000	9	2	1,041.8 SF
	9m	0.43	1070	10	2	1,133.8 SF
	9	0.40	1150	11	2	1,225.8 SF
Five Bedroom 575 Gal/Day	1,3,6m	0.70	822	8	2	949.8 SF
	1m, 2, 4, 6, 7m	0.61	943	8	2	949.8 SF
	5, 7	0.52	1106	10	2	1,133.8 SF
	8m	0.48	1198	11	2	1,225.8 SF
	8	0.46	1250	9	4	1255.6 SF
	9m	0.43	1338	10	4	1347.6 SF
	9	0.40	1438	11	4	1439.6 SF

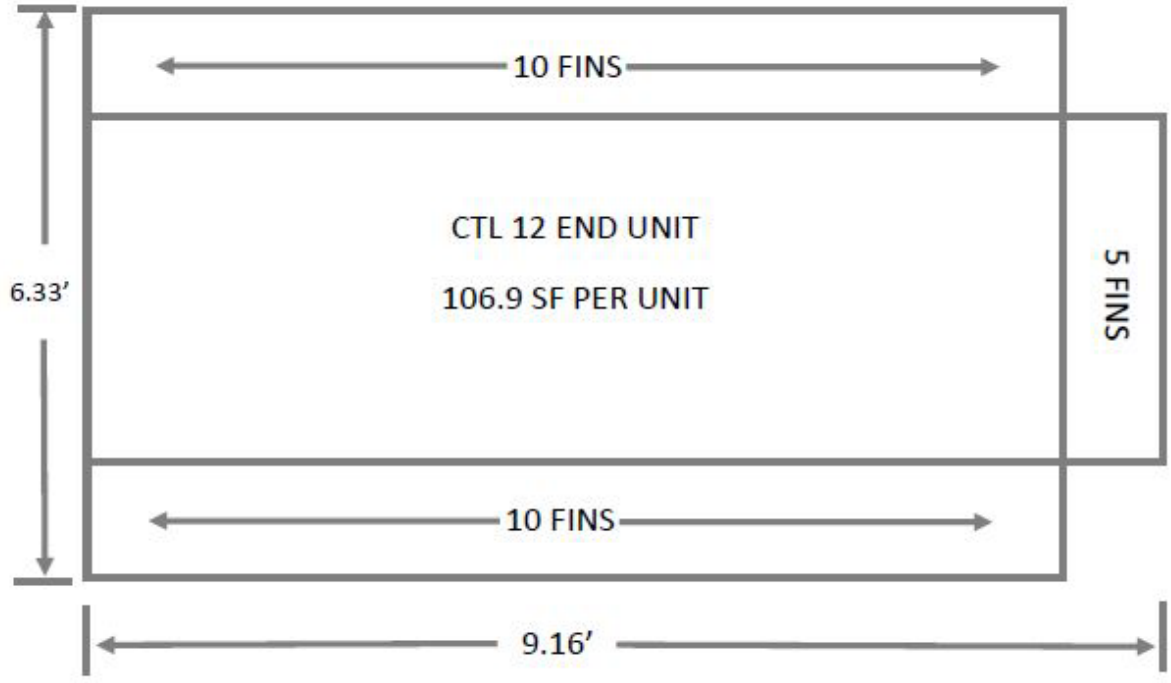
GoodFlow CTL-18

Table 2: System Sizing

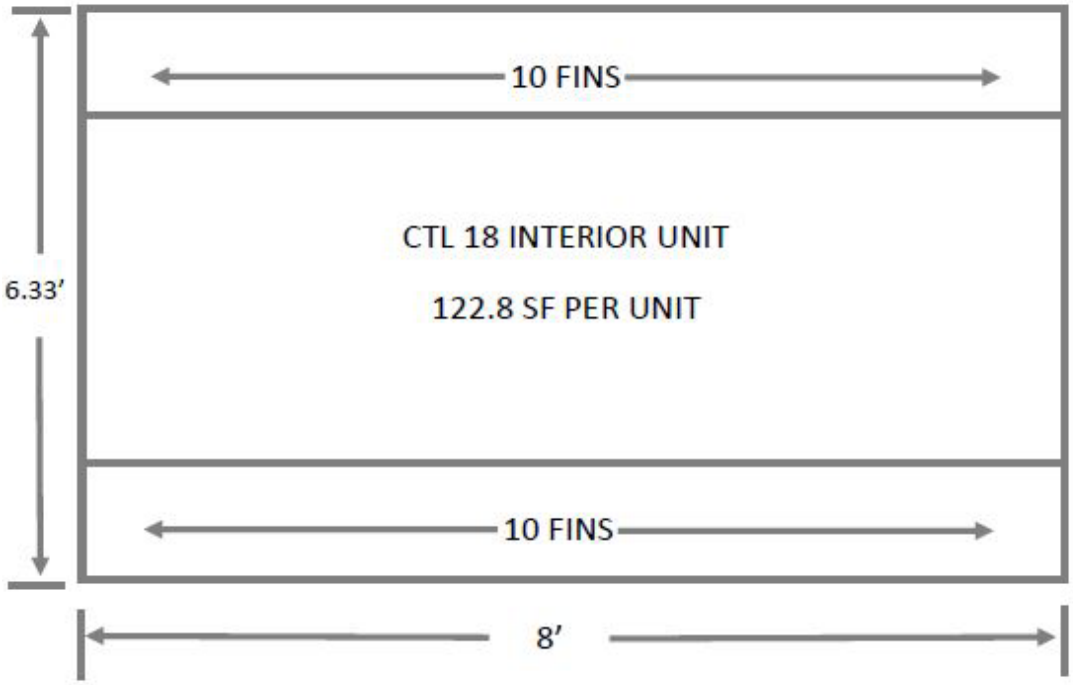
No. of Bedrooms Design GPD	Soil Category See Note Below	Soil Loading Rate GAL/SF	Total Leaching Area SF Required	CTL 18 - Interior Units 122.8 SF per Units	CTL 18 End Units 145.3 SF per Unit	Total Area Provided
One Bedroom 115 Gal/Day	1, 3, 4, 6m	0.70	164.3	2	0	245.6 SF
	1m, 2, 4, 6, 7m	0.61	188.6	2	0	245.6 SF
	5, 7	0.52	221.2	2	0	245.6 SF
	8m	0.48	239.6	2	0	245.6 SF
	8	0.46	250	1	1	268.1 SF
	9m	0.43	267.4	3	0	368.4 SF
	9	0.40	287.5	3	0	368.4 SF
Two Bedroom 230 Gal/Day	1, 3, 4, 6m	0.70	328.5	3	0	368.4 SF
	1m, 2, 4, 6, 7m	0.61	377.1	2	1	390.1 SF
	5, 7	0.52	442.3	4	0	491.2 SF
	8m	0.48	479.1	4	0	491.2 SF
	8	0.46	500	3	1	513.7 SF
	9m	0.43	535	5	0	614.0 SF
	9	0.40	575	5	0	614.0 SF
Three Bedroom 345 Gal/Day	1, 3, 4, 6m	0.70	492.8	3	1	513.7 SF
	1m, 2, 4, 6, 7m	0.61	565.5	5	0	614.0 SF
	5, 7	0.52	663.5	6	0	736.8 SF
	8m	0.48	718.75	6	0	736.8 SF
	8	0.46	750	4	2	781.8 SF
	9m	0.43	802.3	5	2	904.6 SF
	9	0.40	862.3	5	2	904.6 SF
Four Bedroom 460 Gal/Day	1, 3, 4, 6m	0.70	658	6	0	736.8 SF
	1m, 2, 4, 6, 7m	0.61	754	5	1	759.3 SF
	5, 7	0.52	885	5	2	904.6 SF
	8m	0.48	959	6	2	1027.4 SF
	8	0.46	1000	6	2	1027.4 SF
	9m	0.43	1070	7	2	1150.2 SF
	9	0.40	1150	7	2	1150.2 SF
Five Bedroom 575 Gal/Day	1, 3, 4, 6m	0.70	822	5	2	904.6 SF
	1m, 2, 4, 6, 7m	0.61	943	6	2	1027.4 SF
	5, 7	0.52	1106	7	2	1150.2 SF
	8m	0.48	1198	8	2	1273 SF
	8	0.46	1250	8	2	1273 SF
	9m	0.43	1338	9	2	1395.8 SF
	9	0.40	1438	10	2	1518.6 SF

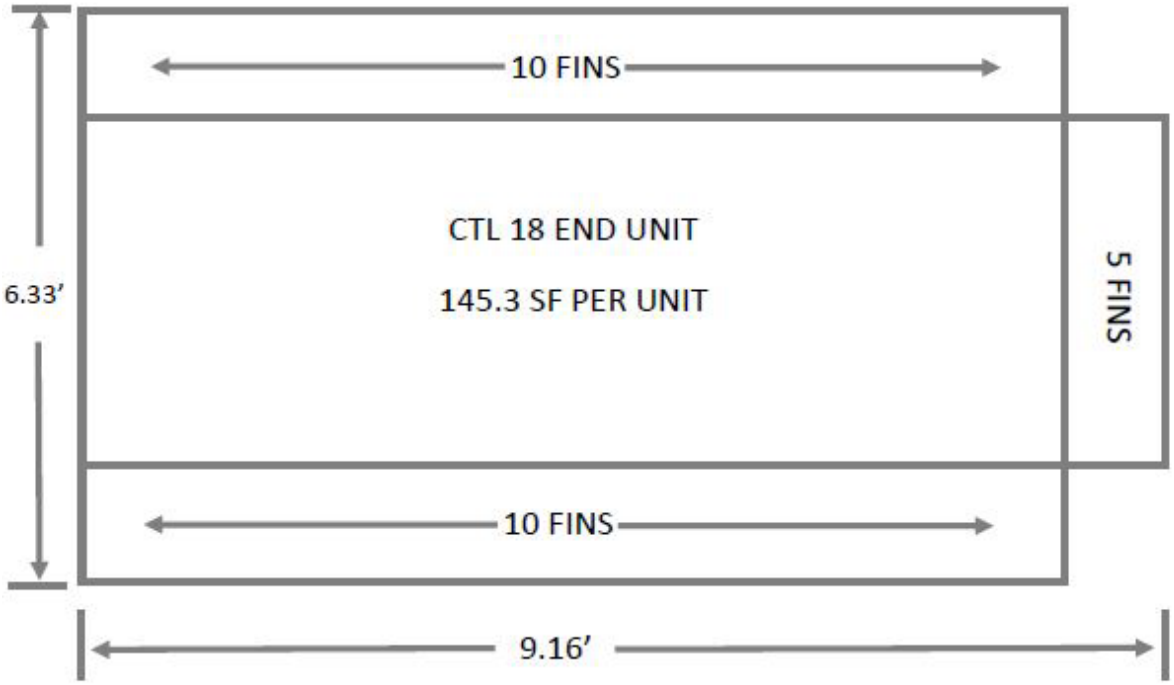
CTL 12 INTERIOR & END UNIT DIAGRAMS





CTL 18 INTERIOR & END UNIT DIAGRAMS





TRENCH SIZING EXAMPLE CTL 12

Design Flow 4 Bedrooms. 460 GPD

- Soil Group 3
- Loading Rate .70
    - 460 GPD ÷ .70 Loading Rate = 658 sq. ft. of system required
- 5 interior units of CTL 12 provide 460 sq. ft.
- 2 End units of CTL 12 provide 213.8 sq. ft.
- 460 sq. ft. + 213.8 sq. ft. = 673.8 sq. ft. provide > 658 sq. ft. required
- One row of CTL 12 units 57’ long provide more sq. ft. than required for the example design.

Trench Sizing Example CTL 12 (interior units only)

Design Flow 4 Bedrooms. 460 GPD

- Soil Group 3
- Loading Rate .70
    - 460GPD/.70 Loading Rate = 658 sq ft of system required
- 8 interior units of CTL12 provide 736 sq ft of system > 658 sq. ft. required
- One row of 8 CTL12 interior units 64’ long, with 4 units on each side of a Distribution Box provide more sq. ft. than required for the example design.

* Please see trench diagrams on pages 16 & 17

TRENCH SIZING EXAMPLE CTL 18

Design Flow 4 Bedrooms. 460 GPD

- Soil Group 3
- Loading Rate .70
    - 460 GPD ÷ .70 Loading Rate = 658 sq. ft. system required
- 5 interior units of CTL 18 provide 614 sq. ft.
- 1 End units of CTL 18 provide 140.75 sq. ft.
- 614 sq. ft. + 140.75 sq. ft. = 755.27 sq. ft. provide > 658 sq. ft. required
- One row of CTL 18 units 49.16’ long provide more sq. ft. than required for the example design.

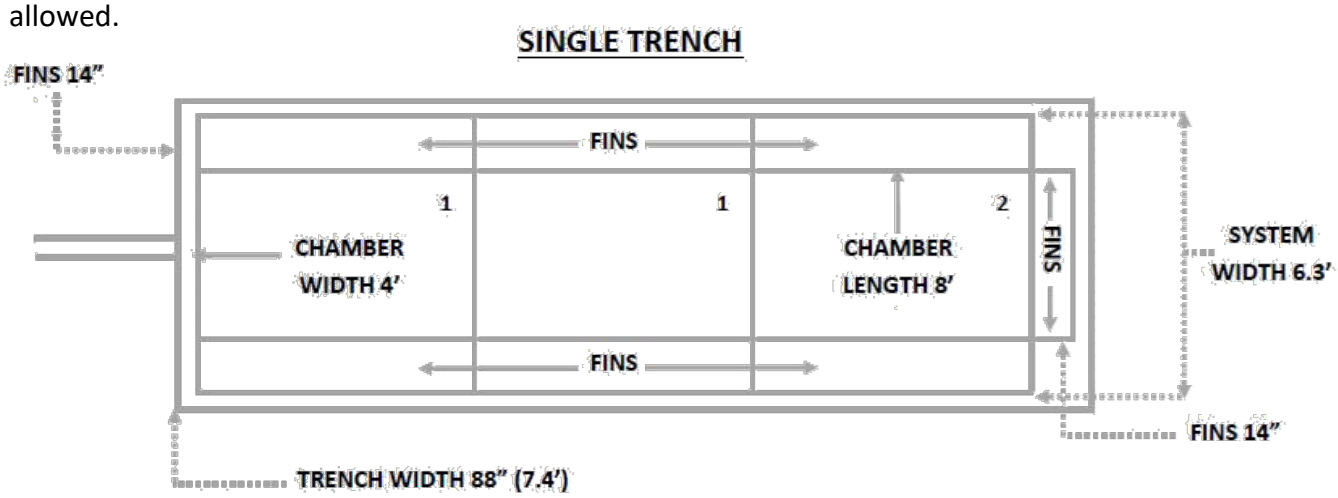
Trench Sizing Example CTL18 (interior units only)

Design Flow 4 Bedrooms. 460GPD

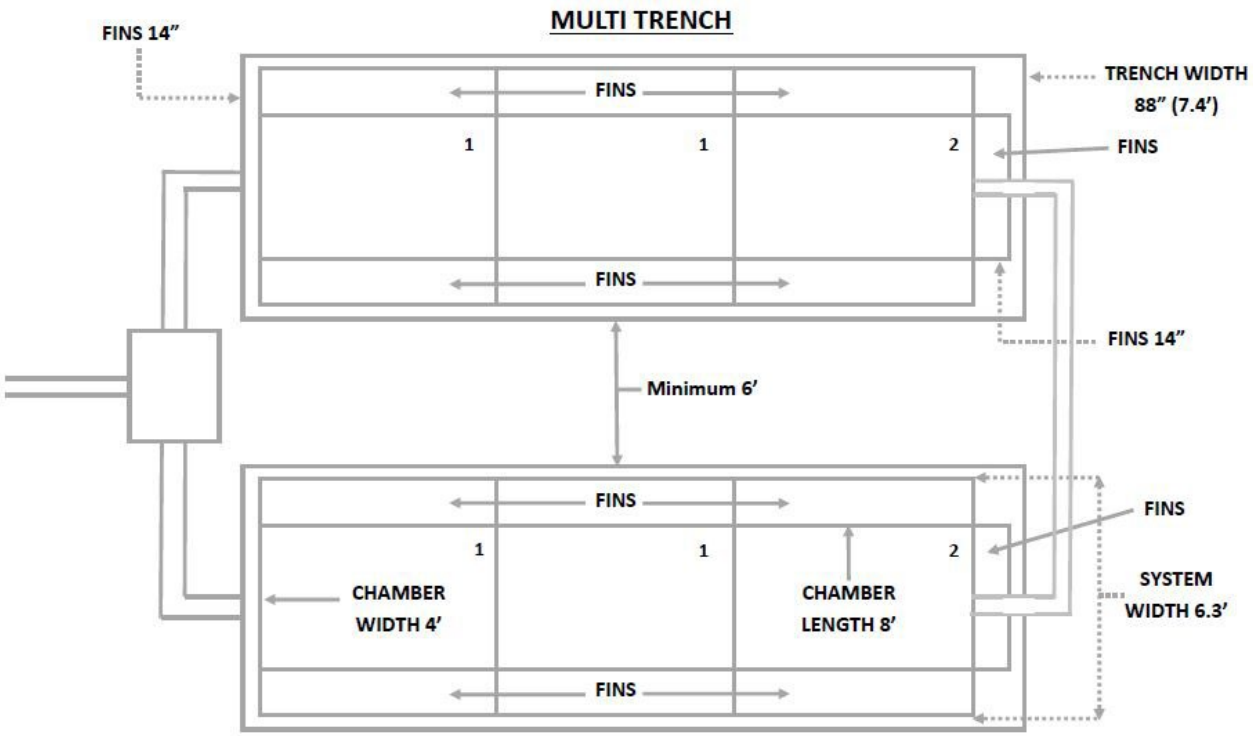
- Soil Group 3
- Loading Rate .70
    - 460GPD/.70 Loading Rate= 658 sq ft of system required
- 6 interior units of CTL18 provide 737.3 sq ft of system > 658 sq. ft. required
- One row of 6 - CTL 18 interior units 48’ long provide more sq. ft. than required for the example design.

TRENCH DIAGRAMS

Concrete chambers may only be installed in trench configuration in RI. No Bed configuration allowed.



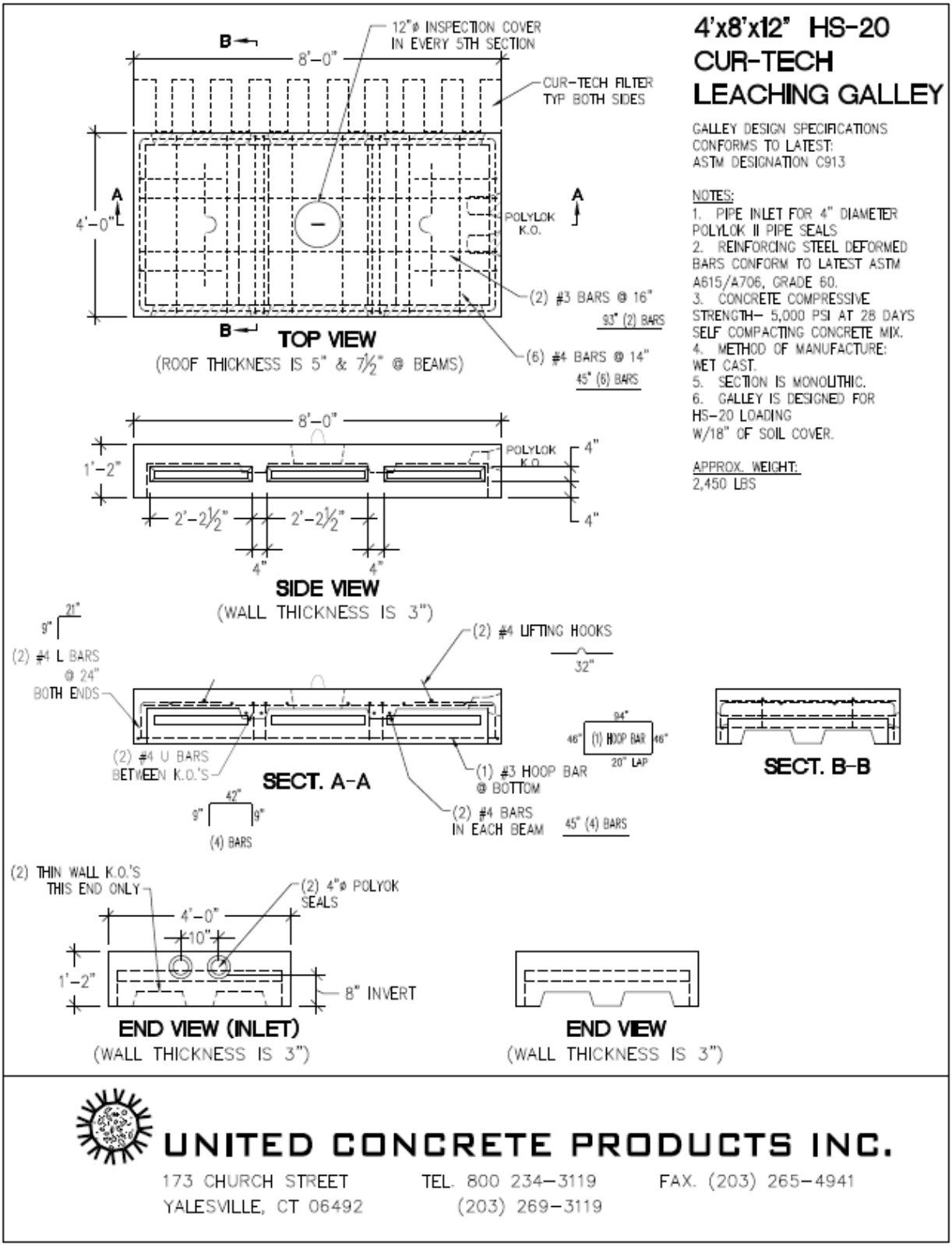
- Width of CTL 12/18 Systems 6.3'
- Width of Trench CTL 12/18 88" (7.4')
- Length of Trench: (# of chambers x 8') + 14" fins + 6" Front + 6" Back = Trench Length
- The system only needs 6 inches in the front and back to install chambers and fins
- Length of this Example: (3x8') + 14" + 6" + 6" = 26.2'



- Width of each trench same as single trench
- Length calculation same as single trench
- Minimum 6' between trenches

1 Interior Unit

2 End Unit



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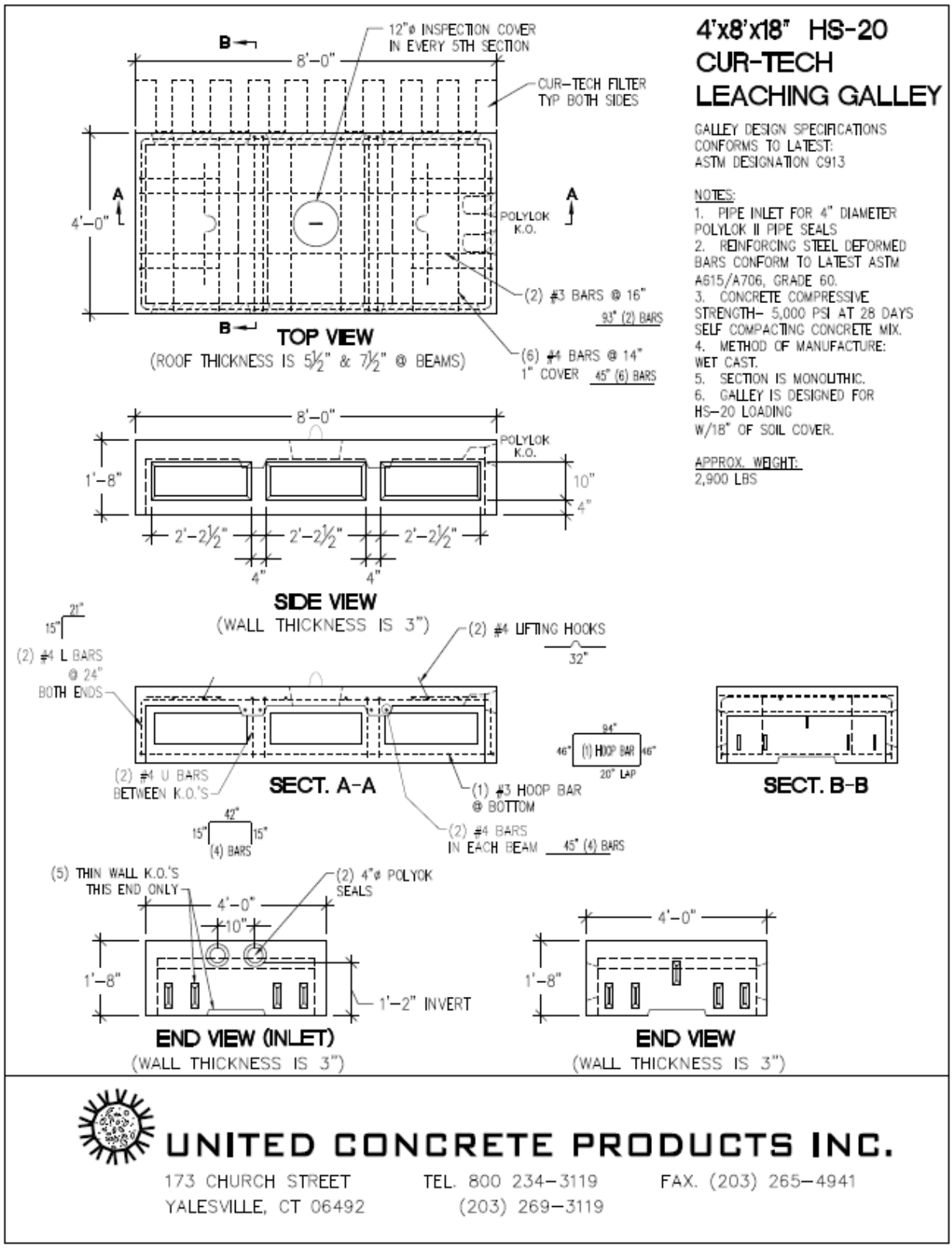

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MAINTENANCE REQUIREMENTS

The only maintenance required for the CTL System is to have the septic tank pumped on an annual or biannual basis.

COMPANY BACKGROUND

GoodFlow, a Connecticut-based company, designed a new system called the CTL series that allows contractors, builders, and engineers to design larger square foot septic systems in a smaller footprint area.

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