Design, Installation and Maintenance

of the

T & J Panel
Wastewater Treatment System

A Better Quality Effluent

Environmental Health Specialists
Engineers
Septic Tank Installers

Updated 2023

TABLE OF CONTENTS

Introduction

Although this manual is sectioned for specific user groups, we at T&J Panel suggest you familiarize yourself with the complete manual. Please visit our website at www.TJPanel.com for more resources regarding design, installation and maintenance of T&J Panel Systems. All of the resources provided in this manual are available online to print. The most current and up-to-date version of this manual is posted on our website at www.TJPanel.com and supersedes all printed editions. For further discussion of this manual, questions about design, or other inquiries about our product, please reach out to our office at 704-924-8600.

Company Information

Office: 269 Marble Rd.
Statesville NC, 28625
Office Phone: 704-924-8600
Office Fax: 704-924-8681
Website: www.TJPanel.com
Email: Info@tjpanel.com
Brad Johnson: 704-880-7697
Brad@tjpanel.com

Installer Training

While T&J Panels does not require a product specific installer certification, it is our goal to train installers to correctly install a panel block system. If it is your first time installing, inspecting, or designing a system, please do not hesitate to reach out to us, or to ask us to include the installer training for your job. Installation training will send a company representative to your jobsite to discuss the panel block system and how to properly install them. T&J Panels recommends an installation training for each orientation of the panel block system (both horizontal and vertical). Contact our offices to schedule your install training at 704-924-8600.

SYSTEM DESIGN

The primary reason for permitting the panel block system is because of insufficient space for a conventional system. The panel block system should be considered when: a quality effluent may be needed, space is limited, usable soil is limited, or there are indications that at some future time space may be needed for other development. When there is a trend for added development such as additions to homes, pools or other special landscaping development, a T&J Panel System may prevent insufficient space later. As the agent who is designing a system, know that the panel block system may be an option the property owner would like to utilize if they desire continued future development of their lot.

As noted in the regulations, a T&J Panel (Prefabricated, Permeable, Block Panel System) is permitted where soils are suitable, provisionally suitable, or reclassified provisionally suitable, however only one half of the nitrification area required by a conventional system is needed. The minimum soil depth required for vertically installed Panel Systems is 34-inches (minimum depths require 6" of suitable soil cover), whereas the minimum soil depth required for horizontally installed Panel Systems is 26-inches in a traditional trench or 18-inches if utilizing fill. Most of the concepts for laying out a panel block system are the same as for a conventional system; the biggest difference being the nitrification area needed and the quality of effluent being introduced into the ground.

T&J panels can utilize either parallel or serial distribution. Panels can be gravity fed, pumped to a pressure manifold or distribution box and then gravity fed into the lines, or pumped to low-pressure panel lines. When designing a pressure system, the principles of low-pressure distribution are as described in the LPP manual. There is further discussion on pressure systems on page 15 of this manual.

T&J Panel Manufacturer's Specifications for Trench Width and Spacing

T&J Panels recommends horizontal panels be installed in 3-foot wide trenches located 9 foot on-center when suitable area exists. When available space does not allow for 9 foot on-center spacing, 3-foot wide trenches located 8 foot on-center can be used to install horizontal panels. Horizontal panels can **only** be installed in 2-foot wide trenches placed 6 foot on-center when repairing a lot and suitable area does not allow for 3-foot wide trenches placed 8-foot on center. When using horizontal panels in 2-foot wide trenches, additional backfill sand (up to 7 more inches) should be used under the panel when soil depth allows.

T&J Panels recommends vertical panels be installed in 2-foot wide trenches located 8 foot on-center when suitable area exists. Designing a PPBPS system utilizing 2-foot wide trenches located 6 foot on center is applicable when using panels as the initial system and the repair system, **or** when repairing a failing lot with limited area. This falls in line with our best engineering practice of using 8 foot on center spacing when possible when installing in 2 foot wide trenches. This practice rules out a larger system being put in place and requiring the repair field to utilize panel blocks with 6 foot on center spacing unnecessarily. If limited by soil conditions, drip dispersal or advanced pretreatment may also be utilized as a repair alternative when using 6 foot on-center spacing for the initial system. T&J Panels recommends that horizontal panels be used in fill systems unless available space requires the use of vertical panels to resize the fill pad.

Please contact T&J Panels with any questions regarding manufacturer's specifications.

T&J Panel Sizing in Trench Formation

T&J Panel sizing can be calculated by multiplying the nitrification area or linear footage required for a standard conventional system by 0.5. This calculation is used when panels are installed in trenches, beds, fill systems, or sand-lined trenches.

For example:

A three-bedroom house with a 0.4 gpd application rate. (The first three steps are the same as for the conventional system.)

1) 120 gallons per bedroom X 3 bedrooms = 360 gallons per day design flow rate.

2) 360 gallons' flow rate / 0.4 application rate = 900 sq. ft. of conventional trench bottom.

3) 900 sq. ft. / 3 ft. wide trench = 300 linear feet of conventional system.

This conventional layout requires 2400 sq. ft. of area on the lot with another equal area of repair space for a total of 4800 sq. ft. of suitable usable area. To calculate the size of the T&J Panel system, the above calculations must be made with an additional fourth step.

4) 300 linear feet of conventional system X 0.5 for a horizontally or vertically installed 16inch panel block system = 150 linear feet of T&J Panel System.

A panel block system requires only a 975 sq. ft. area on the lot for the system with an equal area for repair, a total of 1,950 sq. ft. With the panel block system, the installation and repair can go into the same area as the initial area required for a conventional gravel trench system.

T&J Panel Bed System Sizing

A three-bedroom house with a 0.4 gpd application rate. (The first three steps are the same as for the conventional system.)

1) 120 gallons per bedroom X 3 bedrooms = 360 gallons per day design flow rate.

2) 360 gallons' flow rate / 0.4 application rate = 900 sq. ft. of conventional trench bottom.

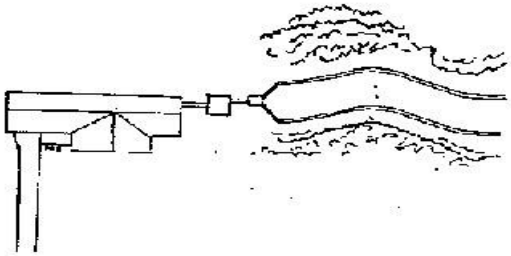
3) 900 sq. ft. x 1.5 = 1,350 sq. ft of conventional bed area needed

4) 1,350 sq. ft x 0.5 = 675 sq. ft of T&J Panel bed area needed

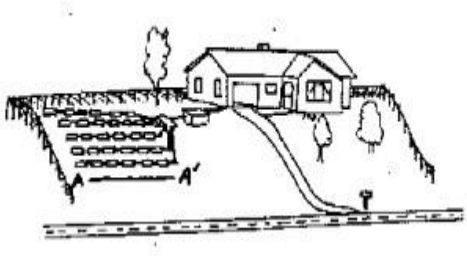
T&J Panel beds are excavated in 3-foot increments up to a maximum bed width of 24 feet. Nitrification lines are placed 3 foot on center and 1.5 feet from the bed sidewalls. Bed systems will require a greater number of panels than a typical trench layout. This ensures proper distribution along with added storage and treatment capabilities. Bed systems can be considered when dealing with lots that are limited by space, topography, or other site-planning considerations. For a complete guide to the design, installation, and inspection process for a T&J Panel Bed System, please refer to our T&J Panel Bed Design & Installation Manual found on our website at tjpanel.com.

Window Effect

To prevent hydraulic overload in the soil, aerial space should always be a consideration for any system. This condition is especially notable with panel block systems, as with any system that reduces the size of the aerial area drain field. The following is a simplistic example of this concept:



MOST DESIRABLE



LESS DESIRABLE

While both systems have the same linear footage of trench, the second diagram is a less desirable design. The effluent must pass through the area A-A' which can cause a strain on that area and even a failure because of hydraulic overloading.

Distribution

When aiming to design the most optimal system for a given site, many variables must be taken into consideration. Distribution methods can vary depending on site limitations. The following sections provide various ways to distribute effluent when presented with differing site conditions.

I. Gravity Flow

A. Parallel Distribution

If adequate fall to the proposed drainfield location is present and line lengths are equal or have a variance less than 20 percent, parallel distribution utilizing a distribution box may be desirable. Parallel distribution might also be an option when long lines can be multi-fed to produce smaller lines that achieve less than a 20 percent variance with respect to other lines. If shorter lines can be serial linked together (connected end to end) to form a longer line that achieves a similar low variance, parallel distribution might still be an applicable design.

B. Serial Distribution

When variance in line lengths exceeds 20 percent and adequate fall to the drainfield exists, gravity-fed serial distribution can be utilized, especially if pump tanks are not desired for cost efficiency or lack of available space. On sites where installing seperate supply lines to each nitrification line would prove problematic, serial distribution might also be a better option. Serial distribution may be designed in two different ways.

1. **Drop Boxes** – Placing drop boxes at each line (except the last line) is one form of serial distribution. Drop boxes are helpful when obstacles between lines exist that prevent connecting them end to end. They are also beneficial when connecting ends of lines are far apart and would require lengthy supply lines. Drop boxes are also useful on steep slopes in order to combat the effects of gravity on effluent. We recommend the use of drop boxes rather than true serial on slopes of 30% or greater if possible.
2. **True Serial** (End to End) – Connecting lines end to end in a snake-like fashion is another form of serial distribution. When connecting lines together, no turnup or dam should be used. The pipe exiting the last panel in the upslope line should be level and then turned using a proper fitting towards the next nitrification line. After making the necessary turn, the supply line should have adequate fall to the next nitrification line. True serial distribution can be a beneficial system design in that effluent will move downline before panels are completely filled with effluent, allowing freeboard in the top portion of the panels for oxygen content.

II. Pressure Dosing

Pressure dosing (i.e., utilizing a pump tank) can be incorporated into designs when any of the following criteria exist on a given site:

- Adequate fall cannot be achieved from the septic tank to the drainfield

- Variance in line lengths exceeds 10 percent and serial distribution is not desired
- Line lengths in parallel distribution exceed 67 feet from the point of introduction and are unable to be center-fed or multi-fed

Pressure dosing can involve several different distribution devices and methods such as pumping to a pressure manifold, pumping to a distribution box, or using low pressure pipe distribution.

A. Pressure Manifold

Pumping to a pressure manifold is a common method of distribution when pump tanks are needed. Pressure manifolds allow for more control when trying to achieve a desired flow to individual nitrification lines. Using different tap sizes for varying line lengths can help to minimize flow variance and may help to avoid the use of low-pressure distribution. As with gravity flow, lines can be linked together via serial feed to essentially form longer lines. In some instances, this can provide more desirable line lengths and help limit flow variance. Using multiple taps to feed a long single line can also be advantageous in creating a more efficient overall design.

B. Distribution Box

When nearly equal line lengths can be designed, pumping to a distribution box may be a useful option. T&J Panels recommends that a second distribution box be placed in series with the first distribution box. The first distribution box would act as a splash box, helping to deplete some of the energy of the pumped effluent. This allows the effluent to then be more equally fed to the nitrification lines from the second distribution box. Effluent can then be fed via parallel distribution (when variance in line lengths is low) or serial fed.

C. Low-Pressure Distribution

Low-pressure distribution may be desirable when long line lengths (over 85 feet) can only be fed from one end due to limiting site conditions or a multitude of differing line lengths exist that are difficult to overcome using varying size taps.

Any questions regarding the optimal distribution method for your system design, please contact our office.

Calculating Panels per Trench

To calculate the number of panels needed for a given nitrification line length, the formula is **Number of Panels** = LF(linear feet) x 12/52. If the result is a decimal of .4 or lower, round down to the nearest panel (panel spacing may be slightly closer than 6 inches to fit the line length). If the result is a decimal of .5 or higher, round up (panel spacing may be slightly further than 6 inches to fit the line length). To calculate the number of panels needed for a 50-foot line, multiply 50' X 12" = 600", then divide by 52" which is 46 inches for the panel and 6 inches for the space between the panels in the trench. 600" / 52" = 11.5 panels; therefore, the 50-foot line would call for 12 panels. Ideally, the sizing of the lines should be as equal as possible with as close to the same number of panels in each trench as is practical.

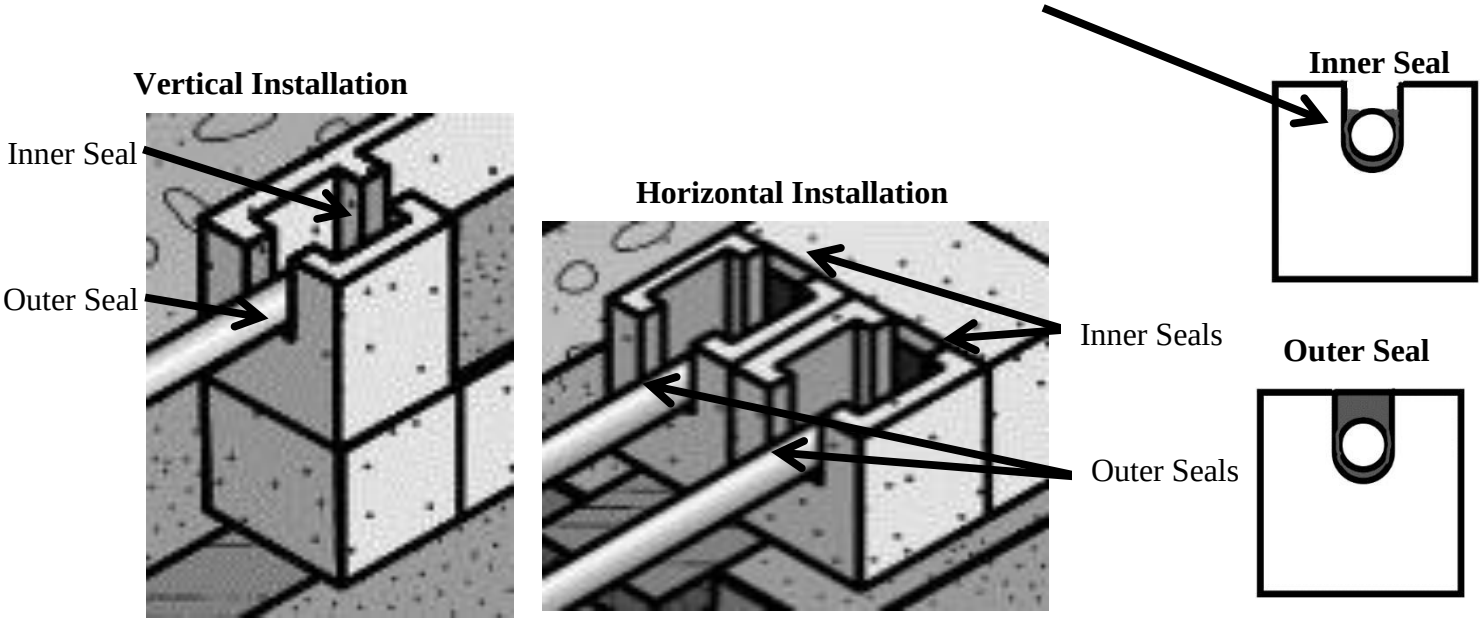
Backfill

Backfill sand shall be a clean, screened, medium-grade sand that is naturally-occurring. Acceptable sands are sands that are suitable for the production of ready-mix concrete and clean of organic debris and stone. In true Group I soils, panels can be installed directly on the trench bottom (when soil depth is limited). Additional backfill sand used during installation should meet grade and specs listed below. Sands dredged from rivers and creeks can be used, if gradation is sufficient to be blended into ready-mix concrete production. Product description includes, but is not limited to: Concrete Sand, NC-2S Sand, ASTM C-33 Sand, FA-10 Sand and Grade "A" Sand. Product suitability is important and T&J Panel, Inc. will help answer any questions.

S.A.P. Sand Alternative Product: is the geotextile fabric inside each panel for quality control and downline and horizontal distribution. (this takes the place of medium blasting sand)

Foam Sealant / Tar Seals

The drawings below illustrate the outer and inner seal. Note that while the outer seal is a complete seal, the inner seal is only up to the top of the connecting pipe. This is to allow for over flow of the effluent into the sand at peak use. These seals can be inspected by lifting the caps at the ends of the panels while inspecting the system installation. T&J approved foam sealer or tar seal rope must be used to construct these seals. Care should be used not to glue the caps down with the use of foam sealer. When using foam sealer, special care should be used on the inner seals of the panel not to over fill or under fill this seal. The **inner** seal, if sealed off completely, will restrict the overflow reservoir.



Preparation for Installation

The Panel Block System

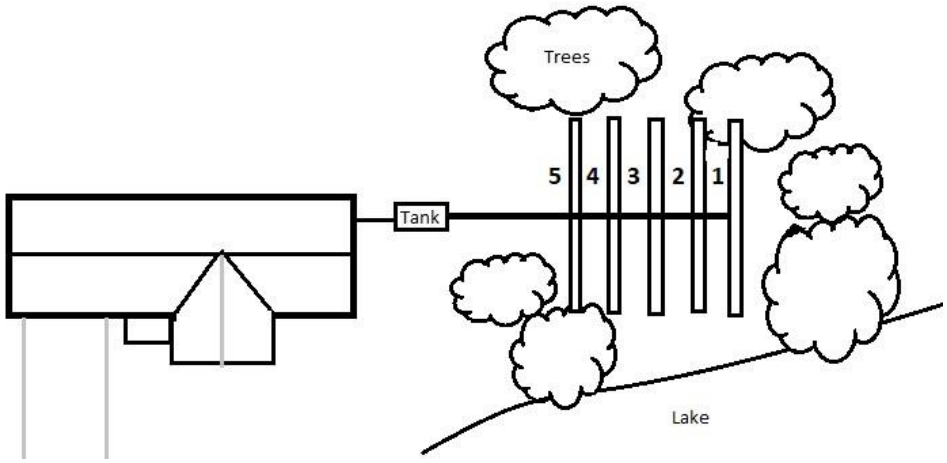
Generally, on level open land, a panel block system can be installed in about the same amount of time as a conventional system; however, traditionally, panel block systems have been installed where space and topography have restricted the use of a conventional system. For this reason, panel block system installations typically require more time. Many installers enjoy the change of working with panels, not handling gravel, and the satisfaction of knowing a better quality, long-lasting system has been installed.

Ordering Materials

T&J Panel partners with suppliers to ensure panel block systems are available statewide. Please be sure to let your supplier know what installation method you are utilizing, as this will affect the amount of materials needed for the system. For information on the distributor located closest to you, call **704-924-8600** or email **info@tjpanel.com**.

Installation Tips

Installation for multiple line systems should begin in the most confining area and be worked to the more open areas.



Above is an example of a multiple line installation. As you can see, the installation should begin with the line marked 1 and proceed to 2, 3 then 4. This procedure will greatly ease material handling and backfilling. (Note, sections of the drain lines should be left uncovered to allow for inspection of lines when area is confined and return access to lines is limited.)

Most Panel Systems are currently used due to space considerations and caution should be taken to preserve suitable soil structure and site conditions.

Below are two examples of drain lines on sloping lots. The second drawing shows the drain line going through a slope making the center of the line deeper in the ground, resulting in an undesirable situation. The first drawing shows the drain line going around the slope (on contour) keeping the trench depth and cover uniform for the entire length of the line. On slopes, care should be given to avoid cutting away valuable topsoil in an effort to make straight lines. The panel line should be installed on grade with the contour of the natural slope. Panel lines can be curved to almost any degree.

CORRECT INCORRECT

Trench Preparation

Trench grade should be established so that backfill cover will be four to six inches over the tops of the panels. (Note, on severe slopes, system depth should be adjusted to protect against breakout of effluent.) In shallow soil conditions, panel blocks may be installed at grade and require 6 inches of topsoil suited for vegetative growth be brought in. In soils containing clay as the key mineralogy, the trench side walls should be raked to bring slicked over areas back as near to original structure as possible. A light dusting of lime on the sidewalls will help restore the soils back to their original structure.

***** Please Let Your Distributor Know If You Need Vertical or Horizontal Panels*****
(This will change the amount of materials needed to complete your job)

Materials Needed for Vertical Installation

- One can of Foam Sealer per five panels or 3ft of half inch tar seal rope per panel
- Two feet of 2-inch SCH 40 pipe per panel (unless low pressure distribution is used). For low pressure systems, use the same linear feet as line layout of 1 ¼ or 1 ½ inch pipe. Additional pipe is needed for all supply lines.
- Same linear feet of 1x4 or 1x6 boards as total line length of system to be installed
- Bag of powder lime when in clay soil

Materials Needed for Horizontal Installation

- Three cans of Foam Sealer per ten panels or five feet of half inch tar seal rope per panel
- Two pieces of two foot long 1 ½ inch SCH 40 pipe per panel (unless low pressure distribution is used). For low pressure systems, use the same linear feet as line layout of 1 ¼ or 1 ½ inch pipe. Additional pipe is needed for all supply lines.
- Same linear feet of 1x6 boards as total line length of system to be installed
- Bag of powder lime when in clay soil

T&J Panels Jobsite Worksheet

Homeowner/Job Name: _____ County:

_____ Address:

_____

System Description (Distribution type, total lines, line lengths, etc.):

_____

_____

MATERIALS CHECKLIST:

_____ Vertical T&J Panels (Caps included)

_____ Horizontal T&J Panels (Caps included)

_____ Foam Sealer (amount varies based on installation method)

_____ Powdered Lime

_____ Entry T (per line, Horizontal Installation ONLY)

_____ AVAILABLE FOR PURCHASE FROM T&J PANEL.

_____ 2" Pipe

_____ 1 ½" Pipe

_____ 1 ¼" Pipe

_____ Fittings for Pipe

_____ Backfill Sand (Clean, Screened, Naturally-Occurring, Concrete Sand, or ASTM-C33, NC-2S, FA-10 and Grade "A" Sands)

↳ Be sure to use the correct backfill sand material. Contact our offices for backfill sand sources or with any questions regarding backfill sand material.

_____ 1x4 or 1x6 Board (Does not need to be treated)

ADDITIONAL PRODUCTS THAT MAY BE NEEDED FOR COMPLETITION:

_____ Septic Tank _____ Gallon

_____ Pump Tank _____ Gallon

_____ 4" Pipe

_____ Distribution Box

_____ Manifold _____ Taps _____ Size

_____ Install Training

_____ Tar Seal Rope (5ft. per panel)

Installation Process

Vertical Trench Installation

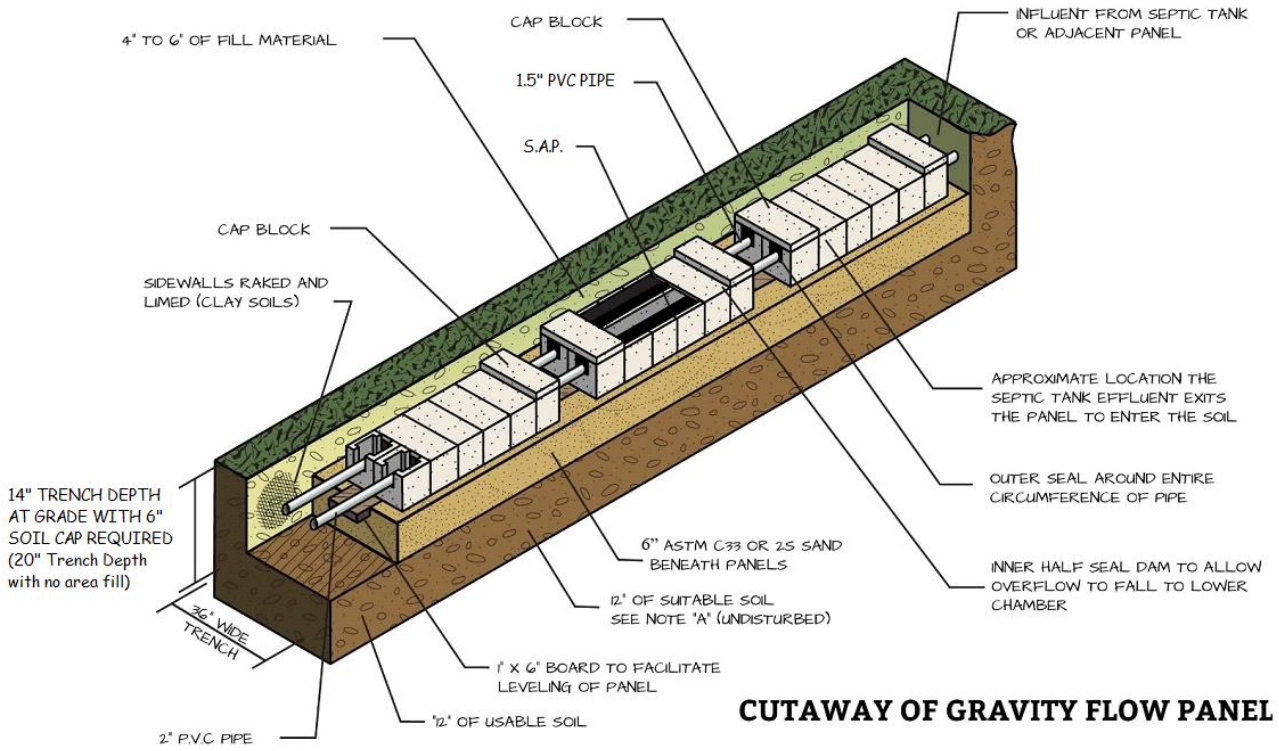
1. Start by shooting grade and marking contour of the lot
2. Using the lowest or shallowest grade on contour, add the specified trench depth
3. Dig the trench at the elevation derived, checking grade frequently.
4. Trenches should be two feet wide and typically 8 foot on-center.
   (See Page 3 concerning 6 foot on-center spacing)
5. If smearing of the side walls is present (as is the case in most clay dominant mineralogy), the side walls affected should be raked to bring them back to original structure.
6. Place a 6-inch layer of appropriate backfill sand (natural, clean, screened) in the trench and level to grade.
7. Place 1x4 or 1x6 inch boards flat down the middle of the trench.
8. Check the grade of the boards by shooting the grade off the top of the boards.
9. Once grade boards have been set, panels may be set into the trench on top of the boards using equipment and a lift chain, or if need be by hand.
10. Panels can be placed about 6 inches apart. This spacing can be adjusted to ensure the correct number of panels can be placed into each nitrification line.
11. Foam Sealer or tar seal rope should be placed in the bottom of the U outs to form seals around the pipe as shown in earlier drawings.
12. Once the Foam Sealer or tar seal rope is in place, a 24-inch section of 2 inch PVC pipe (for gravity distribution, see page 13 for pressure distribution instructions) is cut to span from the middle top chamber of the first panel to the middle top chamber of the next panel.
13. Using foam sealer or tar seal rope, form a complete seal on all outer cutouts. Ensure that inner seals are partial seals that do not extend over top of the PVC pipe.
14. After completing the inner and outer seals, place a cap block on each end of the panel to cover all openings.
15. The cap block may serve as an inspection port at some later date.
16. Use the appropriate backfill sand to backfill up to the top of the panel block.
17. The system is now ready for final inspection.
18. After final inspection, a minimum of 4-6 inches soil cover is to be added over top of the panel block system.

Horizontal Trench Installation

1. Start by shooting grade and marking contour of the lot
2. Using the lowest or shallowest grade on contour, add the specified trench depth
3. Dig the trench at the elevation derived, checking grade frequently.
   The recommended trench width for horizontal panels is three feet wide and spaced at 9 foot on center unless 8 foot on-center is required to meet setbacks.
   (See Page 3 concerning alternative trench width and on-center spacing)
4. If smearing of the side walls is present (as is the case in most clay dominant mineralogy), side walls effected should be raked to bring them back to original structure.
5. Place a 6-inch layer of appropriate backfill sand (natural, clean, screened) in the trench and level to grade. If installing in Group I soil, this 6-inch layer of sand beneath the panel is optional.
6. Place 1x6 inch boards flat down the middle of the trench.
7. Check the grade of the boards by shooting the grade off the top of the boards.
8. One grade boards have been set, panels may be set into the trench on top of the boards using equipment and a lift chain, or if need be by hand.
9. Panels can be placed about 6 inches apart. This spacing can be adjusted to ensure the correct number of panels can be placed into each nitrification line.
10. At the beginning of each line, install an Entry T (for gravity distribution) to divide the gravity flow, as close to the beginning of the first panel as possible.
11. Foam Sealer or tar seal rope should be placed in the bottom of the U outs to form seals around the pipe as shown in earlier drawings.
12. Once the Foam Sealer or tar seal rope is in place, a 24-inch section of 1 ½ inch PVC pipe (for gravity distribution, see page 13 for pressure distribution instructions) is cut to span from the middle top chamber of the first panel to the middle top chamber of the next panel. Two pieces of pipe will be needed between each panel.
13. Using foam sealer or tar seal rope, form a complete seal on all outer cutouts. Ensure that inner seals are partial seals that do not extend over top of the PVC pipe.
14. After completing the inner and outer seals, place a cap block on each end of the panel to cover all openings.
15. The cap block may serve as an inspection port at some later date.
16. Use the same backfill sand as used in the trench bottom to backfill up to to the top of the panel block.
17. The system is now ready for final inspection.
18. After final inspection, soil cover is to be added over top of the panel block system.

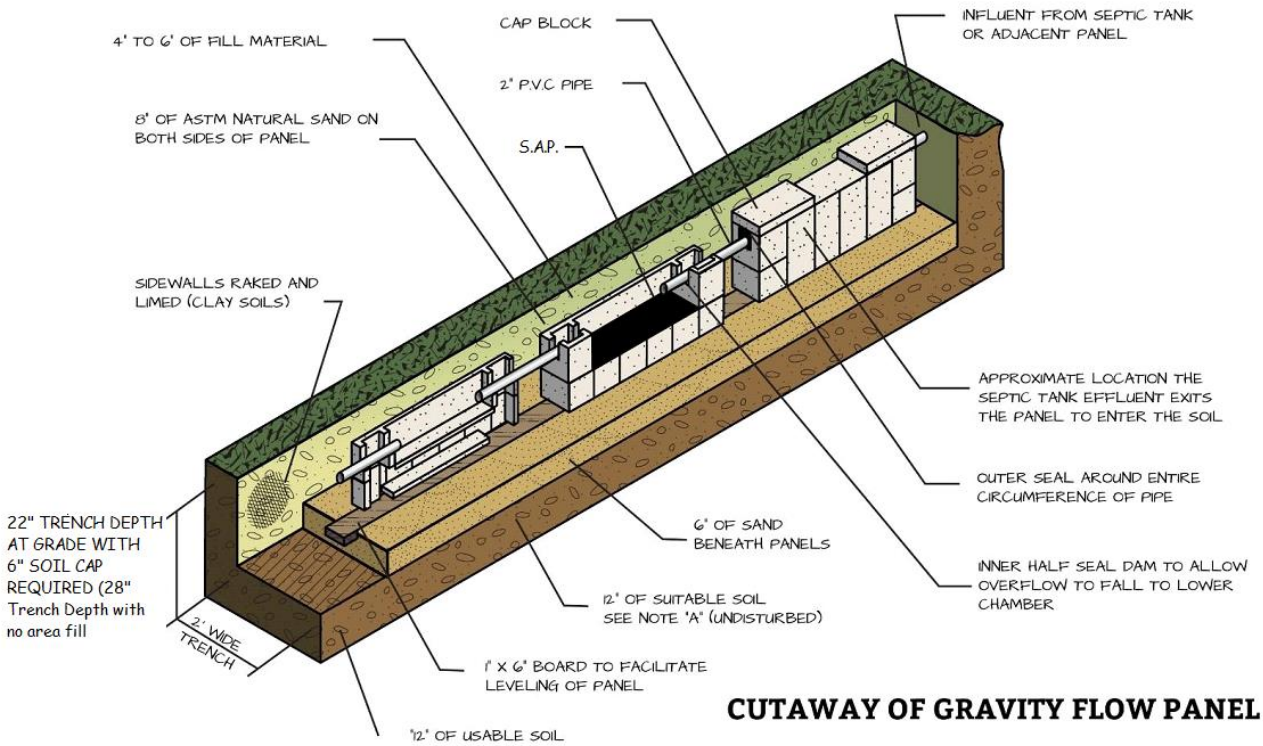
The following page provides illustrations of proper installation of vertical and horizontal panels along with all necessary components.

Isometric Drawing of a Segment of T & J Panel Horizontal Installation



CUTAWAY OF GRAVITY FLOW PANEL

Isometric Drawing of a Segment of T & J Panel Vertical Installation



CUTAWAY OF GRAVITY FLOW PANEL

Pump to Pressure Manifold Gravity Feed

When pumping to gravity feed, the vertical panel should be dosed at 3.6 gal per panel and the horizontal panel should be dosed between 3.6 gal to 7.2 gal per panel. The outer and inner seal on the first panel in each line should be a full seal. The maximum flow per tap on a vertical panel should be 12.5 gpm and 17.7 gpm on horizontal panels.

Low-Pressure Distribution

The LP Panel uses technology similar to that of Low Pressure Pipe (LPP) Systems, with the orifices discharging into the panels. The tables and distribution design described in the LPP manual, in most regards, is applicable to the pressure Panel System. The system should be used with two to four feet of head. In *both* horizontally and vertically installed pressure dosed panel systems, valves should be banked in a valve box and turn-ups should be neatly capped, covered and labeled for future service. Foam sealer is only needed in the outer cutout. Pump tanks should be constructed as shown in the drawing on page 21 to allow for service and repairs.

Vertical Panels with Pressure Distribution

When using low pressure distribution, our recommended dosing is 3.6 gallons per panel. By dosing each panel at 3.6 gallons, the top chamber will have the optimal ratio of both effluent and freeboard, allowing for storage capacity and high oxygen content. By drilling one hole per panel in the distribution line, the total dose volume can easily be calculated by multiplying the number of panels by 3.6. As an example, for a system with 34 panels and identical orifice sizes, the total dose volume would be 122 gallons (34 X 3.6 = 122). Special care should be taken to ensure that only one hole is drilled per panel. The first and last hole of each line should be drilled at 6 o'clock (facing trench bottom) to act as weep holes, helping any residual effluent to escape the line. All holes in between should be drilled alternating from the 10 o'clock and the 2 o'clock positions on the distribution pipe, with only one hole per panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest.

Horizontal Panels with Pressure Distribution

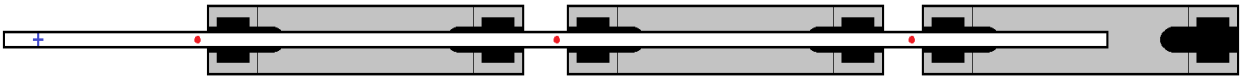
When dosing a horizontal panel with low pressure distribution, the same ideas apply. Panels will have one orifice each. For cost effectiveness, it is allowable to run a single distribution pipe per line rather than having to install two for each line (one in each chamber). We recommend the distribution line be installed in the chamber that is most uphill. The chamber without the distribution still serves its purpose of storage capacity as the panel block matrix allows for effluent permeability. The chambers without a distribution line must have a full seal of foam sealer on the outer cutout. Additional materials may be used to give structure to the foam sealer to prevent unstable seals during the curing process. As with vertical panels, calculating total dose volume for a low-pressure horizontal panel system can be achieved by multiplying total number of panels by 3.6 gallons. If a system has 34 panels and all holes are the same size, you would multiply 34 X 3.6 to get 122 gallons per dose cycle. that the effluent is pumped into the inner chambers of the panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest. The first and last hole of each line should be drilled at 6 o'clock (facing trench bottom) to act as weep holes, helping any residual effluent to escape the line. All holes in between should be drilled alternating from the 10 o'clock and the 2 o'clock

positions on the distribution pipe, with only one hole per panel. If the hole sizing changes in the system, the pump cycle is set by the hole that is discharging the fastest.

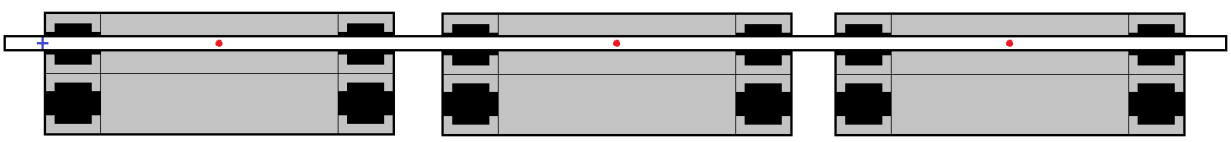
Proper Hole Placement in a Low-Pressure Panel Block System

The following diagram shows how to easily drill orifices in the distribution line for a T&J Panel system utilizing low-pressure distribution.

In the picture above, we see that the distribution line has been run through the full number of panel blocks for a given trench length. The goal is to drill the orifices close to the middle of the panel (23 inches from the end of the panel). The red circles indicate the ideal location for the distribution orifices. By marking a cross where the distribution line enters the first panel in the line, it is easy to keep track of orientation for drilling holes at the appropriate angles. This mark will also help give a reference point as to where the distribution pipe should be reset to after all holes are drilled.

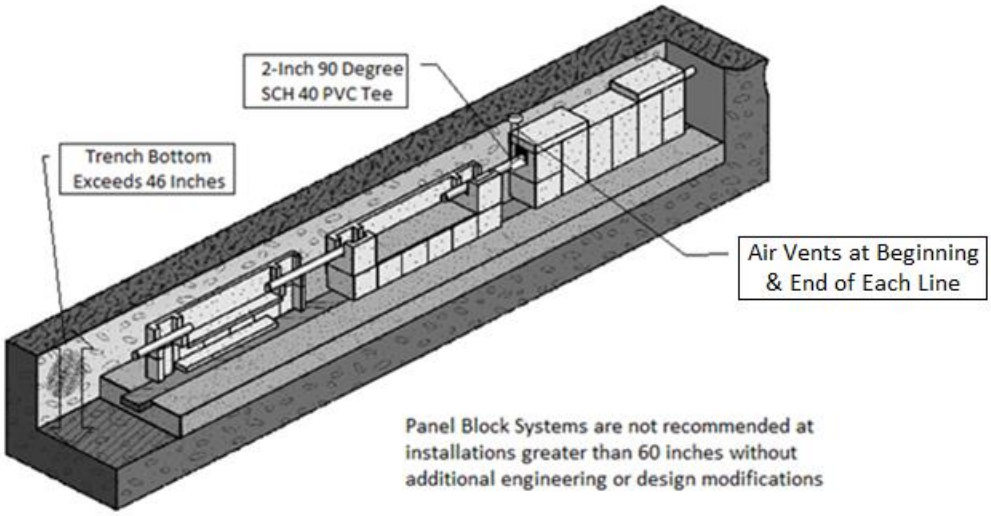


Once the orientation mark has been made, the distribution pipe can be pulled outward just over 23 inches. This allows for each orifice to be drilled just in front of the corresponding panel. After drilling all holes at the proper angles as mentioned in the previous section, the distribution pipe can be returned to its proper location by aligning the blue cross with the front side of the first panel block. The same process applies for a horizontal installation, with only one side of panel receiving the distribution line as shown below.



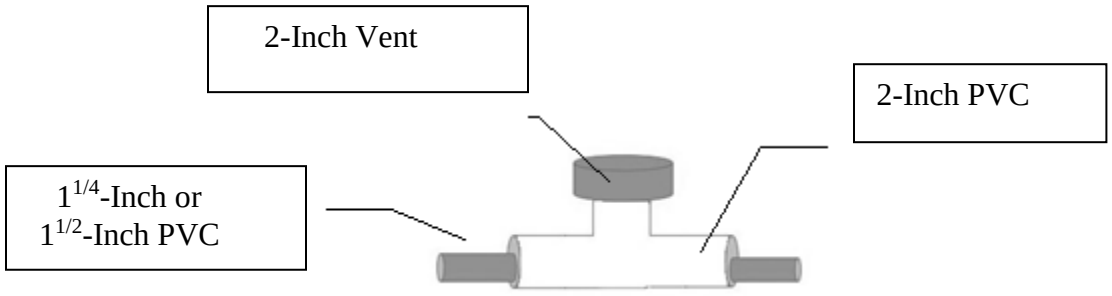
Deep Installation of Panel Block Systems

Utilize these specifications for ventilation when Trench Bottom *exceeds* 46-inches. In certain situations, there are more desirable soil conditions deeper in the soil profile. On these sites, Panel Systems can still be utilized with proper ventilation to the system. Air vents are used with Panel Systems to allow the chambers within the Panel to receive the air needed for treatment. Air vents should be installed as designed. When venting Panel Systems, vents should be placed at the beginning and end of each line.



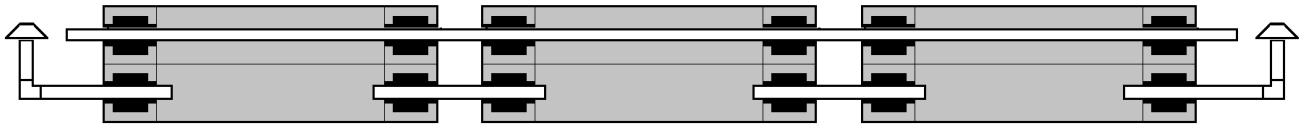
Gravity Flow Installation: Air vents should be placed at the beginning and end of each line to provide adequate oxygen content. For vertical panels, cut the 24-inch long, 2-inch PVC pipe in half, then reconnect with a 2-inch 90-Degree SCH 40 Tee. Extend the 2-inch Tee up to ground surface to allow ventilation. For horizontal panels, follow the same procedure on one side of the panel block and utilize 1 ½-inch PVC. Air vents should come to or just below finish grade and housed neatly in something such as an irrigation box/cover for protection.

Vertical Panel Deep LP Installation (Low Pressure Pipe): Insert your $1^{1/4}$-inch or 1 ½-inch into a 2-inch PVC "sleeve" that spans from one inner chamber of a panel to the next for each panel. At the beginning and end of each line, connect a 2-inch 90 Degree SCH 40 Tee to the "sleeve" halfway between one panel and the next. Extend the 2-inch Tee up to ground surface to allow ventilation. Air vents should come to or just below finish grade and be housed neatly in something such as an irrigation box/cover for protection.



Horizontal Panel Deep LP Installation

For deep horizontal installations, venting can be supplied to the side of the panels not being utilized by the distribution line. 2-foot sections of 1 ½-inch SCH 40 PVC can be used to connect the panels from inner chamber to inner chamber. At the beginning and end of each line of panels, connect a 1 ½- inch SCH 40 ninety and extend the vent lines to ground surface to allow for ventilation. Air vents should come to or just below finish grade and housed neatly in something such as an irrigation box/cover for protection. The diagram below illustrates this configuration.



Installing Panels in Deep Trenches Using Additional Backfill Sand

When more permeable underlying horizons are present below more restrictive upper horizons in the soil profile, installing panels with additional backfill sand is applicable **in lieu of utilizing vents**. The backfill sand used shall be a medium-grade naturally occurring sand that extends into the permeable underlying horizon. Panels can then be installed closer to the surface, allowing for greater oxygen availability, and negating the need for vents. When permeable horizons exceed 60 inches, additional engineering may be required.

Final Inspection

The following list are key points that an inspector should look for when issuing a completion permit:

1) Were panels installed horizontally or vertically, according to the permit?
2) Are the proper number of panels for each line installed?
3) Is the depth of the panels within guidelines?
4) Are drain lines level or less than ¼ inch fall in ten feet?
5) Have seals been properly constructed?
6) Was the proper foam sealer (GE) or tar seal rope used to construct the seals?
7) Was the proper sand used in the trench backfill?
   Is the sand clean? (i.e. free of debris, large organics, leaves, etc.)
   Has the sand been screened? (to a medium-grade, not too fine, free of large rocks)
   Is the sand naturally-occurring? (i.e. from a river, creek, sand pit, etc., not manufactured)
8) If in soils where clay is present, were the sidewalls raked and limed?

<u>For Pumped Systems</u>

9) Have pump size, head pressure and dose cycle been properly sized and set?
   Set dose cycle for 3.6 gallons per panel with pressure distribution
   Set dose cycle at 3.6 gallons per vertical panel and 3.6 to 7.2 gallons per horizontal panel when pumping to pressure manifold and gravity feeding.

10) Record field data on operations permit.

Design Resources

Please feel free to contact a member of T&J Panel with any design, installation or maintenance questions related to an LP Panel or Pressure Manifold system
Here you will find a pressure head table to help in flow design of your LP Panel system. These numbers are a guide to help you in selecting the right flow for your system. We have found that in most systems the 5/32" and 3/16" hole at 2 to 4 feet of head pressure works the best in giving a pump cycle of more than 5 minutes and keeps the same maximum top chamber flow load as sited on the previous page.

Flow Chart of Various Orifices and Pressure Heads

FLOW CHART OF VARIOUS ORIFICES AND HEAD PRESSURES

Head Pressure Ft.	Orifice Size 3/32" .094"	1/8" .125"	**5/32" .156"**	**3/16" .188"**	7/32" .219"	1/4" .250"	9/32" .281"	5/16" .313"	11/32" .344"	3/8" .375"
2.0	.15	.26	**.41**	**.59**	.80	1.04	1.32	1.63	1.97	2.34
2.1	.15	.27	**.42**	**.60**	.82	1.07	1.35	1.67	2.02	2.40
2.2	.15	.27	**.43**	**.61**	.84	1.09	1.38	1.71	2.07	2.46
2.3	.16	.28	**.44**	**.63**	.86	1.12	1.41	1.75	2.11	2.51
2.4	.16	.29	**.46**	**.64**	.87	1.14	1.44	1.78	2.16	2.57
2.5	.16	.29	**.46**	**.66**	.89	1.17	1.47	1.82	2.20	2.62
2.6	.17	.30	**.46**	**.67**	.91	1.19	1.5	1.86	2.25	2.67
2.7	.17	.30	**.47**	**.68**	.93	1.21	1.53	1.89	2.29	2.72
2.8	.17	.31	**.48**	**.69**	.94	1.23	1.56	1.93	2.33	2.77
2.9	.18	.31	**.49**	**.71**	.96	1.25	1.59	1.96	2.37	2.82
3.0	.18	.32	**.50**	**.72**	.98	1.28	1.62	1.99	2.41	2.87
3.1	.18	.32	**.51**	**.73**	.99	1.3	1.64	2.03	2.45	2.92
3.2	.19	.33	**.51**	**.74**	1.01	1.32	1.67	2.06	2.49	2.97
3.3	.19	.33	**.52**	**.75**	1.02	1.34	1.69	2.09	2.53	3.01
3.4	.19	.34	**.53**	**.76**	1.04	1.36	1.72	2.12	2.57	3.06
3.5	.19	.34	**.54**	**.78**	1.06	1.38	1.74	2.15	2.61	3.10
3.6	.20	.35	**.55**	**.79**	1.07	1.40	1.77	2.18	2.64	3.15
3.7	.20	.35	**.55**	**80**	1.09	1.42	1.79	2.21	2.68	3.19
3.8	.20	.36	**.56**	**.81**	1.10	1.44	1.82	2.24	2.72	3.23
3.9	.20	.36	**.57**	**.82**	1.11	1.46	1.84	2.27	2.75	3.27
4.0	.21	.37	**.58**	**.83**	1.13	1.47	1.87	2.30	2.79	3.32

GPM

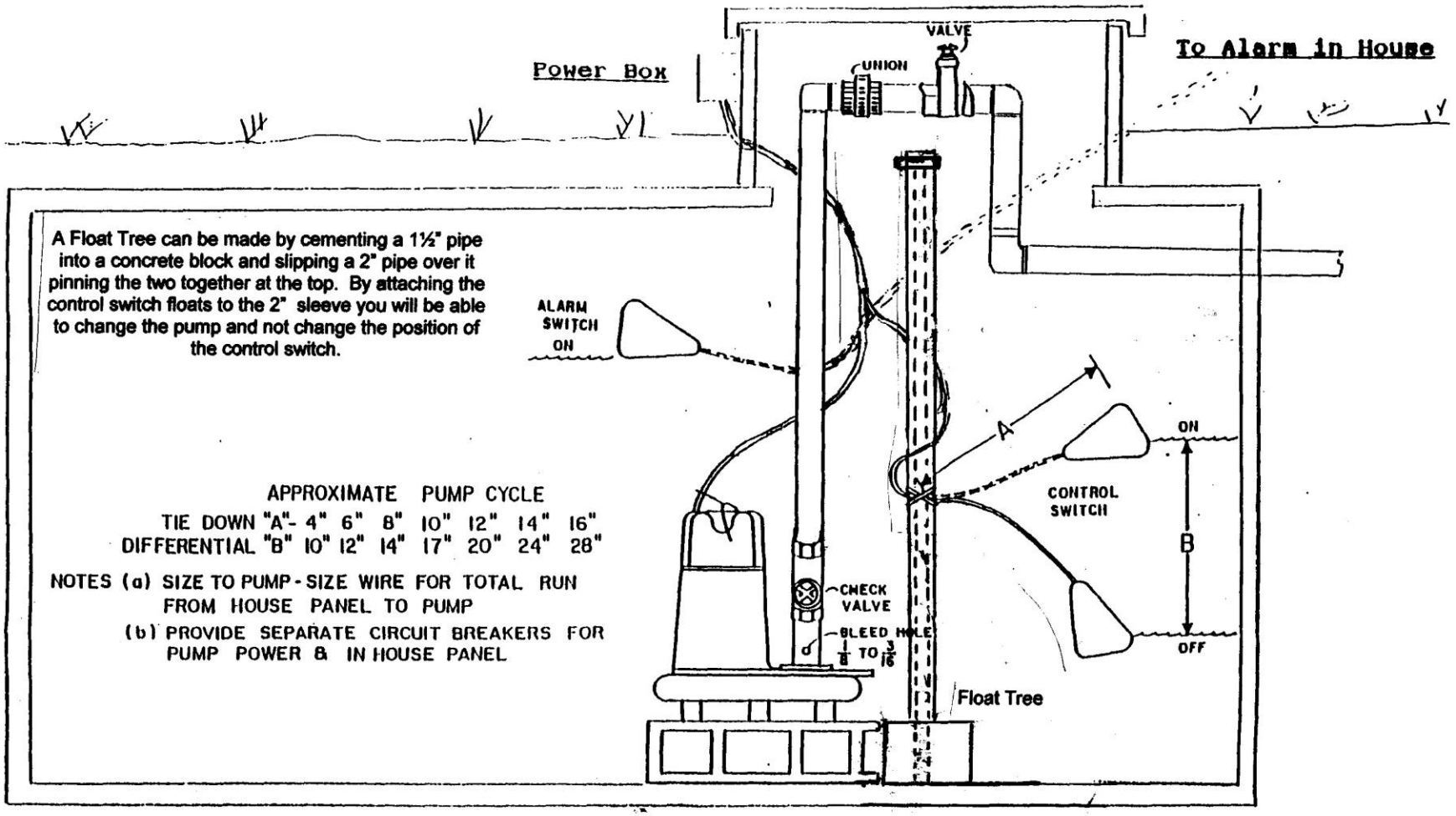
This chart will assist you in determining the proper tap sizes when you have to pump to a pressure manifold in a gravity system.

PRESSURE MANIFOLD TAP FLOW

Head	SCH 40		Tap Diameter	SCH 80	
Pressure ft.	1/2" 0.622	3/4" 0.824		1/2" 0.546	3/4" 0.742
2.0	7.11	12.50		5.48	10.10
2.1	7.29	12.80		5.62	10.40
2.2	7.46	13.10		5.75	10.60
2.3	7.63	13.40		5.88	10.90
2.4	7.79	13.70		6.00	11.10
2.5	7.95	14.00		6.13	11.30
2.6	8.11	14.20		6.25	11.50
2.7	8.26	14.50		6.37	11.80
2.8	8.62	14.80	**Gallons**	6.48	12.00
2.9	8.36	15.00	**per minute**	6.60	12.20
3.0	8.71	15.30		6.71	12.40
3.1	8.86	15.50		6.82	12.60
3.2	9.00	15.80		6.93	12.80
3.3	9.14	16.00		7.04	13.00
3.4	9.27	16.30		7.15	13.20
3.5	9.41	16.50		7.25	13.40
3.6	9.54	16.70		7.35	13.60
3.7	9.67	17.00		7.45	13.80
3.8	9.80	17.20		7.55	14.00
3.9	9.93	17.40		7.65	14.10
4.0	10.10	17.70		7.75	14.30

Below is a chart to aid in head selection due to friction loss in PVC pipe. In calculating friction, be sure to add 20% for loss in fittings. In the chart below, friction loss is per 100 feet of pipe. The head created by friction loss is added to the elevation head of lift from the bottom of the pump tank to the top of the highest turn-up.

Flow GPM	**Pipe Diameter**					
	1"	1 1/4"	1 1/2"	2"	3"	4"
		Friction Loss (100ft)				
1	.07					
2	.28	.07				
3	.60	.16	.07			
4	1.01	.25	.12			
5	1.52	.39	.18			
6	2.14	.55	.25	.07		
7	2.89	.76	.36	.10		
8	3.63	.97	.46	.14		
9	4.57	1.21	.58	.17		
10	5.5	1.46	.70	.21		
11		1.77	.84	.25		
12		2.09	1.01	.30	.07	
13		2.42	1.17	.35	.08	
14		2.74	1.33	.39	.09	
15		3.06	1.45	.44	.10	
16		3.49	1.65	.50	.11	
17		3.93	1.86	.56	.12	
18		4.37	2.07	.62	.16	
19		4.81	2.28	.68	.23	
20		5.23	2.46	.74	.30	
25			3.75	1.10	.39	
30			5.22	1.54	.48	
35				2.05	.58	.07
40				2.62	.81	.09
45				3.27	1.08	.12
50				3.98	1.38	.16
60					1.73	.21
70					2.09	.28
80						.37
90						.46
100						.55


Power Box
VALVE
UNION
To Alarm in House
A Float Tree can be made by cementing a 1½" pipe into a concrete block and slipping a 2" pipe over it pinning the two together at the top. By attaching the control switch floats to the 2" sleeve you will be able to change the pump and not change the position of the control switch.
ALARM SWITCH ON
A
ON
CONTROL SWITCH
B
OFF
APPROXIMATE PUMP CYCLE
TIE DOWN "A"- 4" 6" 8" 10" 12" 14" 16"
DIFFERENTIAL "B" 10" 12" 14" 17" 20" 24" 28"
NOTES (a) SIZE TO PUMP - SIZE WIRE FOR TOTAL RUN FROM HOUSE PANEL TO PUMP
(b) PROVIDE SEPARATE CIRCUIT BREAKERS FOR PUMP POWER & IN HOUSE PANEL
CHECK VALVE
BLEED HOLE 1/8 TO 3/16
Float Tree

Frequently Asked Questions

Q: **Can I Use Vertical and Horizontal Panels in the same system to overcome certain site or soil conditions?**
A: **YES**. Both styles are interchangeable can be used in combination.

Q: How do I calculate the amount of backfill sand for my drainfield?
A: To calculate the amount of backfill sand needed, use the equation: **LF x .17 = Tons Needed;** where LF is total linear feet of nitrification line.

Q: When designing a T&J Panel System, do lines need to be designed to certain lengths in order to make panels fit properly with 6-inch spacing between them?
A: NO, panels can be utilized in whatever line lengths are necessary for the design of a system. Spacing between the panels can be adjusted in order to make them fit into any given line length, so long as the proper number of panels are installed in that line.

Q: Does the Horizontal Panel system use more sand due to its 3-foot trench?
A: No, the cubic volume remains the same as Vertical Panel systems even though it is a 2-foot trench due to the lower trench profile.

Q: Should I consider a wider trench when installing a Vertical Panel System?
A: No, a 2-foot trench is vital in the distribution of effluent to the side walls and is key to keeping the aerobic treatment needed for breakdown.

Q: Why do Panel Block Systems have the longest lifespan on average of any system on the market:
A: The successful longevity of our system is primarily due to the fact that the storage capacity is **3X** that of a conventional system all while pretreating effluent and preserving the soil itself. This hydraulically allows the soil to accept effluent longer and in a much smaller footprint.

Q: What type of boards are used for installation and that are their purpose?
A: Any 1x4 or 1x6 board will work. Boards do not have to be treated because it will actually fossilize in the trench over time. The purpose of this board is for maintaining the level at time of installation.

Q: Do I need a certification from T&J Panels to be able to install the system?
A: No, you do not need a certification from T&J Panels to be able to install the system, but we recommend an install training from one our company representatives for your first-time installation.

Q: Why should I consider a Panel System?
A: You may consider using a panel system if you want a system with longevity, if you have future site needs (ex. pools, additional bedrooms, landscaping needs), to maximize your development potential, or if you value having a more environmentally friendly option.

T & J Panel Wastewater Treatment System

269 Marble Road
Statesville, NC 28625

Office: **704-924-8600**
Fax: **704-924-8681**

Website**: www.tjpanel.com**
Email: **info@tjpanel.com**

Limited Warranty:

The structural integrity of each T&J Panel, when installed in accordance with manufacturer's instructions, is warranted against defective materials and workmanship for one year from date of manufacture. Should a defect appear within the warranty period, purchaser must inform T&J Panel System of the defect before the warranty expires. T&J Panel System will supply a replacement unit. T&J Panel System's liability specifically excludes the cost of removal and/or installation of the panels. There are no other warranties with respect to the units, including no warranties of merchantability or of fitness for a particular purpose. The warranty does not extend to incidental, consequential, special or indirect damages. The company shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other loss or expense incurred by buyer. Specifically excluded from warranty coverage are: Damage to the panels due to ordinary wear and tear; alteration, accident, misuse, abuse or neglect of the panels; the panels being subjected to stresses greater than those prescribed in the installation instructions; the placement by buyer of improper materials into buyer's system; or any other event, not caused by the company. Furthermore, in no event shall the company be responsible for any loss or damage to the buyer, the panels or any third party resulting from its installation or shipment. Buyer shall be solely responsible for ensuring that installation of the system is completed in accordance with all applicable laws, codes, rules and regulations. Any alteration of this warranty must be noted as "Warranty" in writing by the company.

When Your Problem In On-site Is:

Topography and Vegetation

Special Landscaping Needs

Future Site Needs

Limited Suitable Area

Then consider a better quality effluent with T & J Panel