



Springfield Plastics, inc.

AG PRODUCT CATALOG



PROVIDING QUALITY FARM DRAINAGE PIPE SINCE 1978!

ABOUT SPI



Based in Auburn, Illinois, Springfield Plastics, Inc. is a Midwest manufacturer that has created plastic pipe solutions for people in the agricultural, residential/building, commercial and highway markets since 1978. Springfield Plastics, Inc. is the only U.S. manufacturer certified to use only 100% virgin resin in all products. Virgin resin provides peace of mind through the highest quality and consistency available in today's drainage market.

OUR HISTORY

Springfield Plastics, Inc. was started in 1978 by a group of local investors headed by Roy Baker, Wayne Baker and Glen Brandt. This group purchased the assets of a previous company with the same name from the bankruptcy court.

Wayne Baker, who was a drainage contractor at the time, was placed in charge of day-to-day operations. Wayne's background from agricultural drainage insisted that the company produce products that would stand up to the demanding farm drainage market. His experience from the early days of plastic drainage pipe also reinforced that the products be consistent from day to day. Roy, who had extensive investment experience, and Glen, who was the President of Brandt Fertilizer & Chemical, also assisted in the management of the new company. Steve Baker, Wayne's son and a CPA, was brought in to handle the finances for the company.

Wayne Baker retired in 1997 and Steve Baker took over the operations. The company has grown to become a leading Midwest manufacturer of corrugated plastic drainage pipe. Springfield Plastics, Inc. is proud to offer plastic pipe solutions for the agricultural, residential, commercial and highway markets.



WHY SPRINGFIELD PLASTICS, INC.?

Our goal is to provide a quality drainage system for our customers. We only use 100% virgin materials and the highest quality standards in the production of our drainage pipe in order to meet this goal. We also take great pride in our service. Our knowledgeable and trained staff is located in house to better serve you and your needs. Our customer service personnel will do whatever it takes to make the ordering process as simple as possible. They make every effort to know our customers and their individual needs and preferences. If technical assistance is needed, it is only a phone call away.



We have our own fleet of trucks and trailers and believe that deliveries should be accurate and on time. After all, schedules not suitable to the customer only lead to inefficiency.

QUALITY COMMITMENT

We take our commitment to providing quality drainage products very seriously. Part of this commitment is requiring the use of only 100% virgin materials in all of our drainage pipe and accessories. By requiring this, we provide peace of mind to our customers as they know they are receiving the highest quality and consistency available in today's drainage market.

We believe in this commitment to quality so strongly that an independent accountant was hired to audit and certify that we purchase and use 100% virgin materials in the manufacturing of our plastic drainage pipe and accessories.

Past users of Springfield Plastics, Inc.'s drainage pipe have always known of our commitment to quality and we thank you for your demands to provide it. If you've never used Springfield Plastics, Inc.'s drainage pipe, we welcome the opportunity to prove ourselves!



**THE ONLY U.S.
MANUFACTURER
CERTIFIED AS USING
ONLY 100% VIRGIN
MATERIAL
SINCE 2000**

CERTIFICATION LETTER



227 South Seventh Street
Springfield, Illinois 62701
217-525-1111
Fax 217-525-1120
www.espcpa.com

Independent Accountants' Report

To the Board of Directors and Customers of
Springfield Plastics, Inc.

We have examined management's assertion, that Springfield Plastics, Inc. complied with the requirement that 100% of the resin purchased during the year ended December 31, 2018 for use by Springfield Plastics, Inc. in the manufacture of its drainage pipe and fittings was virgin resin. Management is responsible for Springfield Plastics, Inc.'s compliance with this requirement. Our responsibility is to express an opinion on Springfield Plastics, Inc.'s compliance based on our examination.

Our examination was conducted in accordance with attestation standards established by the American Institute of Certified Public Accountants and, accordingly, included examining, on a test basis, evidence about Springfield Plastics, Inc.'s compliance with this requirement and performing such other procedures, as we considered necessary in the circumstances. We believe that our examination provides a reasonable basis for our opinion. Our examination does not provide a legal determination on Springfield Plastics, Inc. compliance with the specified requirement.

In our opinion Springfield Plastic, Inc. complied, in all material respects, with the requirement that 100% of the resin purchased during the year ended December 31, 2018 for use by Springfield Plastics, Inc. in the manufacture of its drainage pipe and fittings was virgin resin.

Eck, Schafer & Punke, LLP

Springfield, Illinois
March 14, 2019

SINGLE WALL PIPE

SINGLE WALL PIPE

Springfield Plastics, Inc. single wall pipe (SWP) is manufactured for underground drainage applications where soil supports the flexible walls. The use of single wall plastic pipe is only recommended where drainage water is free of debris and floating material. Its major use is to collect and convey drainage water by open gravity.

Springfield Plastics, Inc. SWP has proven effective for over 30 years in the agriculture industry. After installation water will move vertically and laterally through the soil until optimal soil moisture conditions are reached. A correctly designed system will not only guarantee that all of the surface water is removed in a timely fashion, but also that excess water in the soil profile can be removed to allow for bacteria growth and proper air movement.



Many farmers have reported an increase in the number of working days averaging 6-8 per year due to drainage. Some farmers claim their fields warm up fast enough and stay dry enough that they are provided with an extra 10-15 field work days in a single year.

Because everyone faces slightly different conditions, Springfield Plastics recommends using the state’s drainage guide to determine the best practices for each field. While an over designed system will cause everyone to incur unneeded expenses, an under designed system will take longer to drain and typically moves wet spots around in the field.

Single Wall Pipe Product Details	
Diameter: (in inches)	3, 4, 5, 6, 8, 10, 12, 15
Lengths:	Ranges from 10’ to 5400’
Perforation Type:	Slotted, Solid, Leach, Muck, Ultra Narrow Slotted
Coupler Style:	Split, Snap, Internal
Application:	Agriculture, Residential, Commercial, Highway



MAXI COILS

Did you know that how you handle maxi coils can save significant dollars in your tiling operation? The following analysis shows how you can put some additional dollars in your operation by using maxi coils that maximize the installers handling efficiency.

EXAMPLE

We will assume that the average contractor uses approximately 100 maxi coils per year. Springfield Plastics, Inc. maxi coils on average are 5% to 35% larger than most companies. This means that the same contractor using Springfield Plastics, Inc. coils versus another company would handle 5 to 35 more maxi coils per year. This obviously costs the contractor, but how much? Assuming handling an average of 15 less coils per year, how much would the contractor save? We have assumed a labor rate of \$25/hr.



Field Handling Time Per Maxi Coil
15 minutes x 15 maxi coils= \$93.75

3 Less Truckloads of Pipe to Meet and Assist in Unloading
3 truckloads x 2 men x ½ hr per truckload= \$75.00

Transport Time from Yard to Field if Coils are Dropped at Yard
15 coils x 1 man x 1 hour per coil= \$375.00

Lost Productivity Time in the Above Noted Jobs
21.75 hrs x \$60.00/hr (backhoe rate)= \$1,305.00

Administrative Time - 3 Additional Loads Have to be Ordered
and the Invoices Have to be Processed for Payment
3 truckloads x 1 hour per load= \$75.00

Job completion time - We have not attempted to put a dollar savings on the one or two times per year that you cannot finish a job because you ran short of material. This savings may be as much as all of the other dollar savings combined.

POTENTIAL SAVINGS EXAMPLE 1= \$1923.75

SWP INSTALLATION GUIDE

INSTALLATION GUIDE FOR CORRUGATED POLYETHYLENE DRAINAGE PIPE (SWP)

TRENCH CONSTRUCTION

Construction of the trench should begin at the drain outlet, which should be the lowest point and proceed up grade. The trench should be designed in such a way that the pipe can be laid in as straight a line as possible. The width of the trench at the top of the pipe should be the minimum required to permit installation with a minimum of 3 inches of clearance on either side of the pipe. For trenches wider than 6 inches on each side of the pipe, consideration should be given to special backfills to protect the pipe.

The pipe should be laid in an earth foundation cradle that is shaped to fit the lower part of the pipe. This cradle may be in the shape of a semi-circle, trapezoid or a 90-degree V-groove (see Fig. 1). This cradle provides side and bottom support to the lower part of the pipe and can be formed in a number of ways.

The most common method with a trenching machine or drainage plow is to attach a device on the front of the finishing shoe that will plow out the groove during the trenching operation. Another method that is commonly used is to manually shape a semi-circle in the bottom of the trench with a shovel. When a semi-circle groove is going to be used, the groove must conform to the outside diameter of the pipe and envelope. The groove shall be circular shaped so that 120 degrees of the pipe will rest in the groove with a maximum clearance of .5 inch around the circumference. If this groove is not achieved, there will be insufficient support and pipe deflection will increase. The V-groove is recommended for 3 to 6 inch diameter pipe and the semi-circle curved bottom is recommended for 8-inch diameters and larger. Under no circumstances can the pipe be laid in a trench bottom that is flat or have the necessary groove as described above.

If the drain is to be laid in a rock cut, the trench should be over excavated to a depth of 6 inches below grade. This area should then be filled with sand, gravel or fine soil tamped enough to provide firm foundation. The trench bottom should then be shaped as noted above and leveled to grade.

If the trench bottom is unstable, the loose soil or sand should be removed and replaced with a suitable material (i.e. processed gravel) at sufficient depth to provide a firm foundation for the pipe to sit on. This layer of foundation material will also act as an impervious mat into which the unstable soil will not penetrate.

If the trench walls are unstable, they may cave in and cause pipe failure. This problem may occur where excavation is below groundwater level or in saturated sand. Some means should be used to protect the pipe until it has been laid and properly blinded and backfilled.

INSTALLING THE PIPE

The rolls or lengths of pipe should be unrolled out along the trench so any bends in the pipe will straighten out. This is especially important in cold weather where the pipe has a tendency to recoil. The pipe should be free of clinging wet or frozen material so it can be laid on grade. Any couplings should be securely fastened to insure that the pipe sections do not pull apart when it is laid in the trench. The pipe can be laid manually into the trench or through the tile boot or shoe on the trencher. It is important that the pipe is laying in the groove in the trench. This insures the pipe is laid to grade and has the proper foundation. In hot weather care should be exercised in handling, so there is not stretching or pulling. The pipe can reach 100 to 150 degrees F on a hot bright day. The strength of the pipe decreases by about 40 to 50 percent when the pipe reaches this temperature. The pipe will regain its original strength when its temperature returns to that of the surrounding soil. This usually takes five minutes or less after installation.

BLINDING

Blinding is the placement of bedding material around and over the pipe. This bedding material should consist of loose mellow topsoil or other porous soil. All pipe should be blinded as soon as possible after installation to protect from ditch cave-ins and floating pipe. Sand should not be used as a bedding material unless non-perforated pipe or a filter envelope is installed on the pipe. Blinding with topsoil is not necessary when sand or gravel is the required backfill material.

There are a number of acceptable blinding methods. If a trencher is being used to install the pipe, a mechanical device can be installed to take spoil from the trencher and place it around and over the drain. The main advantage of this is that it blinds pipe immediately after laying it and reduces labor requirements. Another commonly used method is to manually blind the pipe with a shovel or spade. Whatever method of blinding is used it is important that the pipe remain in the groove until it is secured by the blinding. Careful soil placement on both sides of the pipe will provide good side support. No rocks, frozen soil chunks or other hard objects should be allowed to come into contact with the pipe. If you are installing pipe on a hot day, you should delay the blinding until the pipe reaches the soil temperature.

BACKFILLING

The backfilling should be done as soon as possible after installation or no later than the conclusion of each day's work. The end of the pipe should have an end plug installed in it. The backfill material should be placed in the trench in a manner that displacement of the pipe will not occur. It is preferable to place the material on an angle so that it flows down the front slope. Avoid large stones, frozen clods and heavy direct loads during backfill operations. Operators of heavy equipment should avoid putting the weight of the equipment on top of the trench.

SWP INSTALLATION GUIDE

REFERENCES

USDA - SCS Drain Code 606

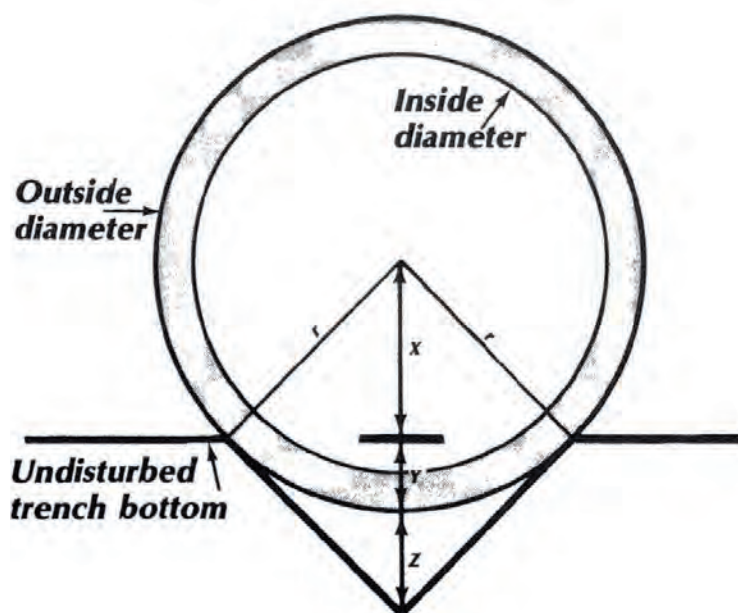
ASTM F449 - Installation of Corrugated Tubing for Agricultural Drainage

Illinois Drainage Guide

FIGURE 1 - DIMENSIONS FOR A 90-DEGREE V GROOVE

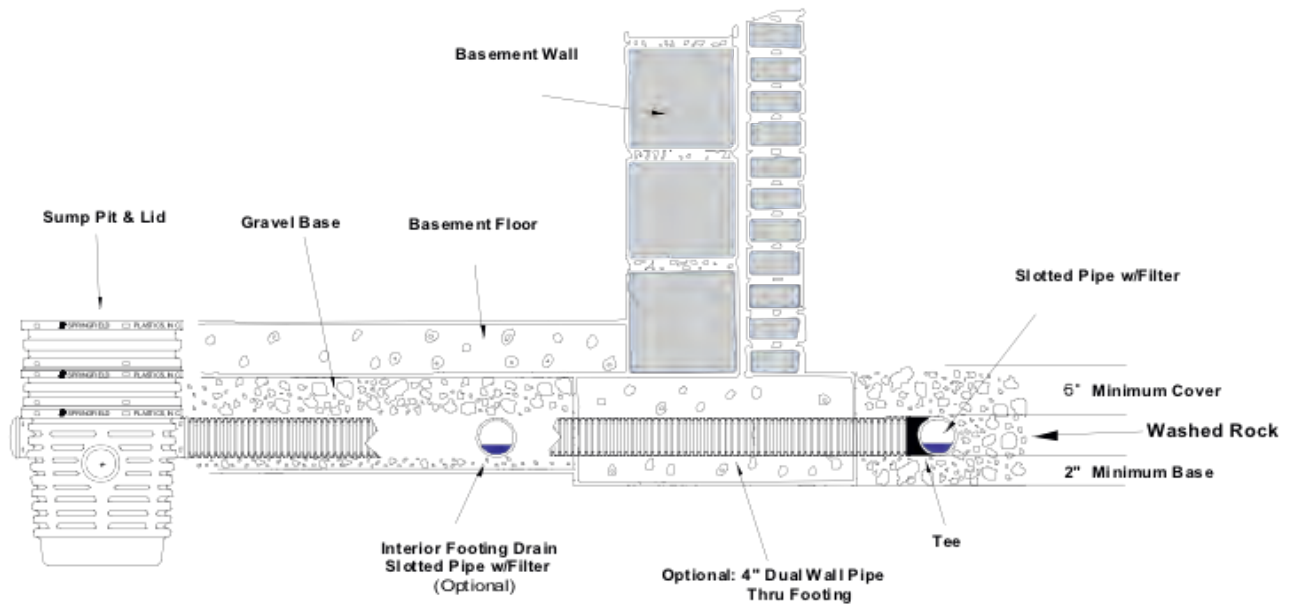
Diameter ^a (D)	r (D/2)	X (0.707r)	Y (0.293r)	Z (0.414r)
<i>inches</i>				
3	1.5	1.060	0.439	0.621
4	2.0	1.414	0.586	0.828
5	2.5	1.768	0.732	1.036
6	3.0	2.121	0.879	1.242
8	4.0	2.828	1.171	1.657

^aValues are based on typical outside diameters, which are assumed to be 20% greater than inside diameters.



Foundation Drain

SPI Foundation Drain Installation
Meets BOCA installation requirements



Downspout Drain



SINGLE-WALL DRAINAGE PIPE (SWP) TECHNICAL DATA

STANDARDS

Springfield Plastics, Inc. single-wall drainage pipe (SWP) is manufactured to the highest quality control standards using only the highest quality high density polyethylene. SPI single-wall pipe and fittings meets or exceeds all specifications when run to the following standards: ASTM F 405-13, ASTM F 667-12, AASHTO M 252, AASHTO M 294 and NRCS Conservation Practice Standard Code 606.

MATERIALS

Raw materials used in the manufacturing of single-wall pipe shall be high-density polyethylene conforming with all requirements of ASTM 3350. All SWP meets or exceeds the following cell classes for each standard:

Standard	Cell Class
ASTM F405-13	323410C
ASTM F667-12	323410C
AASHTO M252	424420C
AASHTO M294	424420C

As required by the above specifications, Springfield Plastics, Inc. uses only 100% virgin high-density polyethylene resin in the manufacturing of its drainage pipe and fittings. Only its own clean pipe or fitting rework material is used in SPI products; no regrind/recycled material enters SPI from outside its facility.

NTPEP APPROVAL

All SPI single-wall pipe manufactured to AASHTO M252 and M294 has been approved by the Federal Highway Administration’s National Transportation Product Evaluation Program (NTPEP). This program requires rigid adherence to quality control standards and procedures. Springfield Plastics is subjected to annual NTPEP reviews. Product approval certifications can be found at www.ntpep.org.

WORKMANSHIP

SPI single-wall pipe shall be homogenous throughout and free of foreign inclusions or visible defects. All SWP shall be uniform in color and free of internal obstructions, defective seams or mold parting lines. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusions or any other visible defects.

INSIDE DIAMETER

SPI single-wall pipe has a tolerance of +/- 1.5% of the specified inside diameter when measured in accordance with ASTM D2122.

PIPE STIFFNESS

SPI single-wall pipe will have a minimum pipe stiffness of 35 PSI (241 kPa) at 5% deflection when tested in accordance with ASTM D2412.

PIPE FLATTENING

SPI single-wall pipe will withstand 20% deflection with no evidence of buckling, cracking or splitting.

RESISTANCE TO EXTREME CONDITIONS

SPI single-wall pipe is tested for environmental stress cracking, high temperature strength and low temperature flexibility with no evidence of failure.

ELONGATION (STRETCH)

SPI single-wall pipe shall have a maximum elongation percentage of 5% when tested in accordance with applicable standards.

SPRINGFIELD PLASTICS OFFERS THE FOLLOWING SINGLE-WALL PRODUCTS:

Nominal Size	Solid	Regular Slotted	Ultra-Narrow Slotted	Leachfield/GLS	Muck	Filter Wrap
3"	X	X	X			X
4"	X	X	X	X	X	X
5"	X	X	X		X	X
6"	X	X	X		X	X
8"	X	X	X	X		X
10"	X	X	X	X		X
12"	X	X	X			X
15"	X	X	X			X

** Special Order production is available upon request/approval.*

** 4" SWP available in white; 5", 6", & 8" available in white upon special request.*

SWP TECH DATA

LENGTH

SPI single-wall pipe may be sold in any length agreeable to the end user. SWP length shall not be less than 99% of the stated quantity.

SPRINGFIELD PLASTICS SINGLE-WALL PIPE IS AVAILABLE IN THE FOLLOWING LENGTHS AND SIZES:

Nominal Size	Small Roll Lengths	Maxi Lengths	Stick Lengths
3"	100'	5400'	--
4"	100', 250'	3400'	10'
5"	150'	2250'	--
6"	100'	820', 1750'	--
8"	--	320', 500', 725', 975'	20'
10"	--	185', 350', 550'	10', 20'
12"	--	330'	20'
15"	--	160'	20'

MAXI COILS - LENGTHS PER WRAP (FT.)

		3"	4"	5"	6"	8"	10"	12"	15"
WRAPS	1	146	150	90	85	70	64	60	50
	2	328	305	220	200	175	187	170	160
	3	546	485	390	370	328	350	330	
	4	799	710	590	570	508	550		
	5	1089	970	815	810	725			
	6	1416	1280	1105	1085	975			
	7	1780	1620	1445	1405				
	8	2182	2015	1810	1750				
	9	2624	2455	2250					
	10	3098	2920						
	11	3614	3400						
	12	4169							
	13	4764							
	14	5400							

PERFORATIONS

Springfield Plastics pipe has cleanly cut and uniformly spaced rows of slots located along the pipe in the valleys between the corrugations.

Special perforations and configurations shall be permitted where required to meet the needs of the purchaser.

Nominal Size	Rows of Perforations	Perforations/ Row/Foot	Perforations/ Corrugation	Perforations/ Foot
3"	4	9	2	36
4"	8	9	4	72
5"	8	9	4	72
6"	8	9	4	72
8"	4	12	4	48
10"	4	9	4	36
12"	8	6	8	48
15"	8	4.5	8	36

** Specifications only apply to Regular Slotted & Ultra-Narrow Slotted Perforations.*

REGULAR SLOTTED PERFORATIONS:

Nominal Size	Target Perforation Length	Target Perforation Width	Target Opening/ Foot
3"	0.725"	0.0475"	1.24 in ²
4"	0.725"	0.0475"	2.48 in ²
5"	0.725"	0.0475"	2.48 in ²
6"	0.725"	0.0475"	2.48 in ²
8"	0.750"	0.0525"	1.90 in ²
10"	0.800"	0.0600"	1.73 in ²
12"	0.800"	0.0600"	2.30 in ²
15"	0.800"	0.0600"	1.73 in ²

SWP TECH DATA

ULTRA-NARROW SLOTTED PERFORATIONS:

Nominal Size	Target Perforation Length	Target Perforation Width	Target Opening/Foot
3"	0.550"	0.012"	0.238 in ²
4"	0.550"	0.012"	0.475 in ²
5"	0.550"	0.012"	0.475 in ²
6"	0.550"	0.012"	0.475 in ²
8"	0.550"	0.012"	0.317 in ²
10"	0.550"	0.020"	0.238 in ²
12"	0.550"	0.020"	0.317 in ²
15"	0.550"	0.020"	0.238 in ²

* Ultra-Narrow pipe does not meet the ASTM F667 minimum inlet area of 1 in²/ft.

LEACHFIELD

4" Leach bed pipe has two rows of 0.31" x 0.70" holes with each row located 30 degrees off the bottom centerline of the pipe. Holes will be 2.70" on center. This hole pattern yields eight holes per foot of pipe. Holes shall be staggered so there is at least one hole in every other corrugation. The top of all leachfield pipe is clearly marked with a yellow locating stripe.

GRAVEL-LESS LEACHFIELD

8" and 10" Gravel-less Leachfield (GLS) pipe has two rows of holes 3/8" in diameter located 120 degrees apart along the bottom half of the pipe. Each row of holes is 60 degrees up from the bottom center line of the pipe. Holes shall be staggered so there is at least one hole in each corrugation. GLS is encased in polyester filter fabric. The top of GLS pipe is clearly marked with a yellow locating stripe.

Nominal Size	Perforations/Foot	Target Perforation Diameter	Target Opening/Foot
4"	9	0.625"	2.77 in ²
8"	12	0.375"	1.33 in ²
10"	9	0.375"	1.00 in ²

MUCK

Muck pipe has four rows of openings evenly spaced around the circumference of the pipe. The hole pattern per linear foot is 4 holes in 2 rows and 5 holes in 2 rows, totaling 18 holes per foot of pipe. Following are specifications for each available size.

Nominal Size	Target Perforation Length	Target Perforation Width	Target Opening/ Foot
4"	0.700"	0.310"	3.90 in ²
5"	0.700"	0.310"	3.90 in ²
6"	0.700"	0.310"	3.90 in ²

FITTINGS

Fittings shall conform to the requirements of ASTM F405-13, ASTM F667-12, AASHTO M252, and AASHTO M294.

INSTALLATION

Springfield Plastics single-wall pipe shall be installed in accordance with ASTM F449 - Subsurface Installation of Corrugated Thermoplastic Tubing for Agricultural Drainage, Springfield Plastics installation guidelines and any applicable engineering specifications.

Leachfield pipe shall be installed in accordance with ASTM F481 - Standard Practice for Installation of Thermoplastic Pipe and Corrugated Pipe in Septic Tank Leach Fields.

REFERENCED STANDARDS

ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM F405 - Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings

ASTM F449 - Standard Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control

ASTM F481 - Standard Practice for Installation of Thermoplastic Pipe and Corrugated Pipe in Septic Tank Leach Fields

ASTM F667 - Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings

AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe (3"-10")

AASHTO M294 - Standard Specification for Corrugated Polyethylene Drainage Pipe (12"-60")

DUAL WALL PIPE

DUAL WALL PIPE

Springfield Plastics, Inc. dual wall pipe combines a corrugated outer wall for exceptional strength and a smooth inner wall for outstanding hydraulic characteristics. This allows the dual wall pipe to be buried as shallow as 1 foot and as deep as 50 feet with Class I backfill compacted to 90% Standard Proctor Density. Dual wall pipe, manufactured from tough high-density polyethylene, is highly inert and resists rust and corrosion better than competitor materials.

The use of dual wall plastic pipe is recommended where discharge water contains floating debris and materials. The primary use of dual wall pipe is to convey water for underground non-pressure applications, such as storm sewers, highway underdrains, drainage outlets, roadway culverts and farm drainage main lines. Other uses include underground conduits for telephone, electrical and television cables.



Installation: Installation of DWP is easier because it is easier to handle than traditional materials. For example, 12" DWP weighs 3.4 lbs per foot compared to 10.5 lbs for corrugated metal and 79 lbs for concrete. In some cases this means you can use smaller equipment. DWP can be coupled together with split couplers or snap couplers. 12", 15", 18", 21" and 24". All sizes of dual wall pipe are available with bell ends.

PROPERTIES:

- Easier to Handle than Traditional Materials
- Excellent Flow Characteristics
- Chemical and Corrosive Resistant
- No Brittleness in Cold Temperatures

Dual Wall Pipe Product Details	
Diameter: (in inches)	4, 6, 8, 10, 12, 15, 18, 21, 24, 30, 36, 42, 48
Lengths:	Various. See technical data sheet for specific sizes
Color:	Black
Filter Wrap Available:	Yes
Application:	Agriculture, Residential, Commercial, Highway



DWP INSTALLATION GUIDE

INSTALLATION GUIDE FOR CORRUGATED DUAL-WALL POLYETHYLENE PIPE (DWP)

SCOPE

This guide provides recommendations for the installation of corrugated dual wall polyethylene pipe used in gravity flow storm sewers and subsurface drainage applications. This guide is for use by designers and specifiers, installation contractors, regulatory agencies, owners, and inspection organizations that are involved in the construction of storm sewers and other gravity-flow drainage applications. This guideline does not eliminate the need for engineering analysis of each job. The recommendations made herein may require modification upon the completion of such analysis.

This installation guide does not address all of the safety problems, if any, associated with its use. It is the user's responsibility to determine the appropriate safety and health practices associated with the use of this product and insure compliance on each job.

TRENCH EXCAVATION

Excavate trenches to ensure that sides will be stable under ALL working conditions. Slope trench walls or provide supports for the walls in conformance with all local and national standards for safety. The trench should be backfilled as soon as possible, but not later than the end of each workday. Pipe should not be laid or embedded in standing or running water.

Surface water should be prevented from entering the trench and the trench should be dewatered when necessary to maintain stability. Trench bottoms containing rock, soft areas of muck or other material needs to be removed and replaced with a suitable material.

When a trench groove is going to be used, the groove must conform to the outside diameter of the pipe and envelope. The groove shall be circular shaped so that 140 degrees of the pipe will rest in the groove with a maximum clearance of .5 inch around the circumference. If this groove is not achieved, there will be insufficient support and pipe deflection will increase. The use of the groove does not eliminate the requirement for the proper initial and final backfills. The minimum trench width to be used when a trench groove is used will be the outside diameter of the pipe plus 3 inches on each side of the pipe.

When a trench groove is not going to be used and trench walls are stable or supported, provide a width sufficient, but no greater than necessary, to ensure working room to properly and safely place and compact haunching and other embedment materials. The minimum width shall be not less than the greater of either the

DWP INSTALLATION GUIDE

pipe outside diameter plus 16 in. (400 mm) or the pipe outside diameter times 1.25, plus 12 in. (300 mm). If mechanical compaction of the fill material is required, the space between the pipe and the trench wall must be wider than the compaction equipment used in the pipe zone. If there is not enough room for fine material to fill alongside the pipe then a wider trench should be considered or special bedding material provided.

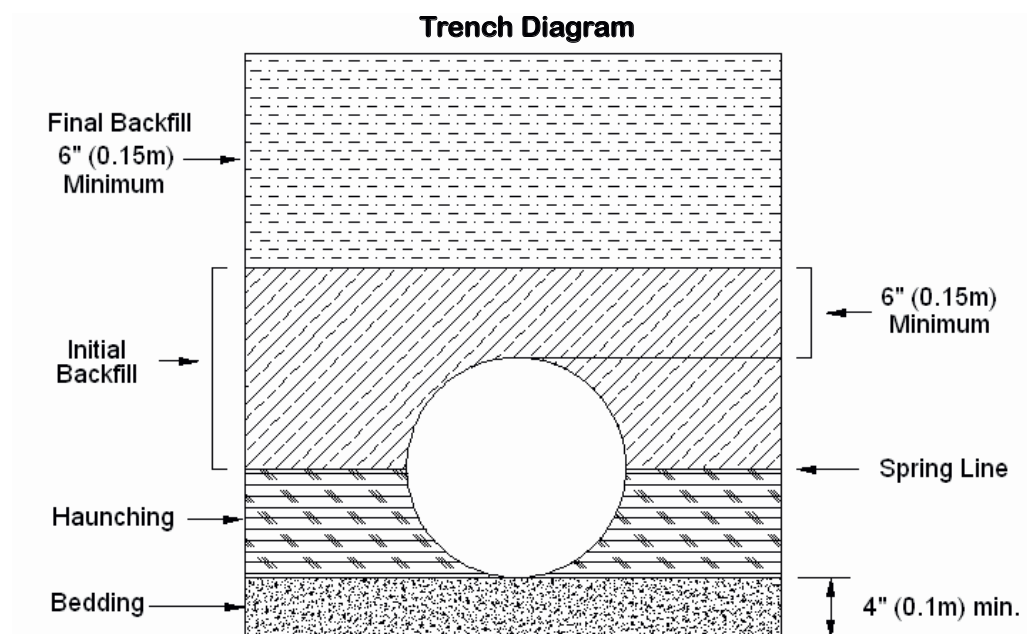
Supports may be used to maintain the trench sidewalls throughout the installation; the supports should be tight enough to prevent washing out of the trench walls from behind the supports. Unless specified by the engineer supports should be left in place as long as support is necessary in that region. When removing trench supports the pipe and the embedment material should not be disturbed, this also holds true for movable trench supports.

BEDDING

A layer of bedding will create a consistent surface free of unstable or unsuitable materials. The trench should be excavated to allow for a minimum of a 4" bedding layer, unless otherwise specified. It may be necessary to excavate additional trench to provide more bedding in situations where unstable or spongy trench bottoms are encountered. The bedding shall be done with Class I non-compacted materials or Class II materials compacted to 85% Proctor Density. Materials and descriptions appropriate for bedding may be found in the table 1 below.

PIPE JOINING

Pipe should be placed into the trench and connected together in a manner that will not damage the structural integrity of the pipe or compromise the joint itself. When a gasket is used it should be lubricated with a lubricant prior to joining the pipes together. The spigot end should be inserted manually to insure the proper alignment and a machine may be required to finish pushing the pipes together. The receiving pipe must be sufficiently anchored to handle the force of the pipe fitting into the bell. An installation stub or power ram should be inserted into the bell of the 2nd pipe to push the pipes together. This will reduce the chances of damage by pushing against the pipe with the machine. The spigot end should be pushed into the pipe until the Home Position (painted dot on corrugation) is just on the outside of the bell. Attempting to push Home position into the bell will result in damaging the pipe and the bell. If the joint does not completely connect, take the pipe apart, clean the bell and spigot and attempt it again.



BACKFILL: HAUNCHING

The haunching is the most important part of the installation process since it provides the primary support for the soil and traffic loadings. Haunching should be placed in maximum 6" layers uniformly on both sides of the pipe. Tamp or ram to achieve the specified compaction. If the material does not require compaction shovel into the area, eliminating voids. Construction of each layer should be repeated up to the spring-line. The haunching may be done with Class I non-compacted materials or Class II materials compacted to 90% proctor density. (See Table 1 for material specifications).

INITIAL BACKFILL

Initial backfill extends from the spring-line to a minimum of 6" above the crown of the pipe. This area of the backfill anchors the pipe and ensures that loads are distributed as evenly as possible into the haunching. When compacting, it is important to avoid using equipment directly on the pipe itself. Initial backfill may be done with non-compacted Class I materials or Class II materials compacted to 90% proctor density.

FINAL BACKFILL

The final backfill extends from the initial backfill to the surface. It does not support the pipe, but plays an important role in allowing the load to be distributed over the pipe. Compaction of this area is recommended if live load such as a roadway or equipment movement will be over the pipe trench to prevent pavement settlement. The final backfill can be done with a Class I material and Class II material compacted to the engineer's specifications. The native material excavated as well as classes III or IV backfill materials will need to be reviewed by the engineer before they may be used as a final backfill material.

DWP INSTALLATION GUIDE

COVER LIMITATIONS

The minimum cover in trafficked areas is 1ft. above the crown. Pavement layers may sometimes be included as part of minimum cover. For flexible pavement the paving equipment load and the amount of cover over the pipe must be considered in determining if the pipe can support the resultant load.

Minimum cover calculations for flexible pavement are measured from the top of the pipe to the bottom of the pavement section. Minimum cover calculated for rigid pavement is measured from the top of the pipe to the top of the pavement section.

TABLE 1: CLASSES OF EMBEDMENT AND BACKFILL MATERIALS

Soil Group ^{A,B}	Soil Class	American Association of State Highway and Transportation Officials (AASHTO) Soil Groups ^C
Crushed rock, angular ^D : 100% passing 1-1/2in. sieve, $\leq 15\%$ passing #4 sieve, $\leq 25\%$ passing 3/8in. sieve and $\leq 12\%$ passing #200 sieve	Class I
Clean, coarse grained soils: SW, SP, GW, GP or any soil beginning with one of these symbols with $\leq 12\%$ passing #200 sieve ^{E,F}	Class II	A1,A3
Coarse grained soils with fines: GM, GC, SM, SC, or any soil beginning with one of these symbols, containing $> 12\%$ passing #200 sieve; Sandy or gravelly fine-grained soils: CL, ML, or any soil beginning with one of these symbols, with $\geq 30\%$ retained on #200 sieve	Class III	A-2-4, A-2-5, A-2-6, or A-4 or A-6 soils with more than 30% retained on #200 sieve
Fine-grained soils: CL, ML, or any soil beginning with one of these symbols, with $< 30\%$ retained on #200 sieve	Class IV	A-2-7, or A-4, or A-6 soils with 30% or less retained on #200 sieve
MH, CH, OL, OH, PT	Class V Not for use as embedment	A5, A7

^A See Classification D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
^B Limits may be imposed on the soil group to meet project or local requirements if the specified soil remains within the group. For example, some project applications require a Class I material with minimal fines to address specific structural or hydraulic conditions and the specification may read "Use Class I soil with a maximum of 5% passing the #200 sieve."
^C AASHTO M145, Classification of Soils and Soil Aggregate Mixtures.
^D All particle faces shall be fractured.
^E Materials such as broken coral, shells, and recycled concrete, with $\leq 12\%$ passing a No. 200 sieve, are considered to be Class II materials. These materials should only be used when evaluated and approved by the Engineer
^F Uniform fine sands (SP) with more than 50% passing a No. 100 sieve (0.006 in., 0.15 mm) are very sensitive to moisture and should not be used as backfill unless specifically allowed in the contract documents. If use of these materials is allowed, compaction and handling procedures should follow the guidelines for Class III materials.

DUAL-WALL DRAINAGE PIPE (DWP) TECHNICAL DATA

STANDARDS

Springfield Plastics, Inc. dual-wall drainage pipe (DWP) is manufactured to the highest quality control standards using only the highest quality high density polyethylene. SPI dual-wall pipe meets or exceeds all specifications when run to the following standards: ASTM F 2648, ASTM F 2306, AASHTO M252 and AASHTO M294.

MATERIALS

Raw materials used in the manufacturing of dual-wall pipe shall be high-density polyethylene conforming with all requirements of ASTM 3350. All DWP meets or exceeds the following cell classes for each standard:

Standard	Sizes	Cell Class
ASTM F 2648	4" - 10"	424400C
	12" - 24"	435400C
ASTM F 2306	12" - 24"	435400C
AASHTO M 252	4" - 10"	424420C
AASHTO M 294	12" - 24"	435400C

As required by the above specifications, Springfield Plastics, Inc. uses only 100% virgin high-density polyethylene resin in the manufacturing of its drainage pipe and fittings.

NTPEP APPROVAL

All SPI dual-wall pipe manufactured to AASHTO M252 and M294 has been approved by the Federal Highway Administration's National Transportation Product Evaluation Program (NTPEP). This program requires rigid adherence to quality control standards and procedures. Springfield Plastics is subjected to annual NTPEP reviews. Product approval certifications can be found at www.ntpep.org.

WORKMANSHIP

SPI dual-wall pipe shall be homogenous throughout and free of foreign inclusions or visible defects. All DWP shall be uniform in color and free of internal obstructions, defective seams or mold parting lines. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusions, delamination or any other visible defects.

DWP TECH DATA

INSIDE DIAMETER

The average inside diameter of SPI dual-wall pipe shall not vary more than $\pm 1\%$ from the specified inside diameter when measured in accordance with ASTM D2122.

PIPE STIFFNESS

SPI dual-wall pipe shall have a minimum pipe stiffness (psi) at 5% deflection as specified in Table 1 when tested in accordance with ASTM D2412.

PIPE FLATTENING

SPI dual-wall pipe shall withstand 20% deflection with no evidence of buckling, cracking, splitting or delamination.

RESISTANCE TO EXTREME CONDITIONS

SPI dual-wall pipe is tested for environmental stress cracking, high/low temperature strength with no evidence of failure.

INNER WALL (LINER)

SPI dual-wall pipe shall have a minimum inner-liner thickness as specified in Table 1 when measured in accordance with ASTM D2122. There shall be no delamination or separation of the inner liner and the profile.

LENGTH

SPI dual-wall pipe shall not be less than 99% of the stated length when measured in accordance with ASTM D2122.

HYDRAULICS

The recommended Manning "n" to be used for engineering purposes shall be .012.

BURIAL DEPTH

SPI dual-wall pipe can be buried as shallow as 1 foot and as deep as 50 feet with Class 1 backfills compacted to 90 percent Standard Proctor Density in accordance with ASTM D2321 and industry recommended procedures. Greater burial depths may be achieved with compacted backfills.

SPI dual-wall pipe will withstand H2O loads.

JOINTS

SPI dual-wall pipe is manufactured with two types of joints and also as plain-end sticks. Bell and spigot pipe with no gasket is for soil-tight applications.

The water-tight and silt-tight joint is referred to as TufCor Tight. This pipe will meet water-tight and silt-tight requirements of ASTM 2306 and the gaskets will meet the requirements of ASTM F477.

INSTALLATION

SPI dual-wall pipe shall be installed in accordance with ASTM D2321, ASTM F449, Springfield Plastics guidelines or project engineer specifications.

TABLE 1

Nominal Size	Stick Lengths	Outside Diameter	5% Deflection Minimum	Manning "n"	Inner Liner Minimum Thickness
4"	20'	4.678"	50 psi	0.012	0.020"
6"	20'	6.848"	50 psi	0.012	0.020"
8"	10', 20'	9.394"	50 psi	0.012	0.024"
10"	10', 20'	11.720"	50 psi	0.012	0.024"
12"	6', 8.5', 20'	14.508"	50 psi	0.012	0.035"
15"	6', 8.5', 20'	18.225"	42 psi	0.012	0.040"
18"	6', 8.5', 20'	21.349"	40 psi	0.012	0.051"
21"	6', 8.5', 20'	24.759"	38 psi	0.012	0.060"
24"	6', 8.5', 20'	27.681"	34 psi	0.012	0.060"

Pipe Coefficients in Manning's "n" Values			
Pipe Diameters (in)	SPI DWP	Concrete Pipe	Corrugated Metal Pipe
4, 6, 8, 10, 12, 15, 18, 21, 24	.010 - .012	.011 - .015	.022 - .026

PERFORATIONS

SPI dual-wall pipe perforations shall be cleanly cut/drilled and uniformly spaced along the length and circumference of the pipe in the valleys between the corrugations. Perforation dimensions and the water inlet area shall be as listed in Table 2.

Special perforations and configurations shall be permitted where required to meet the needs of the purchaser.

TABLE 2

ID	Perforation Type	Rows of Perforations	Perforations/ Row/Foot	Perforations/ Valley	Perforations/ Foot	ID	Perforation Width	Perforation Length	Total Opening/ Foot (in ²)
4"	Slots	4	9	2	36	4"	0.050	0.75	1.35
6"	Slots	4	9	2	36	6"	0.050	0.75	1.35
8"	Slots	4	12	4	48	8"	0.052	0.75	1.87
10"	Slots	4	9	4	36	10"	0.060	0.80	1.73
12"	Holes	8	6	8	48	12"	0.312	0.312	4.67
15"	Holes	8	4.5	8	36	15"	0.312	0.312	3.50
18"	Holes	8	3.75	8	30	18"	0.312	0.312	2.92
21"	Holes	8	3	8	24	21"	0.312	0.312	2.34
24"	Holes	8	3.75	8	30	24"	0.312	0.312	2.92

REFERENCED STANDARDS

ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM F449 - Standard Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control

ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

ASTM F2648 - Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications

ASTM F2306 - Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe (3"-10")

AASHTO M294 - Standard Specification for Corrugated Polyethylene Drainage Pipe (12"-60")

FITTINGS

FITTINGS

INTERNAL COUPLERS



Internal Coupler Product Details

Product	Size (in inches)
3601	3"
4601.5	4"
5601	5"
6601	6"
8601	8"
10601	10"

SPLIT COUPLERS



Split Coupler Product Details

Product	Size (in inches)
4600	4"
5600	5"
6600	6"
8600	8"
10600	10"
12600	12"
15600	15" (SWP)
15601	15" (DWP)
18600	18"
21600	21"
24600	24"

SNAP COUPLERS



Snap Coupler Product Details

Product	Size (in inches)
4602	4"
6602	6"
8602	8"
10602	10"
12602	12"
15602	15"
18602	18"

TEES



Tees Product Details

Product	Size (in inches)
5604	5" x 5"
8604	8" x 8"
3605	3"
4605	4"
5605	5" x 5" x 4"
6605	6" x 6" x 6" x 5" x 4"
8605	8" x 6" x 5" x 4"
10605	10" x 8" x 6" x 5" x 4"
12605	12" x 10" x 8"
6606	6" x 6" x 6"
12606	12" x 12" x 12"

TRIPLE BLIND TEES



Triple Blind Tees Product Details

Product	Size (in inches)
4607	4"
5607	5" x 4"
6607	6" x 6" x 6" x 5" x 4" x 3"
8607	8" x 6" x 5" x 4"
10607	10" x 8" x 6" x 5" x 4"
12607	12" x 10" x 8"

TAP TEES



Tap Tees Product Details

Product	Size (in inches)	Description
3606	3"	Short (6"/8")
4606	4"	Short (6"/8")
5606	5"	Short (10"/12")
4608	4"	Long (10"/12")
5608	5"	Long (15"/18")
6608	6"	Short (15"/18"/24")
6609	6"	Long (30"/36")

FITTINGS

REDUCERS



Reducers Product Details

Product	Size (in inches)
4615	4" x 3"
6615	6" x 5" x 4"
8615	8" x 6"
10615	10" x 8"
12615	12" x 10"
18615	18" x 15"
15616	15" x 12" x 10"

INTERNAL REDUCERS



Internal Reducers Product Details

Product	Size (in inches)
5616	5" x 4"
6617	6" x 5"

CLAY ADAPTERS



Clay Adapters Product Details

Product	Size (in inches)
4620	4"
5620	5"
6620	6"
8620	8"
10620	10"
12620	12"
15620	15"
18620	18"
24620	24"

END PLUGS



End Plugs Product Details

Product	Size (in inches)
3613	3"
4613	4" Blue
4613.5	4" Red
5613	5"
6613	6"

SNAP END CAPS



Snap End Caps Product Details

Product	Size (in inches)
3612	3"
4612	4"
5612	5"
6612	6"
8612	8"
10612	10"
12612	12"
15612	15"
18612	18"
24612	24"

WYES



Wye Fitting Product Details

Product	Size (in inches)
3610	3"
4610	4"
5610	5"
6610	6"
8610	8"

FITTINGS

ELBOWS



90° Elbows Product Details

Product	Size (in inches)
3625	3"
4625	4"

DOWNSPOUT ADAPTERS



Downspout Adapters Product Details

Product	Size (in inches)
4630	2" x 3" x 4"

OFFSET DOWNSPOUT ADAPTERS



Offset Downspout Adapters Product Details

Product	Size (in inches)
3630	2" x 3" x 3"
4629	2" x 3" x 4"
4631	3" x 4" x 4"
6630	4" x 6" x 6"

DUAL WALL PIPE FITTINGS

DWP TOTALLY OPEN PLAIN END TEES



DWP Totally Open Plain End Tees Product Details

Product	Size (in inches)
6645	6" x 6" x 6"
8645	8" x 8" x 8"
10645	10" x 10" x 10"
12645	12" x 12" x 12"
15645	15" x 15" x 15"
18645	18" x 18" x 18"
21645	21" x 21" x 21"
24645	24" x 24" x 24"

90° PLAIN END ELBOWS



90° Plain End Elbows Product Details

Product	Size (in inches)
6637	6"
8637	8"
10637	10"
12637	12"
15637	15"
18637	18"
21637	21"
24637	24"

45° PLAIN END ELBOWS



45° Plain End Elbows Product Details

Product	Size (in inches)
6638	6"
8638	8"
10638	10"
12638	12"
15638	15"
18638	18"
21638	21"
24638	24"

DUAL WALL PIPE FITTINGS

22 1/2° PLAIN END ELBOWS



22 1/2° Plain End Elbows Product Details

Product	Size (in inches)
6639	6"
8639	8"
10639	10"
12639	12"
15639	15"
18639	18"
21639	21"
24639	24"

TUFCOR TIGHT DWP (B X S X B) TEES



TufCor Tight DWP (B x S x B) Tees Product Details

Product	Size (in inches)
12655	12"
15655	15"
18655	18"
21655	21"
24655	24"
30655	30"
36655	36"

90° (B X S) ELBOWS



90° (B x S) Elbows Product Details

Product	Size (in inches)
12650	12"
15650	15"
18650	18"
21650	21"
24650	24"
30650	30"
36650	36"

45° (B X S) ELBOWS



45° (B x S) Elbows Product Details

Product	Size (in inches)
12651	12"
15651	15"
18651	18"
21651	21"
24651	24"
30651	30"
36651	36"

22 ½° (B X S) ELBOWS



22 ½° (B x S) Elbows Product Details

Product	Size (in inches)
12652	12"

ACCESSORIES

ACCESSORIES

RUBBER COUPLERS



Rubber Couplers Product Details

Product	Size (in inches)
4635	4" DWP x SDR 35
4767	4" SDR 35 x SDR 35
6767	6" SDR 35 x SDR 35
6634	6" DWP x 6" DWP
6635	6" DWP x 6" SDR 35
6636	6" DWP x 4" SDR 35
8635	8" DWP x SDR 35
8636	8" DWP x 8" DWP
10635	10" DWP x 10" SDR
10636	10" DWP x 10" DWP
12635	12" DWP x 12" SDR 35
12636	12" DWP x 12" DWP
15636	15" DWP x 15" DWP
18636	18" DWP x 18" DWP
21636	21" DWP x 21" DWP
24635	24" DWP x 24" DWP

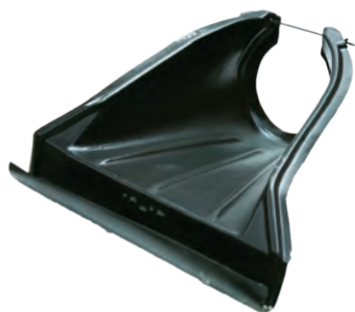
MAR MAC POLYSEAL PIPE COUPLERS



Mar Mac Polyseal Pipe Couplers Product Details

Product	Size (in inches)
12750	12"
15750	15"
18750	18"
24750	24"
30750	30"
36750	36"
42750	42"
48750	48"

HDPE FLARED END SECTIONS



HDPE Flared End Sections Product Details

Product	Size (in inches)
12860	12/15"
18860	18"
24860	24"
30860	30/36"

ACCESSORIES

RISERS



Risers Product Details

Product	Size (in inches)	Description
6853	6"	Top Precision
6854	6"	Bottom Precision
6855	6"	Tee Precision
8853	8"	Top Precision
8854	8"	Bottom Precision
8855	8" / 10"	Tee Precision
10853	10"	Top Precision
10854	10"	Bottom Precision
12849	12"	Top HB
12850	12"	Bottom HB
12851	12"	Tee HB

RESTRICTORS



Restrictors Product Details

Product	Size (in inches)
6856	6" Stepped
6857	6" Flat
8856	8" Flat
10856	10" Flat

TRASH GUARDS



Trash Guards Product Details

Product	Size (in inches)
6804	6" (Precision, HB, Pipe)
8804	8" (Precision, HB)
8805	8" (Pipe)
10804	10" (Precision, HB)
10805	10" (Pipe)
12804	12" (Precision, HB)
12805	12" (Pipe)
15804	15" (Pipe)
18804	18" (Pipe)
24804	24" (Pipe)
30804	30" (Pipe)
36804	36" (Pipe)

OUTLET RAT GUARDS



Outlet Rat Guards Product Details

Product	Size (in inches)
4800	4" Aluminum
6800	6" Aluminum
8800	8" Aluminum
10800	10" Aluminum
12800	12" Aluminum
15800	15" Aluminum
18800	18" Aluminum
21800	21" Aluminum
24800	24" Aluminum
36800	36" Zinc Coated

ROUND DROP-IN GRATES



Round Drop-in Grates Product Details

Product	Size (in inches)
9304	4" Aluminum
9306	6" Aluminum
9308	8" Aluminum
9310	10" Cast-Iron
9312	12" Cast-Iron
9315	15" Cast-Iron
9318	18" Cast-Iron
9324	24" Cast-Iron

ANTI-SEEP PLATES

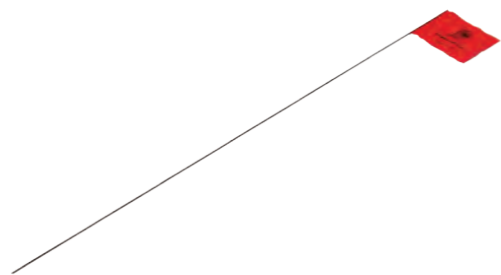


Anti-Seep Plates Product Details

Product	Size
1890	4' x 8'
1891	5' x 10'
1893	4' x 4'
1894	5' x 5'

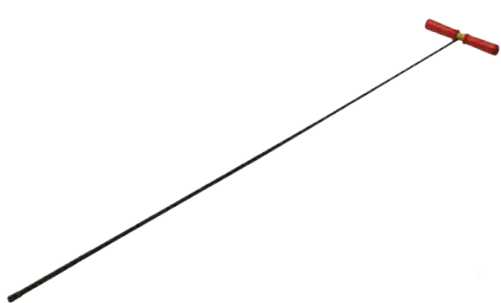
ACCESSORIES

TILE FLAGS



Tile Product Details	
Product	Description
1875	Tile Flags - Red

TILE PROBES



Tile Probes Product Details	
Product	Description
1880	4"
1881	4.5"
1882	5"
1883	5.5"
1884	6"
1886	Tile Probe Tips

TILE CUTTERS



Tile Cutters Product Details	
Product	Description
1885	Medium
1885.5	Large

TILE TAPE



Tile Tape Product Details

Product	Description
1827	2" x 100' - Black

PLASTIC TIES



Plastic Ties Product Details

Product	Description
1835	8" - 15"
1836	18" - 36"

SUMP PIT



Sump Pit Product Details

Product	Descriptions
1822	Sump Extensions
1823	18" x 24" Perforated
1824	18" x 24"
1825	18 Sump Lid CR
1826	18 Sump Lid CR Solid

ACCESSORIES

GEOTEXTILE FABRIC



Geotextile Fabrics Product Details	
Product	Size
1896	12'6" x 360' (4.0 oz)
1898	15' x 300' (4.0 oz)
1902	15' x 300' (7.0 oz)
1900	Geotextile Fabric Pins (100/box)

DWP INLINE WATER LEVEL CONTROL STRUCTURES

(See page 47 for complete description)



DWP Inline Water Level Control Structures Product Details	
Product	Size
20806	8' x 6"
20808	8' x 8"
20810	8' x 10"
20812	8' x 12"
20815	8' x 15"

Structures are available in any lengths and diameters of pipe.

MANAGED DRAINAGE

For the past 40 years, the agriculture industry has used plastic pipe as a drainage solution. Using plastic drainage pipe systems has allowed producers to improve crop yields in areas that were not able to produce as much in the past because of poor drainage. The ever-growing need for more food to feed the world's population coupled with unpredictable weather patterns will continue to motivate the producer to lessen the risk of crop failure due to poor drainage. Simultaneously, these same producers have increased the use of fertilizers. The combination of the increase in fertilizers and drainage intensity has created an unintended consequence - nutrient enriched discharges from the drainage tile lines. Springfield Plastics, Inc., in conjunction with the Agricultural Drainage Management Coalition (ADMC), is now tackling this issue head on by evaluating technologies that will address the nutrient enriched discharges. These technologies are all under the broad term known as "managed drainage".

Managed drainage is simply a method that manages the discharge from a subsurface drainage system. The Golden Rule of Drainage is to only release the amount of water necessary to allow field operations and enable oxygen to reach the plant roots. Any drainage that does more than the golden rule risks discharging excess nutrients into the environment. The common held perception that drainage is just about "getting water away" needs to shift now to how to better manage the drainage of water.

Managed drainage is not a one-solution effort. There are currently three types of technologies in managing drainage: drainage water management systems, bioreactors and saturated buffer strips.

DRAINAGE WATER MANAGEMENT SYSTEMS (DWM)

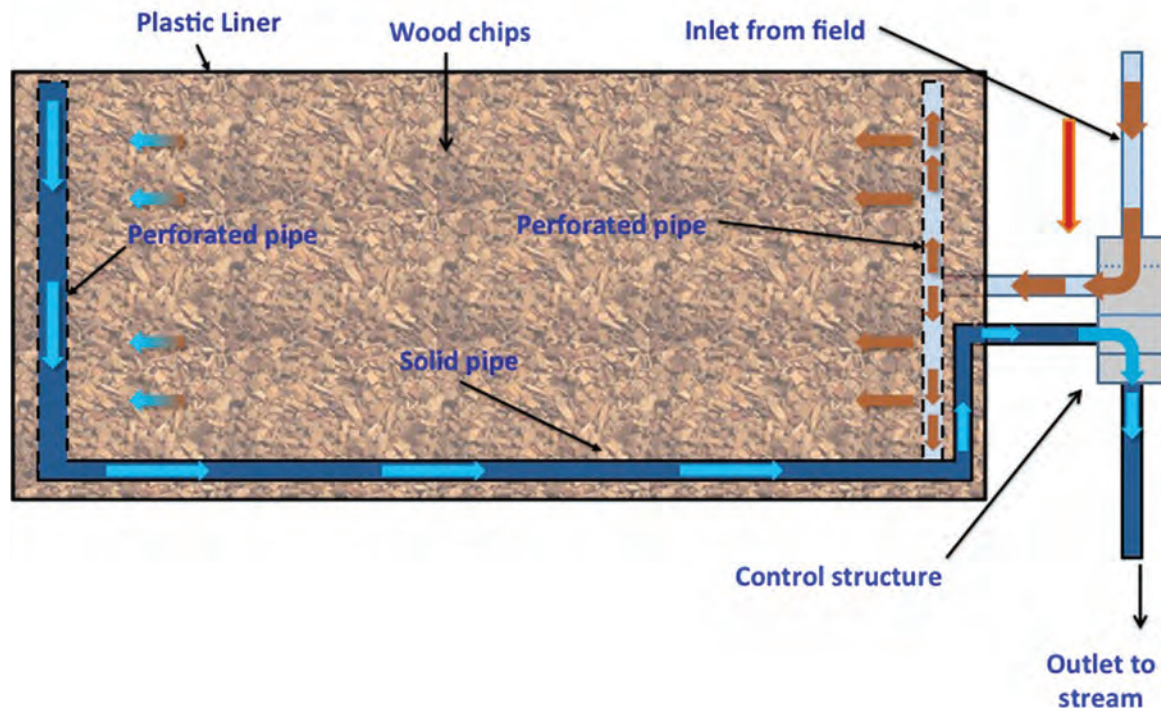
DWM is the practice of using a water control structure in a main, sub main or lateral drain. DWM allows the farmer to manage the timing and amount of water discharged from agricultural drainage systems. Water quality benefits are possible by minimizing unnecessary tile drainage and reducing nitrate amounts that leave fields. DWM systems can also retain water needed for crop production.



MANAGED DRAINAGE

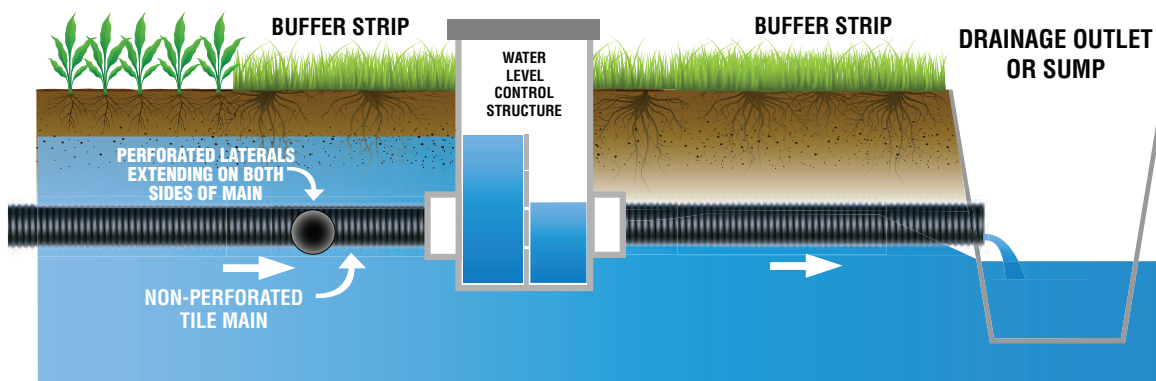
BIOREACTORS

Bioreactors are structures that contain wood chips (a carbon source) installed in a trench to significantly reduce the amount of nitrates in tile drainage water leaving crop fields. Typically, bioreactors are installed at the end of a tile system, just before the drainage water enters a drainage ditch or stream.



SATURATED BUFFER STRIPS

Saturated Buffer Strips have a control structure that diverts the flow from the outlet to a lateral distribution line in a buffer strip. The lateral distribution line runs parallel to the buffer and as the water is diverted to this line, saturation occurs. As this saturation, or lateral water movement through the buffer, occurs the vegetation naturally removes the nitrates in the water.

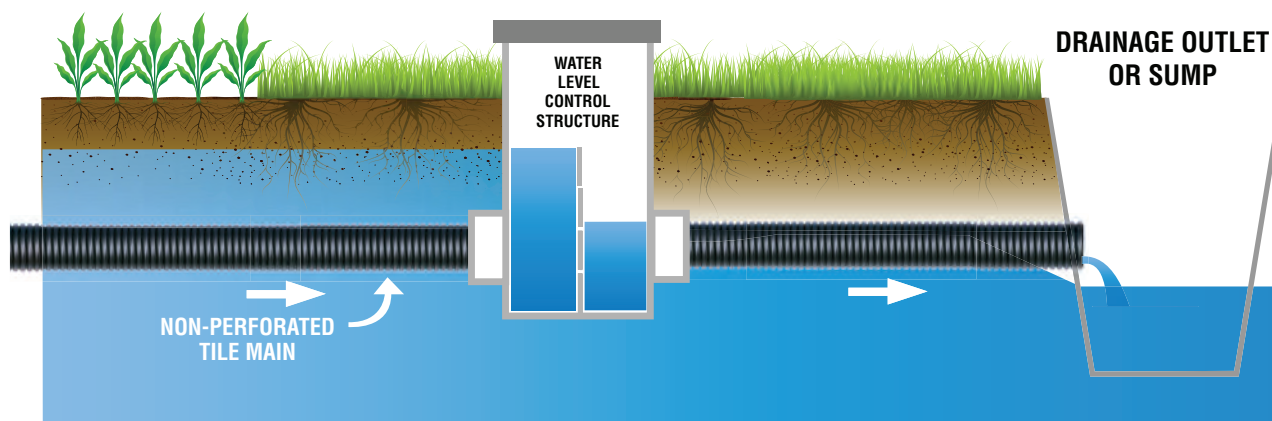


INLINE WATER CONTROL STRUCTURE

Inline Water Level Control Structures control the water table. Raise the water table in the winter to prevent loss of fertilizers that were applied in the fall; and lower the level in the spring to allow fieldwork.

Control to the water table after planting ensures that fertilizers will be available to the plants for optimal root development. Hold on to summer rains to prevent excessive damage from possible droughts.

- Rugged 1/2" PVC structure
- Heavy steel lockable top
- Stainless steel screws and custom anodized aluminum corner extrusions are used for strength and durability
- 5" and 7" drop logs for adjustability
- Flexible couples allow PVC, plastic pipe, or other materials to be easily attached
- Five-year warranty on all parts

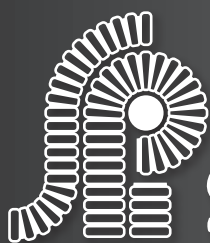




YIELD ENHANCEMENT 300 SOLUTION

UNDRAINED

DRAINED



Springfield Plastics, inc.

Springfield Plastics, Inc. • 800-252-3361 • www.spipipe.com