VIA EMAIL AND U.S.P.S. FIRST CLASS MAIL

Tuesday, June 15, 2004

Jonathan E. Hobill, Regional Engineer
DEP Bureau of Waste Site Cleanup
20 Riverside Drive
Lakeville, MA 02347

RE: Immediate Response Action Plan Status Report and Modification;
131 Main Street, Carver (the Site); RTN 4-17582; NON-SE-03-3T-103

Dear Mr. Hobill:

On behalf of Eagle Gas, Inc., Decoulos & Company is pleased to submit this status report and proposed modification to the Immediate Response Action (IRA) Plan for the above referenced release.

A discovery of petroleum Non-Aqueous Phase Liquid (NAPL) in monitoring well BP-5RR was reported to the Department on January 21, 2003. To address the NAPL discovery, an Immediate Response Action (IRA) Plan was submitted on March 17, 2003 and a status report was subsequently filed on July 3, 2003. As a result of the failure to comply with the timelines for IRA status reports set forth in 310 CMR 40.0425, the Department requested a status report and modification of the IRA Plan on March 19, 2004 (NON-SE-03-3T-103).

STATUS OF NAPL RECOVERY AT BP-5RR

After the vacuum recovery of NAPL from BP-5RR on April 24, 2003[1], NAPL recovery has continued to the present date with a micro bailer (see monitoring well locations on attached Figure 1). Periodic inspections and recovery have yielded approximately 25 gallons of product since April 24, 2003. The product has been emptied to a 55 gallon drum behind a six foot high wooden stockade fence on the northerly side of the building on Site. The drum will be emptied during the next remedial stage, which is expected to occur within the next month.

The NAPL Withdrawal Form presented in the 2003 IRA Status Report has been used to record NAPL observations and bailing activities. Copies of the forms are attached hereto as Exhibit A.

During a groundwater sampling round on June 3, 2004, NAPL was also identified in monitoring well DCW-1. Unlike the NAPL recovered from BP-5RR, the NAPL from DCW-1 did not appear to be fresh diesel fuel. A sample of the product was collected for fingerprinting and characterization at GeoLabs, Inc. in Braintree, MA.

[1] A description of the recovery action was described in the IRA Status Report dated July 3, 2003.

IRA PLAN MODIFICATION

Due to the continuing emanation of NAPL from BP-5RR and the newly discovered NAPL at DCW-1, further remedial actions are immediately required. The purpose of the next action step shall be to accelerate the recovery of NAPL in a rapid, safe and comprehensive manner.

Eagle proposes the excavation of a fifty (50) foot long trench, three (3) feet wide, within the Main Street right-of-way as shown on attached Figure 1. The Main Street right-of-way is held in fee ownership by the Town of Carver and permission from the Town will be required before commencing the work.

Construction of NAPL Interceptor Trench

It is anticipated that the work will take two days to complete and the station shall be closed during the entire operation. The first few hours of work will involve establishing public safety controls within the traveled way. Jersey barriers shall be set with a police detail oversight.

Once safety controls are in place, the pavement shall be marked and cut with a jack hammer. In addition to cutting the pavement for the NAPL interceptor trench, a pavement cut shall also be made for a one foot wide utility trench between the sign island and NAPL interceptor trench.

Pavement shall then be removed and properly disposed off Site. There shall be no stockpiling of any pavement or deleterious material on Site or within the Main Street right-of-way.

Soil shall then be excavated with a rubber tired backhoe and properly disposed. Based upon exploratory soil borings, it is anticipated that the first three feet of material will be clean and suitable for reuse as backfill. To ensure acceptable reuse, the material shall be screened with a portable photo-ionization detector (PID). All PID readings below 10 ppm shall be considered suitable for backfill.

All material that exceeds a headspace of 10 ppm shall be disposed at an approved asphalt batching facility. The Bill of Lading (BOL) for the shipment shall be in place, signed and approved by the accepting facility at least 48 hours prior to construction of the NAPL interceptor trench.

The excavation of petroleum contaminated soil from the NAPL interceptor trench shall be immediately placed in waiting 30 yard dump trailers. Depending on the final shipment destination, two or three trailers will be engaged for the hauling operation.

As the excavation of the interceptor trench proceeds, a vacuum truck shall be on standby to collect NAPL and contaminated groundwater.

Once the final depth of the NAPL interceptor trench is achieved, two layers of panel piping shall be set within the trench. Product literature on the piping is provided in Exhibit B. The 18 inch piping shall be stacked on its ends, one on top of the other, and secured with 2x4 studs to allow proper placement in the trench without the need for any personnel to enter the trench. The middle of the panel piping stack shall be set at the approximate groundwater elevation on the date of the excavation.

Once set within the trench, the panel piping shall provide a total vertical NAPL interceptor of three feet. The purpose of this arrangement is to allow NAPL recovery throughout the seasonal fluctuations in groundwater and NAPL elevations.

Panel piping is typically surrounded by a non-woven fabric. In this instance, the fabric would likely inhibit entry to the piping. Consequently, the piping will be laid within the excavation bare, and backfilled with washed stone. The washed stone will allow for rapid collection of NAPL and reduce the amount of fines that may collect within the piping.

Prior to the backfilling of stone, a four inch PVC monitoring well shall be established at each end of the interceptor trench. Each well shall be set with a five foot, 10 slot screen at the bottom, and a solid PVC riser to grade. A six inch watertight manhole shall be provided over each well.

The main recovery point shall be a 12 inch HDPE recovery well in the middle of the NAPL interceptor trench. The bottom of the recovery well shall be set three feet below the interceptor trench bottom. Each wing of the panel piping arrangement shall feed the recovery well. An 18 inch watertight manhole shall be provided over the recovery well.

To provide for possible active NAPL recovery, a PVC electrical conduit, together with groundwater/NAPL supply and return lines, shall be provided between the sign island and recovery well. As shown on Figure 1, the lines shall include one 2 inch Sch. 40 PVC line and two 1 inch Sch. 40 PVC lines.

After all the piping and wells are properly set, the washed stone shall be backfilled within the trench to approximately three feet below grade. A non-woven geotextile fabric shall then be placed on top of the stone. The previously stockpiled, clean backfill shall then be placed on the fabric and compacted in one foot lifts. Bituminous asphalt pavement shall then be placed and compacted under protocols approved by the Carver Department of Public Works.

NAPL Recovery from Interceptor Trench

The initial phase of NAPL collection from the interceptor trench shall be made with a passive skimmer collection system. A four inch, stainless steel, ZORBO™ recovery system is initially proposed. The unit can collect up to one half a gallon of product, which must then be manually emptied.

The passive skimmer system shall be inspected and emptied three times a week for one month. If it is found that the recovery of NAPL cannot be handled by the passive recovery system, a more aggressive phase of NAPL recovery shall commence.

If necessary, the active recovery system shall consist of a submersible, explosion proof, NAPL recovery pump which shall pump the product to an above ground product holding tank. The tank shall be located to the southwest of the sign island. An additional utility trench will be required to connect the recovery pump. This additional excavation would be conducted on the Eagle property and would not require the cutting of asphalt pavement.

Project Schedule

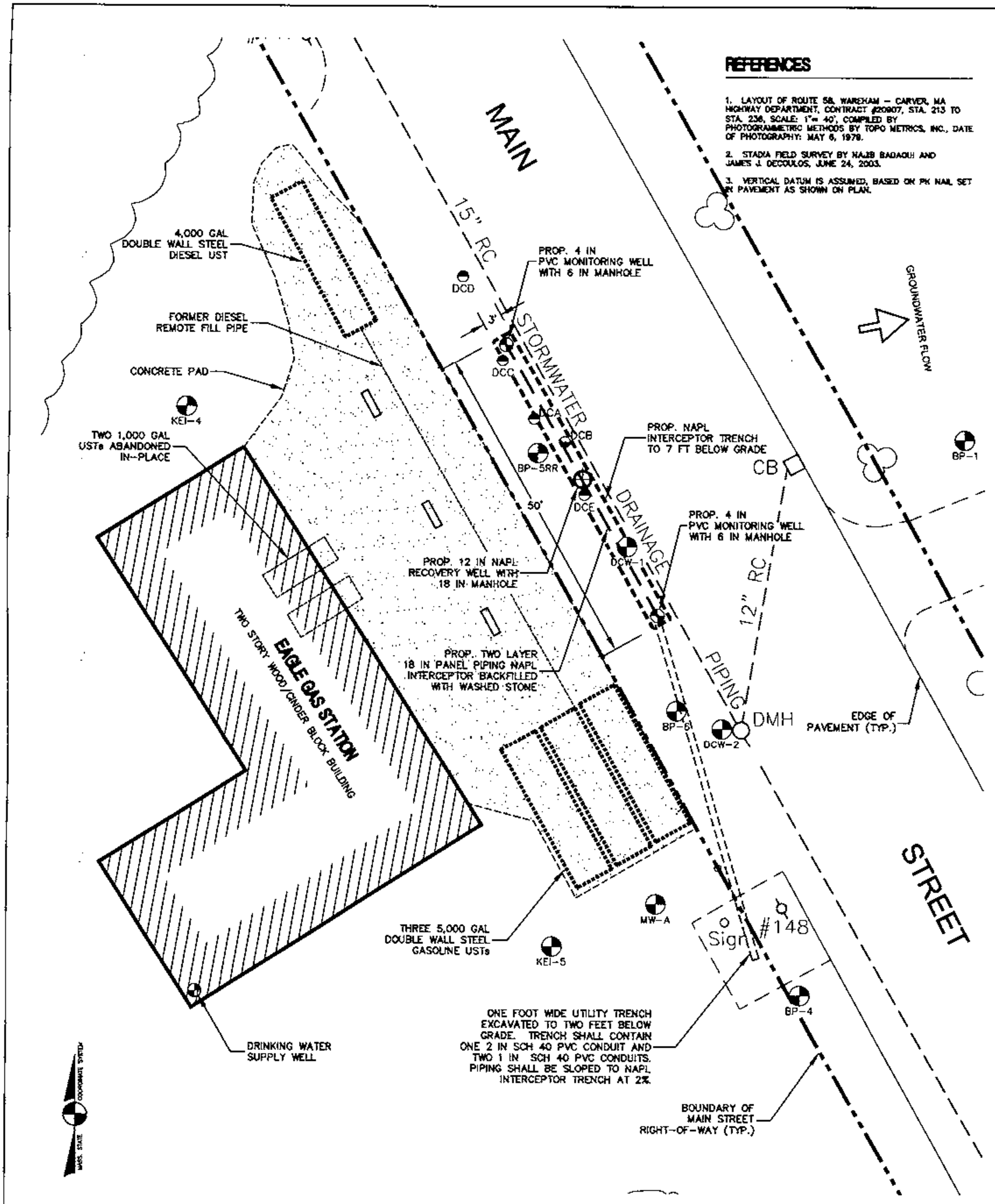
Assuming that an access agreement can be reached with the Town of Carver and that Eagle has the financial ability to pay for the work, the tentative dates of June 30 and July 1 are proposed for the work.

Please feel free to call or email if you have any questions or concerns. Thank you.

Very truly yours,

James J. Decoulos, PE, LSP
jamesj@decoulos.com

cc: Francis J. Casey, Carver Board of Selectmen
Robert C. Tinkham, Jr., Carver Board of Health
Sarah G. Hewins, Carver Conservation Commission
William A. Halunen, Carver Department of Public Works
Dana E. Harriman, Carver Fire Department
Mark R. Reich, Esq., Kopelman and Paige, P.C.
Donald P. Nagle, Esq.
Theodore J. Kaegael, Jr., Kaegael Environmental, Inc.
Theodore L. Bosen, Esq.
Najib Badaoui, Eage Gas, Inc.



DECOULOS & COMPANY
3 ELECTRONICS AVE, DANVERS, MA 01923
WWW.DECOULOS.COM
617.489.7795

PROPOSED NAPL RECOVERY
EAGLE GAS STATION
CARVER, MASSACHUSETTS

DATE	JUNE 2004
SCALE	1" = 20'
FIGURE NO.	1

EXHIBIT A

NAPL WITHDRAWAL FORM
EAGLE GAS, INC.
131 MAIN STREET, CARVER, MA
DEP RTN 4-17582

JUNE, 2003

DATE	TIME	DEPTH OF DIESEL FUEL IN DEDICATED BUCKET (IN)
6/9	7:30 AM	1/16
6/10	8:30 AM	1/8
6/11	9 AM	1/4
6/12	4 PM	1
6/16	3 PM	1/2

I hereby certify that the following withdrawals occurred from monitoring well BP-5RR and that the diesel fuel withdrawn from the well was completely emptied in the dedicated 55 gallon drum on the northerly side of the building on site.

Najib Badaoui, President
Eagle Gas, Inc.

Date 7/1/03

NAPL WITHDRAWAL FORM
EAGLE GAS, INC.
131 MAIN STREET, CARVER, MA
DEP RTN 4-17582

JUNE - JULY, 2003

DATE	TIME	BEGINNING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	ENDING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	NUMBER OF BAILS WITHDRAWN
6/18	9 am	1		10
6/19	8:30 am	1/2		10
6/23	8:30 pm	4		10
6/24	2 pm	3/4		10
6/26	8 pm	1/2		10
6/30	8:30 pm	1		10
7/1	3:30 pm	3/4		10

I hereby certify that the following withdrawals occurred from monitoring well BP-5RR and that the diesel fuel withdrawn from the well was completely emptied in the dedicated 55 gallon drum on the northerly side of the building on site.

[signature] 7/1/03

Najib Badaoui, President — Date
Eagle Gas, Inc.

NAPL WITHDRAWAL FORM
EAGLE GAS, INC.
131 MAIN STREET, CARVER, MA
DEP RTN 4-17882

OCTOBER - NOVEMBER, 2003

DATE	TIME	BEGINNING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	ENDING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	NUMBER OF BAILS WITHDRAWN
10/1	9:00 pm	3 FT		10
10/6	9 pm	3 FT		10
10/13	9 pm	3 FT		10
10/27	9 pm	1 FT		10
11/3	9 pm	1 FT		10
11/24	9 pm			

I hereby certify that the following withdrawals occurred from monitoring well BP-5RR and that the diesel fuel withdrawn from the well was completely emptied in the dedicated 55 gallon drum on the northerly side of the building on site.

Najib Badaoui, President
Eagle Gas, Inc.

Date: 11/24

NAPL WITHDRAWAL FORM
EAGLE GAS, INC.
131 MAIN STREET, CARVER, MA
DEP RTN 4-17882

DEC 2003 - MAR 2004

DATE	TIME	BEGINNING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	ENDING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	NUMBER OF BAILS WITHDRAWN
12/1	9PM	4 INS		10
12/29	9PM	8		10
1/5 04	9PM	6 INS		10
1/26	9PM	4		10
2/2	9PM	7		10
2/23	9PM	6		10
3/15	9PM	5		10

I hereby certify that the following withdrawals occurred from monitoring well BP-5RR and that the diesel fuel withdrawn from the well was completely emptied in the dedicated 55 gallon drum on the northerly side of the building on site.

[signature] 3/15

Najib Badaoui, President — Date
Eagle Gas, Inc.

NAPL WITHDRAWAL FORM
EAGLE GAS, INC.
131 MAIN STREET, CARVER, MA
DEP RTN 4-17882

MAR 2004 - MAY 2004

DATE	TIME	BEGINNING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	ENDING DEPTH OF DIESEL FUEL IN MICRO BAILER (IN)	NUMBER OF BAILS WITHDRAWN
3/29	9m	5		10
4/15	9m	4		6
4/26	9m	3		6
5/3	9m	3		6

I hereby certify that the following withdrawals occurred from monitoring well BP-5RR and that the diesel fuel withdrawn from the well was completely emptied in the dedicated 55 gallon drum on the northerly side of the building on site.

Najib Badaoui, President — Date
Eagle Gas, Inc.

EXHIBIT B

AdvanEDGE® Pipe

Engineered panel pipe for superior quick-response drainage

AdvanEDGE® the panel pipe

Panel pipe is one of the newer developments in subsurface drainage, having first been used in the mid-1980s. The product (also known as geocomposite drainage pipe) consists of a perforated panel-shaped plastic core wrapped with a soil filtering geotextile.

The distinguishing performance feature of panel pipe is its ability to rapidly collect and remove water. Compared to 4" round pipe, an equal length of 12" panel pipe has twice the soil contact area, and will drain a given quantity of water in about 60% of the time (see Figure 1). In addition, its slim 1.5" profile permits a narrow trench and faster installation.

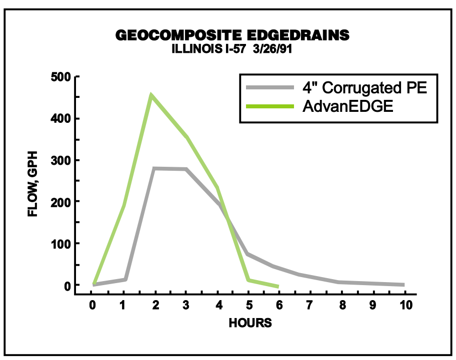


Figure 1. Flow rate vs. 4" round pipe. (Source: Illinois DOT tests, March, 1991)

Proven performance in state studies

Panel pipe is most commonly used for highway edge drains, and has been the subject of a number of performance studies by state transportation agencies. A four-year research project by the Kentucky Transportation Center concluded that properly designed and installed panel edge drains can:

- Reduce subgrade moisture by up to 28%
- Increase subgrade modulus by as much as 64% in falling weight deflectometer tests
- Increase pavement life by an average of seven years
- Save more than $25,000 per mile in pavement life cycle costs

Getting what you pay for

Common geocomposites are relatively inexpensive, and employ a single perforated mat with straight or conical posts, enclosed by filter fabric adhered to the back of the mat and the ends of the posts (see Figure 2). This open-core design relies on the geotextile to, in effect, become the opposite "wall" of the pipe, a structural function that fabrics were never designed to perform.

Field studies in 18 states have revealed serious deficiencies with these geocomposites, including:

- Collapse of the fabric and obstruction of the waterway
- Separation of geotextile, causing sediment clogging
- Escape of water back through the geotextile at the invert
- Structural deformation ("C"ing and "J"ing) during installation and soil compacting
- Crushing and cracking of the core.

Figure 2. Typical open core geocomposite panel drains: post & net (left), cuspated (right)

The AdvanEDGE difference

ADS entered the panel edge drain market in 1988 with a closed-core product designed to eliminate the problems associated with earlier geocomposites.

Unlike the others, AdvanEDGE is truly a pipe: not round, of course, but a panel-shaped core that fully encloses the waterway. Lateral pillars maintain the core opening, resulting in a series of oval-shaped channels with all-direction strength and relatively few projections into the waterway (see Figure 3). The design of the invert permits significantly higher flow velocity at lower head.

AdvanEDGE is in no way dependent on the geotextile for structural support. In fact, the fabric wrap can be dispensed with entirely on jobs with free-draining granular backfill, properly sized for the perforations.

Field-proven structural strength

As stated earlier, AdvanEDGE is designed to be a true pipe, with dimensional stability in all directions. The reinforced closed core has exceptional vertical stiffness, compressive strength, and resistance to the installation-induced deformation typical with other geocomposites.

AdvanEDGE's structural superiority is dramatically confirmed in state field performance tests of edge drains. In all cases, the open core geocomposites encountered severe problems with deformation and flow restriction under load, while the AdvanEDGE pipe exhibited none of these deficiencies - zero! In fact, a number of states are discontinuing the use of open core edge drains "until substantial design and material improvements are made."

that really is a pipe.

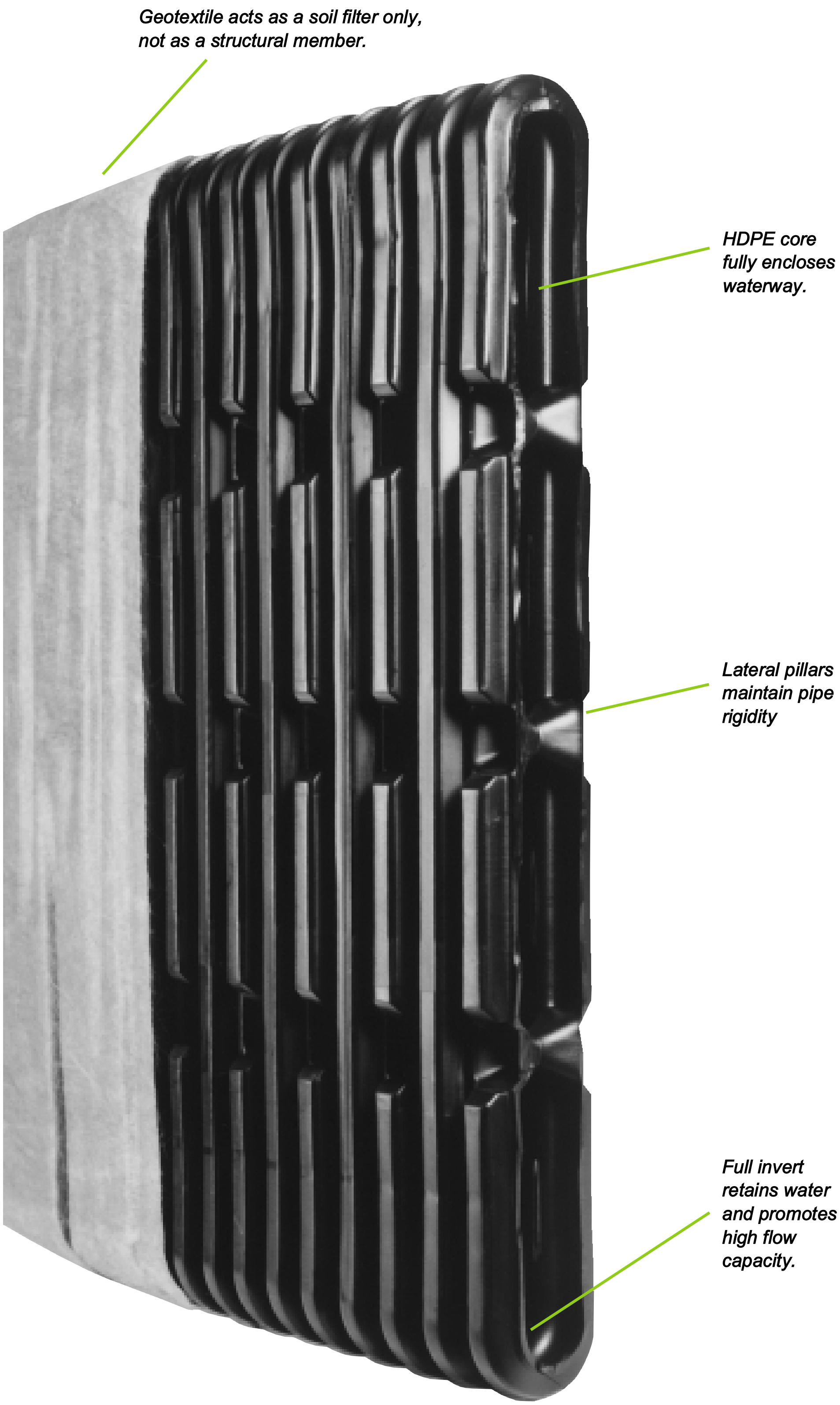


Figure 3. AdvanEDGE is designed to be a true pipe, with significantly higher flow and structural strength.

Double the flow capacity

Traditional flow rate lab tests on panel pipe have borne little resemblance to actual installed conditions, and have shown little difference in the tested flow capacity of any of the geocomposite brands.

Recently, the Kentucky Transportation Center has designed a test method which is far more representative of the actual forces acting on installed pipe. The results of this improved test show that AdvanEDGE has approximately twice the flow capacity of the two leading competitive geocomposites. Details are outlined in the Engineering Specification section on page 5.

Stronger material makes a stronger pipe

AdvanEdge is manufactured from a high density polyethylene resin that meets the structural property and chemical resistance requirements of ASTM D 3350. Many of the other geocomposite cores are made from less durable materials, such as low density PE or styrene.

Fast, economical installation

The slim-line design of AdvanEDGE (only 1.5" thick) allows for installation in a narrow trench, easily cut with high-speed trenching equipment, and with minimal surface disruption. The pipe is strong enough to resist any deformation when fed through the trencher's boot, or when the trench is filled, compacted and covered.

AdvanEDGE is delivered in 100 ft. and 500 ft. coils, with longer lengths available to meet project conditions. Joints are, therefore, few in number, and are made with an innovative coupler that is secure enough to resist installation stresses.

Ideal for quick-response drainage projects

Highway edge drains

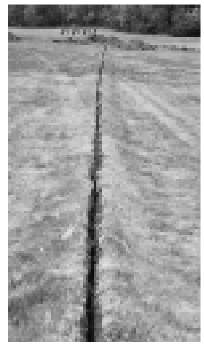
This was the initial application for geo-composite pipe, and today remains the primary market. State transportation authorities have conducted a growing number of field studies, all of which clearly indicate that properly designed and installed edge drains are a major factor in extending pavement life and reducing maintenance costs.

AdvanEDGE stands today as the only panel pipe that has lived up to the promise of quick response drainage performance, long-term durability and affordable installed cost. Highway officials are finding that it pays to use a quality product, and to install it correctly and carefully.

AdvanEDGE pipe's rapid collection and removal of water is equally appropriate for airports, parking lots, and virtually any paved area.

Athletic turf drainage

Cities, schools, and even professional sports teams are finding AdvanEDGE to be highly effective in keeping playing fields playable.



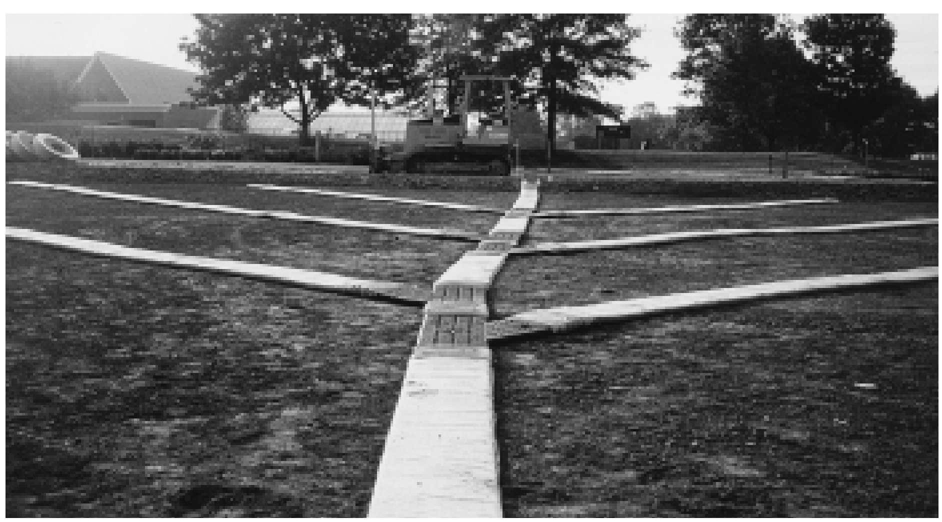
For retrofit drainage on existing turf areas, AdvanEDGE is a natural choice because of its rapid installation in narrow trenches with minimal turf disturbance. And for golf courses and other areas with subsurface irrigation systems, AdvanEDGE is available in 6" heights which permits very shallow burial and prevents interference with the underground piping.

Newly constructed playing surfaces are being designed to use AdvanEDGE in innovative ways. A number of college and professional football stadiums are installing the pipe horizontally on a sand base or directly on the subgrade, a few inches below the turf surface. This orientation accelerates water collection from heavy rainfalls, and is often augmented by pumping systems to speed water removal. Golf courses are also laying AdvanEDGE flat about 12" below the surface of new putting greens. This cuts labor costs because no trenches are necessary. One experimental green is using AdvanEDGE for both drainage and aeration of the root zone.

Other applications

Building foundations and retaining walls. Installed vertically directly against the structure, AdvanEDGE rapidly collects and removes water that can accumulate next to non-permeable surfaces.

Waste management. AdvanEDGE is commonly specified for perimeter drainage around landfills and septic fields to keep external water away from waste cells or surface impoundments.



Progress toward reliable engineering specifications

Throughout the rather brief history of geocomposite panel pipe, there has been an unfortunate lack of testing specifications that would adequately predict the product's performance in the field.

Structural Strength

For example, the early post-and-net and cuspated designs called for compression testing in the horizontal plane only, using test methods such as ASTM D 695 and ASTM D 1621. These methods totally ignored the vertical and shear forces imposed on installed pipe, and the effect of the unsupported geotextile. It's little wonder that these open core products could pass parallel plate loading tests, and yet perform poorly in actual installations.

ADS, along with many industry researchers, have long believed that a new laboratory test could and should be devised to more accurately represent the real-world conditions of installed pipe. After several years of development, there are now two test methods which not only replicate the actual forces imposed on installed drainage panels, but also yield results that correlate closely with the observed failure history of various competitive products.

1. Tilted Plane Test. Originally designed by Ronald Frobel in 1991, this device places the panel pipe sample between two blocks at approximately a 30o angle, which is equivalent to the shear force on vertically installed pipe from a load imposed on the surface (see Figure 4).

The worst case vertical load can be assumed as dual truck wheels positioned on a pavement shoulder above the panel drain, with only 2" between the surface and the top of the pipe. With a wheel load assumed at W = 16 kips, the total force exerted against the panel drain is calculated at 240 lb./in. The actual force required to cause compression failure in AdvanEDGE pipe is 400 lb./in, which gives the product a safety factor of 1.67 (400/240) in this worst case tilted plane lab test.

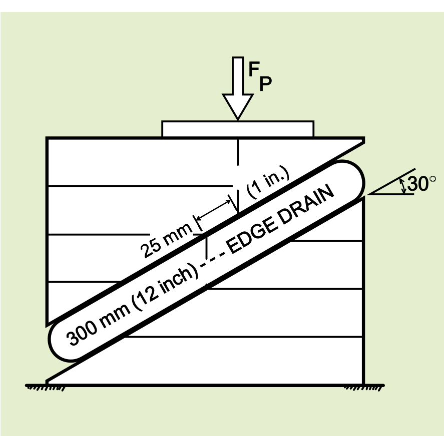


Figure 4

2. Soil Box Test. Even closer to reality is the soil box developed in 1994 by John Fleckenstein of the Kentucky Transportation Center. The test box replicates the trench condition in width, depth, panel pipe placement, and backfill material (see Figure 5).

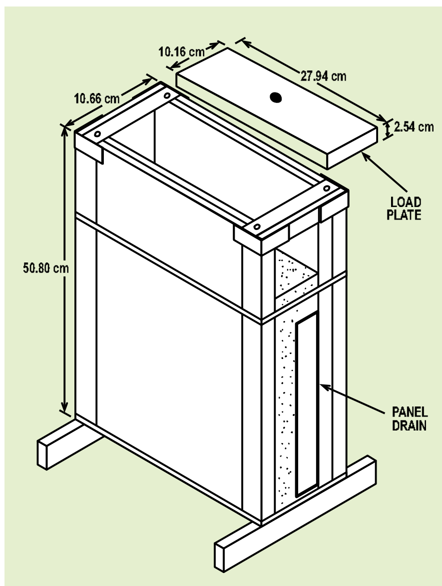


Figure 5

Tests were conducted by Mr. Fleckenstein on the six major brands of geocomposite panel drains, in both loose and dense sand backfills and at vertical loads ranging from 5.7 to 22.7 lb/in2. As shown in the table below, AdvanEDGE clearly outperforms the others both in vertical compression and in loss of core capacity. These findings correlate fairly closely with failure reports from more than 190 dig-ups and borescope inspections in 18 states and one Canadian province.

Kentucky Transportation Center Soil Box Test

Product	Vertical Compression @ 22.7 lb/in^2 (Percent Reduction in Height)	Loss of Core Capacity (Percent Reduction in Core Open Area)
AdvanEDGE	1.4 to 1.9	-1.1 to -2.1*
Hydraway	3.5 to 16.8	12.1 to 57.6
Stripdrain	5.0 to 10.2	15.0 to 35.0
Prodrain	3.3 to 10.0	15.2 to 52.0
Akwadrain	1.6 to 5.3	5.3 to 27.4

* AdvanEDGE core capacity actually increased!

ASTM is developing a formal testing standard based on the KTC soil box, with a tentative publication date of Spring, 1998. This will be a significant step forward to help specifying agencies identify geocomposite drainage products that will in fact give satisfactory long-term performance in the field.

Flow capacity

ASTM D 4716 has been the traditional means of measuring the flow rates of various geocomposites, and the tested brands have all scored between 15 and 20 gpm/ft using this method. But the method has three serious flaws: (1) samples are tested horizontally, while most applications install the pipe vertically, (2) there is no external loading applied to simulate actual pressures from soil, pavement, or traffic, and (3) test samples are very short.

In 1997, the Kentucky Transportation Center devised a flow test that is far more representative of in-service conditions. Samples are placed vertically in a loaded soil chamber, resulting in a surprising difference in measured rates from the old ASTM test. Figure 6 shows that AdvanEDGE has roughly twice the flow capacity of the two major competitive brands, even when the full vertical load is not applied.

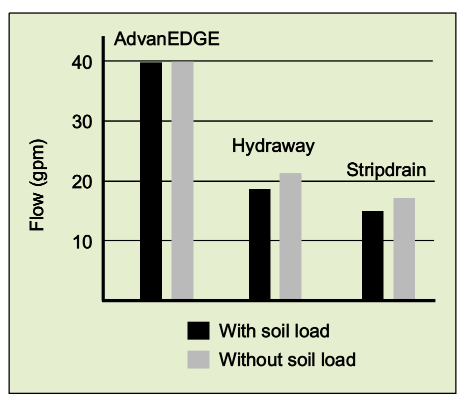


Figure 6. AdvanEDGE flow capacity vs. two open core geocomposites. (Source: Kentucky Transportation Center, 1997)

Specifying Geotextiles

Proper fabric selection is dependent on both the site conditions and the core design. The site conditions include backfill gradation, pavement base gradation and stability, shoulder base material, and any cracking, blocking, or rubblizing done to the pavement. Fabric Average Opening Size (A.O.S.) (O95) and permittivity can be set by these project conditions. Sizing criteria for the filter fabric is as follows:

Soils retention =

$$\frac{D_{15}\text{ (of Filter)}}{D_{85}\text{ (of Soil)}} < 4\text{-}5$$

Soils permeability =

$$\frac{D_{15}\text{ (of Filter)}}{D_{15}\text{ (of Soil)}} > 4\text{-}5$$

Filter fabric selection =

$O_{95} < 2D_{85}$

The O_{95} for AdvanEDGE's standard geotextile is 0.212 mm. If other values are required, the Design Engineer can contact ADS for other available fabrics' A.O.S.

Slot width sizing (fabric-less installations) =

$$\frac{D_{85}\text{ (of Soil)}}{\text{Slot Width}} > 1.2$$

Geotextiles for AdvanEDGE

Selection of the fabric fo AdvanEDGE closed core pipe is governed by the requirements for subsurface drainage shown in the AASHTO M-288 table. Class B requirements typically apply to most installations. If a granular backfill is used, it is possible to remove the fabric from AdvanEDGE (provided the narrow slot width is specified).

Geotextiles for Open Core Designs

For geocomposite products designed such that the geotextile is a structural element and outer boundary, the fabric puncture resistance and modulus are critical. The farther apart the posts or cuspations (and therefore the larger the fabric area supported by each post or cuspation), the greater the required puncture resistance and the higher the required modulus.

Fabric selection for these open core products requires that the additional strength requirements of separation applications be met. Some geocomposite manufacturers use resin bonded or calendared fabrics to increase fabric modulus. These treatments reduce A.O.S. and permittivity as well. The Design Engineer should insure that the reported parameters in the manufacturers' literature reflect the treated properties as this requirement is essential to a good design.

Physical Requirements for Geotextiles per AASHTO M-288

PROPERTY	TEST METHOD	SUBSURFACE DRAINAGE[1] CLASS A[2]	CLASS B[3]
1. Grab Strength (lbs)	ASTM D 4632	180	80
2. Elongation (%)	ASTM D 4632	-----	-----
3. Seam Strength (lbs)	ASTM D 4632	160	70
4. Puncture Strength (lbs)	ASTM D 4833	80	25
5. Burst Strength (psi)	ASTM D 3786	290	130
6. Trapezoid Tear (lbs)	ASTM D 4533	50	25
7. Permeability[4] (cm/sec)	ASTM D 4491	K Fabric > K Soil	K Fabric > K Soil
8. Apparent Opening Size (U.S. Std. Sieve)	ASTM D 4751	Notes 5 & 5A	Notes 5 & 5A
9. Permittivity (Sec^{1})	ASTM D 4491	-----	-----
10. Ultraviolet Degradation (% Retained Strength)	ASTM D 4355	70 @ 150 hrs	70 @ 150 hrs
11. Asphalt Retention (gal/yd^{1})	Appendix XI	-----	-----
12. Melting Point (°f)	ASTM D 276	-----	-----

1 Minimum: Use value in weaker principal direction. All numerical values represent minimum average roll value (i.e., test results from any sampled roll in a lot meet or exceed the minimum values in the table). Stated values are for non-critical, non-severe conditions. Lot sampled according to ASTM D 4354.

2 Class A drainage applications for fabrics are where installation stresses are more severe than Class B applications, i.e., very coarse, sharp, angular aggregate is used, a heavy degree of compaction (>95% AASHTO T-99) is specified, or depth of trench is greater than 10 feet.

3 Class B drainage applications are those where fabric is used with smooth graded surfaces having no sharp angular projections, no sharp angular aggregate is used; compaction requirements are light (<95% AASHTO T-99), and trenches are less than 10 feet in depth.

4 A nominal coefficient of permeability may be determined by multiplying permittivity value by nominal thickness. The k value of the fabric should be greater than the k value of the soil.

5 Soil with 50% or less particles by weight passing US No. 200 Sieve, A.O.S. less than 0.6 mm (greater than #30 US Std. Sieve).

5A Soil with more than 50% particles by weight passing US No. 200 Sieve, A.O.S. less than 0.297 mm (greater than #50 US Std. Sieve).

Installation

The following guidelines apply to the installation of AdvanEDGE in all applications. Specific instructions for highways, streets, parking areas, and other paved surfaces are given in ASTM D 6088, “Standard Practice For Installation of Geocomposite Pavement Drains.”

1. AdvanEDGE pipe can be installed in a narrow trench with either face of the panel against the structure or soil to be drained.

2. Means shall be provided to hold the panel flush against the trench wall or structure during backfilling.

3. Depending on soil permeability and drainage requirements, the trench may be backfilled with the excavated material, coarse aggregate, gravel, or natural sand.

4. When excavated material is used, the trench shall be backfilled to the desired limit (excluding bituminous or rock material larger than one inch) placed in two layers, and compacted.

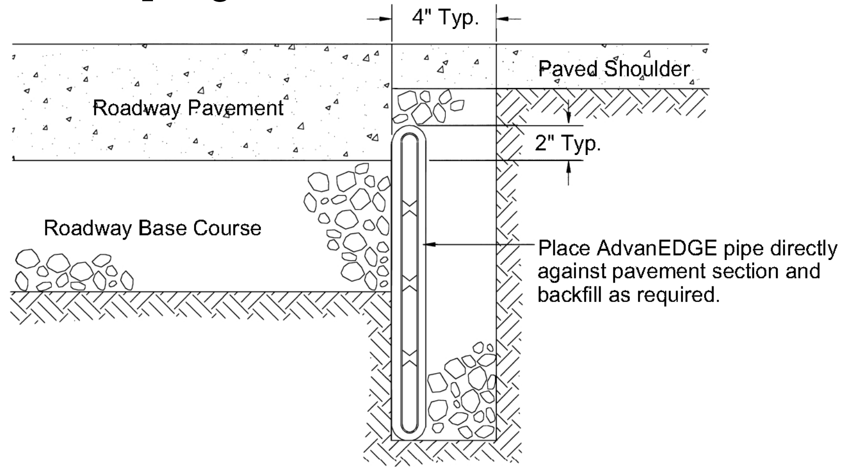
5. When either coarse aggregate, gravel, or natural sand is used, the trench shall be backfilled in two lifts and each lift compacted to the satisfaction of the engineer.

6. Joints shall be made using ADS AdvanEDGE couplers prior to placing AdvanEDGE in the trench. Use two coupling pins on each AdvanEDGE coupler. Couplers should be placed under the fabric at the joint to prevent backfill infiltration. To accomplish this, split the fabric seam and lay back the fabric approximately 8 in. Install the coupler with two pins. Replace fabric over the coupler and secure the fabric with suitable tape.

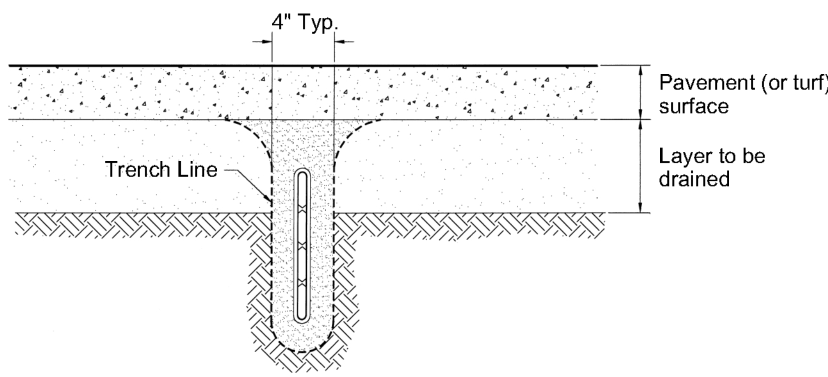
7. Outlets should be placed as needed. Fittings for transition from the AdvanEDGE pipe to 4" or 6" round pipe shall be ADS end outlets or side outlets as required.

8. End caps should be used at all termination points to prevent soil infiltration into system.

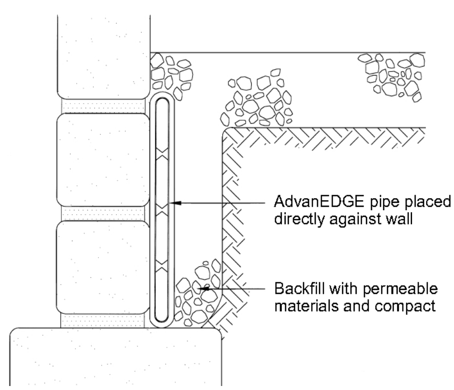
Roadway Edgedrain



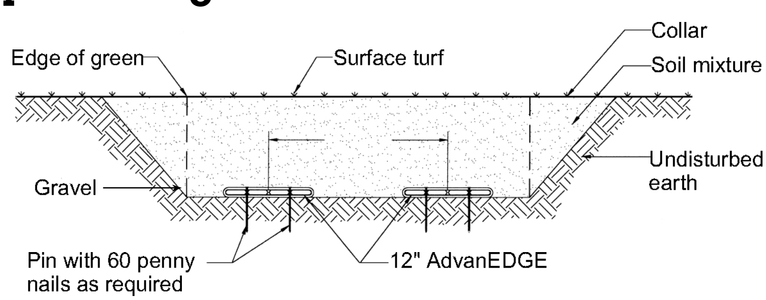
Subsurface Drainage



Foundation Drainage

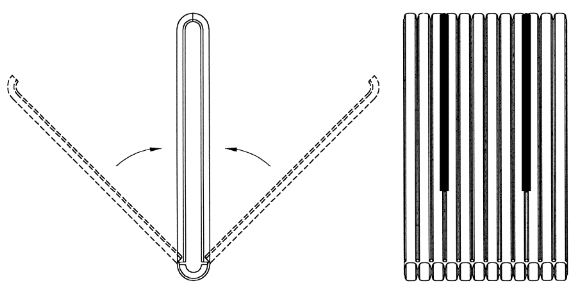


Typical Putting Green

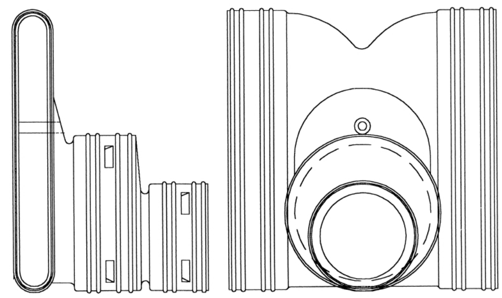


For applications without gravel, AdvanEDGE with sock is recommended.

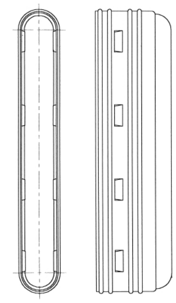
AdvanEDGE Couplings and Fittings



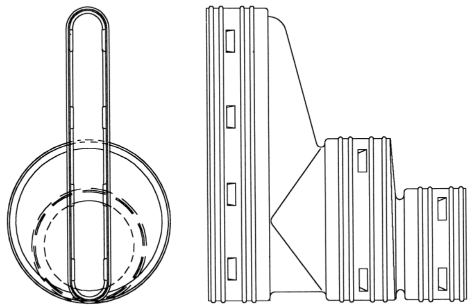
Split Coupling



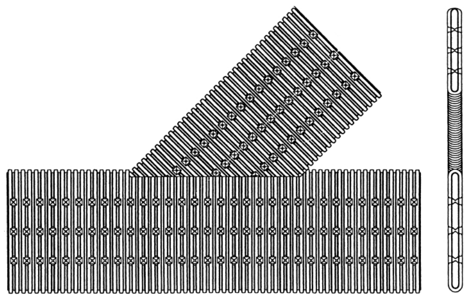
Side Outlet



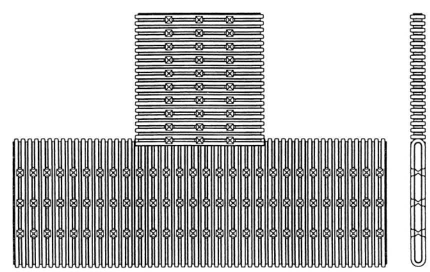
End Cap



End Outlet

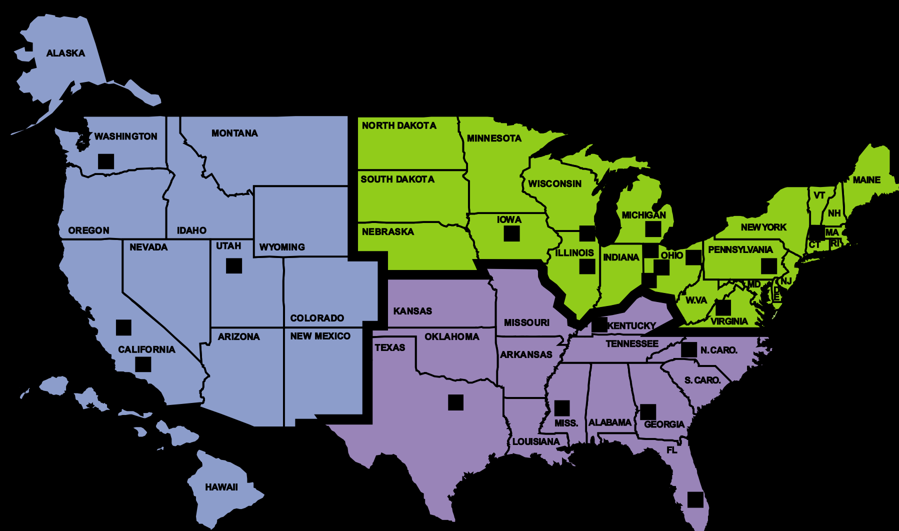


45° Wye (Horizontal)



Tee (Horizontal)

ADS Sales and Service Locations



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