

EXHIBIT "B"

Design Report

For

Nolt Trucking
1250 Lincoln Road
Lititz, PA 17543

Site Address

Spring City Acres, LLC
851 Bethel Church Road, Spring City, PA 19475

East Coventry & East Vincent Townships
Chester County

120' Diameter x 16' Deep Concrete Food Processing Residual Waste
Storage

June 13, 2021

Revised: March 28, 2022

Prepared By:

Ben Postles, PE

Penn Del Engineering and Consulting, LLC

206 Saylor Farm Lane

Williamsburg, PA 16693

814-932-3081

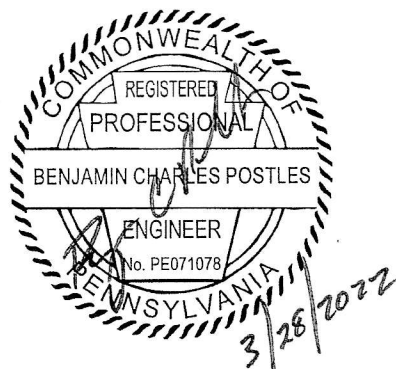


Table of Contents

Introduction

Operation and Maintenance Plan

Quality Assurance Plan
 Inspection Responsibilities
 Key Inspection Points

General Construction Notes

OSHA Fact Sheet

Cave-in Fact Sheet

NRCS Standards

Site Layout Drawing

Tank Specification Drawing

Introduction Spring City Acres, LLC

Nolt Trucking of Lititz, Pennsylvania has an 80-acre farm located on Bethel Church Road in Spring City, Chester County. They wish to construct a 16' deep by 120' diameter storage tank to hold food processing residual waste. This storage tank will allow the Nolt's to land apply the FPR according to their approved nutrient management plan.

Operation and Maintenance Plan Spring City Acres, LLC

The concrete storage shown in the attached design drawings must be operated and maintained as outlined below in order to retain the design engineer's approval of the project as to meeting NRCS 313 Standard. If at any time the system is not operated or maintained as outline, the approval from the design engineer shall be retracted. The attached drawings were prepared by Penn Del Engineering and with concrete design completed by Norton & Schmidt Consulting Engineers, LLP of Kansas City MO and dated July 27, 2000 for meeting Practice Standard 313 of the PA Tech Guide.

1. During exterior walk around inspections, the interior shall also be inspected. Walk around inspection shall occur at minimum of monthly.
2. Always spread FPR waste in accordance to any applicable Residual Waste Management regulations.
3. The storage shall be operated in such a manner as to have a minimum of 1' of freeboard at all times. This will allow for storage of the 25-year storm event and still maintain the minimum required 6-inches of freeboard. A permanent marker (painted line, attached marker, etc.) shall be installed at an elevation 1' from the top of the storage wall. This will be the maximum fill level.
4. Danger signs warning of drowning and asphyxiation shall be post around storage tank and at all access points. Signs shall be inspected twice annually and replaced as needed.
5. Tank shall have adequate fencing to exclude animals, vehicles and traffic as shown on the design drawings and NRCS Standard 342 Chain-link Safety Fence. Fence shall be inspected at a minimum of monthly and repaired as needed.
6. Tank will only be accessed at designated pump out locations.
7. The leak detection system will be monitored weakly to ensure that the tank does not leak. If contaminated flow is detected, the storage tank will be completely emptied and repaired under the supervision of the engineer.
8. The storage tank shall be emptied once the tank level reaches the maximum freeboard level of 1' from the top. However, material can removed at anytime and/or any level below the maximum full level as field conditions permit. This storage tank does not have

a consistent fill schedule because all materials are hauled into the storage on an as needed basis. Therefore, there is no set storage period or material removal schedule.

9. Emergency telephone numbers shall be discussed and adequately displayed for employees in the event of a spill. Employees shall be briefed on the emergency plan for a waste spill.
10. If an emergency spill occurs, it must be contained quickly. Sawdust can be used to soak a small spill. The availability of bulldozers or other heavy equipment on site should be known if it becomes necessary to construct an emergency berm or diversion. If heavy equipment is not available on site, phone numbers shall be provided of the nearest location with equipment available to construct emergency containment.

Nolt Trucking Waste Storage Additional Requirements

In addition to meeting the structural circular manure storage specifications as defined in the attach design submitted by Penn Del Engineering and Consulting LLC with concrete design completed by Norton & Schmidt Consulting Engineers, LLP of Kansas City MO and dated July 27, 2000, the storage must also meet Chapter 299, Storage and Transportation of Residual Waste.

The following item will be included in the construction of the 16' x 120' diameter concrete tank:

Leak Detection System, including:

- A geo-textile layer is to be placed between sub-base (undisturbed earth) and HDPE liner to protect liner from rock and debris during foundation stone placement.
- Place a footer drain under the HDPE liner prior to placement of the liner to convey any possible ground water from pushing upward on the storage tank. The footer drain shall be daylighted and it shall NOT connect to leak detection system.
- Place a HDPE liner between foundation stone and geo-textile that extends to the outside edge of excavation and up the sides of the excavation equal to or above the finished floor elevation of the storage with required stone and footer drain being placed on top of liner.
- DO NOT run on top of HDPE line once installed until required stone thickness is installed to prevent damage to liner.
- The leak detection line shall be perforated 4" corrugated pipe. It shall attach to 4" Sch 40 PVC prior to passing through the HDPE liner and discharge in an observation manhole.
- Care shall be taken to seal the HDPE liner to the leak detection solid PVC pipe line by sliding the pipe through an undersized opening. The excess HDPE liner shall be clamped to the PVC pipe using a stainless steel clamp.

- Drain will be run into an observation manhole. On the outlet of the manhole, a gate valve will be installed that can be shut in the event of fluid collecting in the manhole if applicable. Any fluid captured in the manhole will be tested for contamination. If manhole outlet can not be day lighted, a small submersible pump will be installed to keep manhole dry.
- Straw or geo-textile will be placed on top of footer drain stone to prevent footer stone on leak detection drain from being contaminated during backfilling.

Waste Storage Tank Inspection Spring City Acres, LLC

The purpose of this construction inspection plan is to ensure that farm receives a quality manure storage that will meet NRCS Standards. In order ensure the construction of the tank is completed according to the design, the farm must be involved in the construction process and interact closely with the construction inspector.

Farm's Responsibilities

1. The farm will familiarize themselves with the design to ensure they understand what is to be completed within the scope of the project.
2. At certain points during the project, the farm will call the engineer or his designate. The engineer will be notified 24 hours prior to an inspection needed to be completed on integral parts of the project.
3. Should the farm have questions or concerns about the design or the construction of the project, they will immediately notify the engineer or his designate. This includes problems that arise during construction that are not listed below.

Inspector's Responsibilities

1. The inspector will ensure that someone is on site during all key points of construction outlined below.
2. Should problems be encountered during construction, the inspector will respond with in 24 hours. If a site visit is required to resolve the issue, the engineer or his designate will be onsite within 48 hours.
3. The engineer or his designate will complete a final inspection of the project prior to the contractor leaving the site.

Quality Assurance Plan

To insure installation of each BMP meets the PA Technical Guide, construction inspection will be required during installation. **It is the responsibility of the landowner or contractor to notify the engineer, or his representative, 24 hours prior to required inspection.**

CRITICAL STAGES OF INSPECTION

1. The landowner will arrange for a pre-construction meeting between the contractors, conservation district, NRCS personnel, engineer and land owner to review plans and specifications prior to the start of construct.
2. There will be no changes in specifications, dimension or materials unless approved by the engineer.
3. The following is a list of the items that must be inspected to retain the Engineer's Final Certification:

- | | | |
|--|-------------|-----------------|
| • Pre-Construction Meeting | Date: _____ | Initials: _____ |
| • Verify Site Layout | Date: _____ | Initials: _____ |
| • Verify All Sub-Grades | Date: _____ | Initials: _____ |
| Manure Storage | Date: _____ | Initials: _____ |
| • Verify All Sub-Grade Materials | Date: _____ | Initials: _____ |
| • Verify Secondary Linear Material and Placement | Date: _____ | Initials: _____ |
| • Verify All Steel Grade, Size and Placement | | |
| Storage Footing | Date: _____ | Initials: _____ |
| Storage Floor | Date: _____ | Initials: _____ |
| Storage Walls | Date: _____ | Initials: _____ |
| • Inspect All Concrete Placement in Accordance with Specifications | | |
| Storage Footing | Date: _____ | Initials: _____ |
| Storage Floor | Date: _____ | Initials: _____ |
| Storage Wall | Date: _____ | Initials: _____ |
| • Proper Curing of Concrete | Date: _____ | Initials: _____ |
| • Patching Wall Ties, Holes, Honeycomb | Date: _____ | Initials: _____ |
| • Subsurface Drainage (Leak Detections) | | |
| Trench Grades | Date: _____ | Initials: _____ |
| Drain Tube Material | Date: _____ | Initials: _____ |
| Stone Envelope | Date: _____ | Initials: _____ |
| Backfill Placement | Date: _____ | Initials: _____ |
| Proper Outlet and Animal Guard | Date: _____ | Initials: _____ |
| • Backfill Placement and Compaction | Date: _____ | Initials: _____ |
| • Safety Fence, Gates and Warning Sign | Date: _____ | Initials: _____ |
| • All Disturbed Areas Are Seeded and Mulched | Date: _____ | Initials: _____ |
| • Other Items Shown on The Plan Are Completed | Date: _____ | Initials: _____ |

All quality assurance inspections will be performed by Penn Del Engineering and Consulting LLC, or his designate from AET Consulting, Inc.

Specific Items Needed:

1. Waste Storage Facility: dimension, sub-base, foundation condition, steel placement, concrete spec., concrete volume, leak detection system, pump-out pad, & pipe protrusions.
2. Secondary Linear: material, installation, outlet and animal guard.
3. Subsurface Drain: material, installation, outlet, animal guard, embedment and compaction.
4. Fencing: wire gauge, spacing, post quality

General Construction Notes
Spring City Acres, LLC

Follow all notes located within the attached three pages of drawing specifications. Any questions shall be directed to the Engineer of Record or his designate.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
INFORMATION SHEET

The 1970 Occupational Safety and Health Act applies to employers and their employees in the construction field. Both the employers and the employees have certain responsibilities and rights under the Act. These responsibilities and rights are defined in various publications available through OSHA and/or the U.S. Government Superintendent of Documents.

A list of the available documents pertaining to your industry can be obtained from local OSHA offices located in Pennsylvania. The Pennsylvania office addresses and telephone numbers are listed below. You may contact the closest office to your area for assistance in determining your responsibilities under the Act.

Allentown, PA 18102
850 N 5th St.
Brenwood, Room 1
Telephone: (610) 776-0592

Philadelphia, PA 19106
U. S. Custom House Rm. 242
Second and Chestnut Streets
Telephone: (215) 597-4955

Erie, PA 16506
West Ridge Commons, Suite B-12
3939 West Ridge Road
Telephone: (814) 833-5758

Pittsburgh, PA 15222
Federal Bldg. Rm. 1428
1000 Liberty Ave.
Telephone: (412) 395-4903

Harrisburg, PA 17109
Progress Plaza
49 N. Progress Ave.
Telephone: (717) 782-3902

Wilkes-Barre, PA 18702
Stegmaier Bldg., Room 410
7 N. Wilkes Barre Blvd.
Telephone: (570) 826-6538

In addition, there is a free OSHA consultation service available at IUP to smaller businesses to help them determine their needs and responsibilities in complying with the Occupational Safety and Health Administration Act. Fact Sheet OSHA 97-04 is included in this manual to acquaint you with the free services available to assist you in complying with the Act.

PA/OSHA Consultation Program
Indiana University of Pennsylvania
Walsh Hall, Room 210
302 East Walk
Indiana, PA 15705-1087

800-382-1241 (toll free in Pennsylvania)
724-357-2396
724-357-2385 (fax)

CLOSING CONFERENCE: The consultant will then review detailed findings with you in a closing conference. You will learn not only what you need to improve, but what you are doing right, as well. At that time, you can discuss problems, possible solutions and an abatement period to eliminate or control any serious hazards identified during the walk-through.

In rare instances, the consultant may find an "imminent danger" situation during the walk-through. If so, you must take immediate action to protect all employees. In certain other situations, those which would be judged a "serious violation" under OSHA criteria-- you and the consultant are required to develop and agree to a reasonable plan and schedule to eliminate or control that hazard. The consultants will offer general approaches and options to you. They may also suggest other sources for technical help.

ABATEMENT AND FOLLOW THROUGH: Following the closing conference, the consultant will send you a detailed written report explaining the findings and confirming any abatement periods agreed upon. Consultants may also contact you from time to time to check your progress. You, of course, may always contact them for assistance.

Ultimately, OSHA does require hazard abatement so that each consultation visit achieves its objective--effective employee protection. If you fail to eliminate or control identified serious hazards (or an imminent danger) according to the plan and within the limits agreed upon or an agreed upon extension, the situation must be referred from consultation to an OSHA enforcement office for appropriate action. This however, has occurred only rarely in the past.

BENEFITS: Knowledge of your workplace hazards and ways to eliminate them can only improve your own operations--and the management of your firm. You will get professional advice and assistance on the correction of workplace hazards and benefits from onsite training and assistance provided by the consultant to you and your employees. The consultant can help you establish or strengthen an employee safety and health program, making safety and health activities routine considerations rather than crisis-oriented responses.

SHARP: In many states, employers may participate in OSHA's "Safety and Health Achievement Recognition

Program"-- SHARP. This program is designed to provide incentive and support to smaller, high-hazard employers to develop, implement, and continuously improve effective safety and health programs at their worksite(s). SHARP provides for recognition of employers who have demonstrated exemplary achievements in workplace safety and health by: receiving a comprehensive safety and health consultation visit, correcting all workplace safety and health hazards, adopting and implementing effective safety and health management systems, and agreeing to request further consultative visits if major changes in working conditions or processes occur which may introduce new hazards. Employers who meet these specific SHARP requirements may be exempted from OSHA programmed inspections for a period of one year.

THE ON-SITE CONSULTATION WILL:

- help you recognize hazards in your workplace;
- suggest general approaches or options for solving a safety or health problem;
- identify kinds of help available if you need further assistance;
- provide you with a written report summarizing findings;
- assist you to develop or maintain an effective safety and health program;
- provide training and education for you and your employees;
- recommend you for a one-year exclusion from OSHA programmed inspections, once program criteria are met.

THE ON-SITE CONSULTANTS WILL NOT:

- Issue citations or propose penalties for violations of OSHA standards.
- Report possible violations to OSHA enforcement staff.
- Guarantee that your workplace will "pass" an OSHA inspection.

State OSHA consultation programs generally are listed in the state government section of the telephone directory under "Department of Labor and Industry." A complete listing of all OSHA consultation programs may be found in the OSHA booklet #3047 (1996 revised), "Consultation Services for the Employer," and on the OSHA Home page, <http://www.osha.gov>, under "Directory".

U.S. GOVERNMENT PRINTING OFFICE: 1997 0 172-75

SOIL CAVE IN-A FATAL SLIP

Cause of Cave Ins

Cave ins in pits and ditches cause the death of construction workers every year. Most deaths have occurred in trenches dug for utility lines. However, soil slippage can occur anywhere soil is excavated. Landslides in clay soils kill more people each year than those in sandy soils.

Most workers are careful around sand because they know it moves easily. However, many believe a thick, tough clay soil will not slip. Yet, most clay soils shrink and crack open when dry and swell when wet. This shrinkage and swelling cause slick areas to develop beneath the surface.

Some clay soils contain water-tight layers call fragipans. Water accumulating on the impervious layer lubricates the soil, increasing the probability of slippage. When a ditch or pit is dug in a soil with a fragipan or in a soil with a high shrink-swell potential, the soil will often slip, resulting in a dangerous cave in. This becomes even more likely WHEN THE SOIL IS WET.

Prevention

Occupational Safety and Health Administration (OSHA) regulations require protective action on all worker-occupied excavations unless the cut is made in stable rock, or the cut is less than five feet deep and there is no potential for a cave in to occur. Protection can be accomplished with sloping and benching, support systems, or shield systems which conform to OSHA regulations.

Sloping the sides of the excavation is the simplest protection against a cave in. If soil properties in the excavation are unknown, the excavation slopes should be no steeper than 1-1/2 horizontal to 1 vertical. If the soil can be classified as a Type A or Type B material according to the OSHA classification system (see back side), you can use a steeper slope, as shown in Figures 1 through 5.

Consult OSHA regulations when more than one soil type is exposed in an excavated slope, or when benched slopes are used. The regulations also provide details on support and shield requirements. Complete requirements are found in OSHA's safety and health standards (29 CFR 1926, Subpart P).

Soils Information

Soil survey publications are available for most counties. This information is useful to engineers, builders, contractors and others interested in construction hazards. The publication identifies soils with fragipans and high shrink-swell potential. Other potential construction problems, such as water table, bedrock and corrosiveness, are also contained in the reports as well as information on engineering properties of soils.

Copies of soil survey reports and other soils information are available from the local office of the USDA, Natural Resources Conservation Service, or write Soils, USDA, Natural Resources Conservation Service, Suite 340, One Credit Union Place, Harrisburg, PA 17110-2993.

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-5881 (voice) or (202) 720-7808 (TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call (202) 720-7327 (voice) or (202) 720-1127(TDD). USDA is an equal opportunity employer.

February 1995

OSHA Soils Classification for Excavated Slopes

Type A means cohesive soil with an unconfined compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as hardpan are also considered Type A.

However, no soil is Type A if:

- (i) The soil is fissured; or
- (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (iii) The soil has been previously disturbed; or
- (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of 4H:1V or greater; or
- (v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

- (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
- (ii) Granular, cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam; or
- (iii) Previously disturbed soils except those which would otherwise be classed as Type C soil; or
- (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (v) Dry rock that is not stable; or
- (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than 4H:1V, but only if the material would otherwise be classified as Type B.

Type C means:

- (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
- (ii) Granular soils including gravel, sand, and loamy sand; or
- (iii) Submerged soil or soil from which water is freely seeping; or
- (iv) Submerged rock that is not stable; or
- (v) Material in a sloped, layered system where the layers dip into the excavation on a slope of four 4H:1V or steeper.

MAXIMUM ALLOWABLE SLOPES

Figure 1. Type A Soil
Simple Slope, General



Figure 4. Type A Soil
Unsupported, Vertically Sided
Lower Portion, Max 12Feet



Figure 2. Type A Soil
Simple Slope, Short Term



Figure 5. Type B Soil
Simple Slope



Figure 3. Type A Soil
Unsupported, Vertically Sided Lower
Portion, Max 8 Feet in Depth



Figure 1. Type A Soil
Simple Slope, General



WASTE STORAGE STRUCTURE CONSTRUCTION SPECIFICATION

1. SCOPE

The work shall consist of furnishing materials and installing all components of the waste storage structure as outlined in this specification and the drawings.

Construction work covered by this specification shall not be performed between December 1 and the following March 15 unless the site conditions and/or the construction methods to be used have been reviewed and approved by the Engineer or his/her designated Representative.

2. MATERIALS

All materials used shall conform to the quality and grade noted on the drawings, set forth in Section 9, or as otherwise listed below:

PORTLAND CEMENT shall be Type I, IA, II or IIA and conform to ASTM-C150, unless otherwise set forth in Section 9. If Type I or II is used, an air-entrainment agent shall be used.

CONCRETE AGGREGATE shall meet the requirements and gradation specified in ASTM-C33. Coarse aggregate shall meet the gradation for size numbers 57 or 67.

WATER used in mixing or curing concrete shall be clean and free from injurious amounts of oil, acid, salt, organic matter or other deleterious substances.

REINFORCEMENT BARS shall be grade 40 or higher, and shall conform to ASTM-A615, A616, or A617. Welded wire fabric reinforcement shall conform to ASTM-A185 or A497. Reinforcement shall be free from loose rust, oil, grease, curing compound, paint or other deleterious coatings.

CONCRETE ADMIXTURES shall conform to ASTM-C260 for air-entrainment, and ASTM-C494, type A, D, F or G, for water-reduction and set-retardation, and type C or E for non-corrosive accelerators.

POZZOLAN shall conform to ASTM-C618, Class F, except loss of ignition shall not exceed 3.0 percent.

CURING COMPOUND shall meet the requirements of ASTM-C309, Type 2, Class A or B or as otherwise required in Section 9.

MASONRY COMPONENTS shall meet the requirements of ASTM-C90 & C270, and placed in accordance with ACI-530.

PRECAST CONCRETE units shall comply with ACI-525 and 533.

PREFORMED EXPANSION JOINT FILLER shall conform to the requirements of ASTM-D1752, Type I, II, or III, unless bituminous type is specified, in which case it shall conform to ASTM-D994 or D1751.

JOINT SEALERS shall conform to the requirements for ASTM-C920, Federal Specification SS-S-210A, or Federal Specification TT-S-227, as appropriate for the specific application.

WATERSTOPS. Vinyl-chloride polymer types shall be tested in accordance with Federal Test Method Standard No. 601, and shall show no sign of web failure due to brittleness at a temperature of -35 degrees Fahrenheit. Colloidal (bentonite) waterstops shall be at least 75 percent bentonite in accordance with Federal Specification SS-S-210A. Non-colloidal waterstops shall only be used if approved by the Engineer.

METALS shall conform to the following standards:

- Structural steel - ASTM-A36
- Carbon steel - ASTM-A283, grade C or D; or A611, grade D; or A570, grade C or D
- Aluminum alloy - ASTM-B308, B429, B221, B210, B211, or B209
- Bolts - ASTM-A307; zinc coating shall conform to ASTM-A153, B633 (cond. SC3), A165 (type TS).
- Screws - wrought iron or medium steel
- Split or tooth-ring connectors - hot-rolled, low carbon steel conforming to ASTM- A711, grade 1015

WOOD shall be graded and stamped by an agency accredited by the American Lumber Standards Committee as meeting the required species, grade, and moisture content. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the wood products meet the designated quality criteria.

MANUFACTURED TRUSSES shall be certified as having been designed and built to Truss Plate Institute standards.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 9. They shall be treated with preservatives in accordance with the American Wood Preservers Association (AWPA) Standard C16, "Wood Used on Farms, Pressure Treatment." Each piece shall bear the AWPA stamp of quality. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the pressure treated wood meets the designated quality criteria.

FASTENERS for wood structures shall be stainless steel, galvanized, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses.

3. FOUNDATION PREPARATION AND CONDITIONS

All trees, brush, fences, and rubbish shall be cleared within the area of the structure, including any appurtenances, and borrow areas. All material removed by clearing and excavation operations shall be disposed of as directed by the Owner or his/her Representative. Sufficient topsoil shall be stockpiled in a convenient location for spreading on disturbed areas.

All structures shall be set on undisturbed soil or non-yielding compacted material. Over excavation must be corrected as noted on the drawings or as directed by the Engineer or his/her designated Representative.

In addition to uniformity, the existing subgrade material must have sufficient strength to support the structure and its associated loads. Organic soil or soils with high percentages of clays and silts shall be removed. A base course (a layer of granular material placed on the subgrade prior to placement of concrete) may be used to improve the stability of the foundation. In addition, geosynthetics may be used, if approved by the Engineer, to further separate and/or stabilize the foundation.

Surface and subsurface drainage systems shall be installed and operating adequately to remove water from the foundation to allow for proper structure placement.

Drain fill upon which concrete is to be placed shall be covered with a geosynthetic that has an AOS between 20 and 100, inclusive.

Concrete shall not be placed until the subgrade, forms and steel reinforcements have been inspected and approved by the Engineer or his/her designated Representative. Notification shall be given far enough in advance to provide time for the inspection.

Prior to placement of concrete, the forms and subgrade shall be free of chips,

sawdust, debris, standing water, ice, snow, extraneous oil, mortar or other harmful substances or coatings.

Earth surfaces against which concrete is to be placed shall be firm and damp. Placement of concrete on mud, dried earth or uncompacted fill or frozen subgrade will not be permitted.

4. CAST-IN-PLACE CONCRETE STRUCTURES

a. Concrete Forms

Forms shall be of wood, plywood, steel, or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours.

Form surfaces shall be smooth and essentially free of holes, dents, sags, or other irregularities. Forms shall be coated with form oil before being set into place. Care shall be taken to prevent form oil from coming in contact with steel reinforcement.

b. Concrete Mix

Concrete for structures shall have a 28-day compressive strength of at least 4000 psi, unless otherwise specified on the drawings or in Section 9. The Contractor shall be responsible for the design of the mix and certification of the necessary compressive strength. Current certification of the design mix by Penn DOT may be accepted in lieu of additional testing.

The slump shall be 3 to 6 inches (without superplasticizers, if any); the air content by volume shall be five to seven percent of the volume of the concrete. Admixtures such as superplasticizers, water-reducers and set-retarders may be used provided they are approved by the Engineer prior to concrete placement and are used in

accordance with the manufacturer's recommendations. Superplasticizers (ASTM C494, Type F or G) may be added to concrete that has a 2 to 4-inch slump before the addition, and that is not warmer than 95^o F. The slump shall not exceed 7½ inches with the addition of superplasticizer.

c. Mixing and Handling Concrete

In general, concrete shall be transported, placed, and consolidated in accordance with ACI-304, of which some specific interpretations are set forth below.

The supplier shall provide a batch ticket to the Owner or Technician with each load of concrete delivered to the site. The batch ticket shall state the class of concrete, any admixtures used, time out, and the amount of water that can be added at the site and still be within the design mix limits. Concrete shall be uniform and thoroughly mixed when delivered to the job site. The Contractor shall test slump and air entrainment as necessary to ensure that the concrete meets the requirements of this specification. Variations in slump of more than one inch within a batch will be considered evidence of inadequate mixing and shall be corrected or rejected. No water in excess of the amount called for by the job design mix shall be added to the concrete.

For concrete mixed at the site, the mixing time after all cement, aggregates and water are in the mixer drum shall be at least 1-1/2 minutes.

Concrete shall be conveyed from the mixer to the forms as rapidly as practical by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall be placed in the forms within 1-1/2 hours after the introduction of cement to the aggregate unless an approved set-retarding admixture is used in the mix. During periods of hot weather, it may be necessary to reduce this time.

Concrete shall not be dropped more than 5 feet vertically unless special equipment is used to prevent segregation. Superplasticized concrete shall not be dropped more than 12 feet unless special equipment is used to prevent segregation.

Slab concrete shall be placed at the design thickness in one layer. Formed walls shall be placed in layers not more than 24-inches high, unless superplasticizer is used, in which case the maximum layer shall be 5 feet. Each layer shall be consolidated to insure a good bond with the preceding layer.

Immediately after placement, concrete shall be consolidated by spading and vibrating, or by spading and hand tamping. It shall be worked into corners and angles of the forms and around all reinforcement and embedded items in a manner that prevents segregation or in the formation of "honeycomb." Excessive vibration that results in segregation of materials will not be allowed. Vibration must not be used to make concrete flow in forms, slabs, or conveying equipment.

If the surface of a layer in place will develop its initial set, i.e., will not flow and merge with the succeeding layer when vibrated, a construction joint shall be made. Construction joints shall be made by cleaning the hardened concrete surface to exposed aggregate by sandblasting, air/water jetting, or hand scrubbing with wire brush, and keeping the concrete surface moist for at least one hour prior to placement of new concrete.

Concrete surfaces do not require extensive finishing work; however, the surface shall be smooth and even with concrete paste worked to the surface to fill all voids. The concrete surface must be watertight. Careful screeding (striking-off) and/or wood float finishing shall be required, unless otherwise shown on the drawings. Exposed edges shall be chamfered, either with form molding or molding tools.

The addition of dry cement or water to the surface of screeded concrete to expedite finishing is not allowed.

d. Reinforcing Steel Placement

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. In forms, this shall be accomplished by tying temperature and shrinkage steel or special tie bars (not stress steel) to the form "snap ties" or by other methods of tying. In slabs, steel shall be supported by precast concrete bricks (not clay bricks), or metal or plastic chairs. Except for dowel rods, placing steel reinforcement into concrete already in place shall not be permitted.

The following tolerances will be allowed in the placement of reinforcing bars shown on the drawings:

(1) Maximum reduction in cover:
from formed and exposed surfaces -
1/4 inch from earth surfaces - 1/2
inch

(2) Maximum variation from indicated
spacing:
1/12th of indicated spacing

Splices of reinforcing bars shall be made only at the locations shown on the drawings, unless otherwise approved by the Engineer. Unless otherwise required, welded wire fabric shall be spliced by overlapping sections at least one full mesh dimension plus two inches. All reinforcement splices shall be in accordance with ACI 318.

Reinforcing steel shall not be welded, unless approved by the Designer. The ends of all reinforcing steel shall be covered with at least 1-1/2 inches of concrete.

e. Curing

Concrete shall be prevented from drying for at least seven days after it is placed. Exposed surfaces shall be kept continuously moist during this period by covering with moistened canvas, burlap, straw, sand or other approved material unless they are sprayed with a curing compound. Wooden forms left in place during the curing period shall be kept wet.

Concrete, except at construction joints, may be coated with a curing compound in lieu of continuous application of moisture. The compound shall be sprayed on moist concrete surfaces as soon as free water has disappeared but shall not be applied to any surface until patching, repairs and finishing of that surface are completed. Concrete shall be wet cured or remain in forms until immediately before patching, repairs, or finishing is performed. Curing compound shall not be allowed on any rebars.

Curing compound shall be applied in a uniform layer over all surfaces requiring protection at a rate of not less than one gallon per 150 square feet of surface. Surfaces subjected to heavy rainfall or running water within three hours after the curing compound has been applied, or otherwise damaged, shall be resprayed.

Any construction activity which disturbs the curing material shall be avoided during the curing period. If the curing material is subsequently disturbed, it shall be reapplied immediately.

Steel tying or form construction adjacent to new concrete shall not be started until the concrete has cured at least 24 hours. Vehicles, overlying structures, or other heavy loads shall not be placed on new concrete slabs for at least three days, unless the concrete strength can be shown to be adequate to support such loads.

f. Form Removal and Concrete Repair

Forms for walls and columns shall not be removed for at least 24 hours after placing the concrete. When forms are removed in less than seven days, the exposed concrete shall be sprayed with a curing compound or be kept wet continuously for the remainder of the curing period. Forms which support beams or covers shall not be removed for at least seven days, or 14 days if they are to support forms or shoring.

Forms shall be removed in such a way as to prevent damage to the concrete. Forms shall be removed before walls are backfilled. Columns shall be at least seven days old before any structural loads are applied.

Where minor areas of the concrete surface are "honeycombed," damaged or otherwise defective, the area shall be cleaned, wetted and then filled with a dry-pack mortar. Dry-pack mortar shall consist of one part Portland cement and three parts sand with just enough water to produce a workable paste.

g. Concreting in Cold Weather

Concreting in cold weather shall be performed in accordance with ACI-306R-88. In addition, the contractor shall provide a written plan at least 24 hours in advance of placing concrete in cold weather, and shall have the necessary equipment and materials on the job site before the placement begins.

h. Concreting in Hot Weather

Concreting in hot weather shall be performed in accordance with ACI 305, of which some specific interpretations are set forth below.

The supplier shall apply effective means to maintain the temperature of concrete below 90 degrees Fahrenheit during mixing and conveying. Exposed surfaces shall be continuously moistened by means of fog spray or otherwise protected from drying during the time between placement and finishing and during curing. Concrete with a temperature above 90 degrees Fahrenheit shall not be placed.

i. Backfilling New Concrete Walls

Backfilling and compaction of fill adjacent to new concrete walls shall not begin in less than 14 days after placement of the concrete, except that walls that can be backfilled on both sides simultaneously may be done so within seven days.

Heavy equipment shall not be allowed within three feet of a new concrete wall. Provide compaction near the wall by means of hand tamping or small, manually-directed equipment.

5. WOOD STRUCTURES

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surfaces. Nails and spikes shall be driven with just sufficient force to set the heads flush with the wood surface. Deep hammer marks in the wood shall be considered evidence of poor workmanship and may be sufficient cause for rejection of the work.

Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread. Holes for bolts shall be bored with a bit no more than 1/16"

larger than the bolt diameter to achieve a snug fit without forcibly driving the bolt.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood.

All joints shall be fastened with the number, type, and size of fasteners specified, at the locations or spacing specified.

If field cuts of pressure-treated wood expose untreated interior wood, the untreated surfaces shall be covered with two coats of a liquid preservative, as approved by the Engineer.

Roof trusses shall be handled, installed and braced according to the Truss Plate Institute's HIB-91, "Handling, Installing and Bracing MPC Wood Trusses."

Wood structures shall be backfilled within the limits shown on the drawings by placing material in uniform lifts not to exceed nine inches. Compaction within three feet of walls shall be accomplished by means of hand tamping or small manually-directed equipment.

6. STRUCTURES INSTALLED ACCORDING TO STANDARD DETAIL DRAWINGS PREPARED BY OTHERS

Commercially available structures shall be installed as shown on the drawings provided to and concurred in by NRCS. All materials furnished and installed shall conform to the quality and grade noted on the drawings. A site-specific set of construction drawings shall be at the site during construction.

Modification of the structure outside limits shown on the drawings shall not be made without prior review and approval by the Engineer with appropriate approval authority. The Supplier or Contractor who submitted the original standard detail drawings shall be responsible for making any changes. Sufficient design

documentation to allow an adequate review of the proposed modification shall accompany any request for a change.

Within thirty (30) days of the completion of construction of the structure, the Contractor or Supplier shall furnish written certification to the Engineer that all aspects of the installation are in conformance with the requirements of the drawings and specifications.

7. BURIED TANKS

a. Tank Condition

Tanks, whether steel or fiberglass/plastic, shall have sufficient strength to withstand design loads, be watertight, and be protected from corrosion. New tanks shall have a manufacturer's certification to this effect.

Used tanks must be inspected for pitting, corrosion, and cracks that could impair the strength or watertightness. Tanks which originally stored leaded fuels may have tetraethyl lead deposits and scale on the inside. This material should be detached from the tank's interior, pumped out, and disposed of in a manner which will not pollute ground or surface waters. Also, if welding, handling, etc. is done, safety precautions should be taken to avoid ingesting or inhaling the lead or its fumes. (These tanks may have gasoline fumes or vapors in them and may explode from a spark, welding arc or torch.)

A tank that has been bent or dented will not be accepted unless adequate repairs have been made to restore the strength, watertightness, and corrosion protection. When inlet or outlet pipes or other type of openings are to be cut into one of these tanks, the reduced strength must be considered when the tank is put into use. The Steel Tank Institute's sti-P3 certification procedure shall be used to evaluate the structural integrity and assure the corrosion

protection of steel tanks which have been repaired or modified.

b. Installation

Underground tanks shall be handled and installed according to the manufacturer's recommended procedures.

At a minimum, all tanks shall be set on a firm earth foundation or a full-length concrete slab covered with six inches of clean sand. The tank shall be surrounded by clean sand or well-tamped earth, free from stones and other debris. The use of saddles or "chock blocks" of any sort interferes with the proper distribution of the backfill loads and shall not be permitted.

The excavation shall be dewatered during installation and backfill operations. The backfill shall be well compacted, particularly under the tank, to provide adequate support.

Tanks shall be covered with a minimum of two feet of earth, or with not less than one foot of earth on which is placed a reinforced concrete slab not less than four inches thick.

Tank installations, which will be subjected to traffic, shall have adequate strength to withstand the anticipated overload. Tanks shall be protected against damage from vehicles passing over them by at least three feet of earth cover or by 18 inches of well-tamped earth plus either eight inches of asphaltic paving or six inches of reinforced concrete. The paving or concrete shall be placed to extend at least one foot horizontally in all directions beyond the outline of the tank.

Tanks shall not be filled or even partially filled during their installation and backfilling.

Unless high ground water levels are not expected, the site shall have a drain system to prevent ground water from flooding around the tank. Where a tank may

become buoyant due to a rise in the level of the water table or due to location in an area subjected to flooding, applicable precautions shall be taken to anchor the tank in place or dewater the site.

Openings on all underground tanks must be properly located and maintained in place during backfilling.

8. PIPES

Excavation for pipes shall be made to the grades and lines shown on the drawings or as indicated by construction stakes. Care should be taken not to excavate below the depths specified. Excavation below grade shall be corrected by placing firmly compacted layers of moist earth to provide a good foundation. If rock or boulders are exposed in the bottom of the excavation, they shall be removed to a minimum depth of eight inches below the invert grade of the pipe and any appurtenances and replaced with firmly compacted earth to the specified grade.

Pipes shall be backfilled with horizontal lifts of moist earth not to exceed four inches in thickness, or with other material as specified in Section 9 or in the drawings. Each lift shall be compacted by hand tampers or other compaction equipment, however at no time shall driven equipment tires or tracks be within two feet of pipes or appurtenances.

All connections between pipes and structure walls and floors shall be water tight and capable of withstanding the expected operating pressures.

E. OTHER LINERS

Other liners, e.g. flexible membrane, shall be installed in accordance with Specification 521A

PA 313 Additional Condition for Waste Storage Structure which apply to this project:

16' deep x 120' diameter concrete manure storage structure

1. This project consists of a 16' deep x 120' diameter concrete manure storage structure.
2. It shall have one (1) concrete pump out pad.
3. Concrete pump out pad shall be 12' wide by 18' long and be 10" thick of 4,000 psi concrete. The ramp shall sit in a notch in the storage structure wall.
4. The storage shall have a 5' chain link safety fence (see Fence Specifications 382) installed around the storage with one lockable gate at the pump out pad.
5. The storage shall have the appropriated danger signs for drowning, affixation, and confined space installed at every access location.
6. There shall be a foundation drain around it. See Subsurface Drain 606 for details.
7. The storage shall have an access road installed to the pump out pad.

CONSTRUCTION SPECIFICATION

FENCE

(Ft.)

CODE 382

1. SCOPE

The work shall consist of furnishing materials and installing all components of the fence as outlined in this specification and the drawings.

There are many different types and purposes for fences. While this specification includes details for livestock fence, other types of fence may be used to control wildlife. It is generally recommended that a deer exclusion fence be between 5 and 8 feet high (depending on the design of the fence) in order to be effective. See the references section of this specification for more information concerning exclusion fences for deer and other wildlife. Other types of fences may be applicable for other purposes

2. MATERIALS

Fencing materials shall be new, of high quality and durability, and constructed to meet the intended purpose of the practice. Use of high quality serviceable materials that are not new requires prior approval by *the NRCS State Grassland Specialist*. *Landscape timbers are not acceptable materials for fence posts, battens, or braces.*

Any materials or construction features that exceed these specifications, or have equivalent or greater effectiveness as specified by the manufacturer, may be acceptable for meeting the requirements of this specification. *Before using alternative materials or installation methods not specifically described in this specification, contact the NRCS State Grassland Specialist for approval.* Consider the practice life span of the fence when using alternative materials and installation methods.

The following Exhibits in this specification provide specific information for various types of livestock fences:

Exhibit 1 - Fence Type by Species for **Critical Confinement/Exclusion**; page 5 and 6

Exhibit 2 - Fence Type by Species for **Non-Critical Confinement/Exclusion**; page 7

Exhibit 3 - **Non-Electric** High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion; page 8, 9, 10, and 11

Exhibit 4 - **Wooden Board Fence** for Critical Confinement/Exclusion; page 12

Exhibit 5 - **Chain Link Fence** for Hazardous confinement/exclusion; page 13

Exhibit 6 - **Electric** High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences; page 14, 15, and 16

Exhibit 7 - **Electroplastic** Twine (Polywire) and Electrified Ribbon for Non-Critical Confinement/Exclusion (or Divisional) Fences; page 17

Exhibit 8 - **Summary of Fence Types** and Selected Materials; page 18, 19, and 20

Exhibit 9 - **Fence Curve Construction**, is an illustration for installing fences that deviate from a straight line.

Exhibits 1 and 2 are to be used to determine the types of fences, fence heights, and wire spacings that are recommended for controlling specific types of livestock. Exhibits 3 to 7 are to be used for additional criteria for each type of fence. Exhibit 8 is a brief summary of some of the major components and installation requirements for each fence type.

Fences are categorized based on the degree of protection provided for the intended use, as follows:

1. **Critical confinement/exclusion fences:**
Are used in areas where a high level of confinement or exclusion is needed. Fences along property lines, near roads, or adjacent to environmentally sensitive areas are included in this category. Exhibit 1 provides a selected list of recommended fence types for various types of livestock. Details and criteria for these are included in the additional conditions and/or drawings. Others not

shown must be reviewed and approved in advance by the Engineer.

2. **Non-critical confinement/exclusion fences:** Can be used in areas where a lower level of confinement or exclusion is acceptable. Divisional fences in pastures (either permanently installed or moveable), stream bank fencing, alleyways, and other light-duty fences are included in this category. Exhibit 2 provides recommendations for non-critical confinement electric fences for various types of livestock. Other types of non-critical confinement/exclusion fences may also be appropriate, but must be approved in advance by the Engineer.
3. **Hazardous confinement/exclusion fences:** Are used for a high level of exclusion of small children and animals. These are required on Waste Storage Facilities, non-grated openings around Manure Transfer Systems, and on Heavy Use Areas adjacent to waste storage facilities or adjacent to vertical drops. These fences will be at least 4' high, limit the spacing of the posts to 8', limit the distance between horizontal members to 4" unless the horizontal distance is 6" or less then the spacing can go up to 6". This applies to gates at push offs. This is common for fencing on Heavy Use Areas. Examples include pipe, guiderail, and cable fence. Other types of fences may also be appropriate. Details and criteria are included in the additional conditions and /or drawings. Others not shown must be reviewed and approved in advance by the Engineer.

The criteria listed in this specification for size, gauge, amount, weight or type of materials for each fence type, and the post seating depths shall be regarded as minimums, unless otherwise specified by the fence manufacturer. Post spacing and wire spacing shall be regarded as maximums, unless otherwise specified by the fence manufacturer. Refer to Exhibits 3 to 6, which describe the materials requirements for specific types of fences.

Fence Posts – A post is a linear piece of wood, steel, or other material set upright in the ground to serve as support for the fence material. For each type of fence, criteria are established for line, corner, end,

gate, and brace post, as applicable. Posts are defined as follows:

1. **Line posts** – Primarily support the fence material, and are not under significant tension. One or more line posts are set between the corner, end, gate, and brace posts;
2. **Corner, end, gate, and brace posts** – These posts support the fence material, and are also under tension from the pull of the fence. They are usually larger in diameter and are set deeper in the ground than line posts.
3. **Horizontal brace rails** – These posts are set horizontally between end, corner, or gate post and the brace post.

Battens – Battens are narrow, slotted strips of poly or fiberglass that are used as wire spacers to keep strands apart in high tensile smooth wire or barbed wire fences. Battens are supported by the fence wires using clips to attach the wire to the battens and are not set in the ground.

Access Gates – Install gates at locations suitable for providing controlled access. Select gates of appropriate size and materials for the specific fencing system. Install prefabricated gates according to the manufacturer's instructions. Use properly installed undergrounds to carry electric charge under a gate if using electric fence.

Flood Gates – Where a fence crosses a stream at a livestock crossing, install a flood gate (or water gap section) across the stream as needed to keep livestock within the fenced area. Construct the flood gate so as to minimize debris buildup and prevent structural damage to the fence during flooding events

Grounding Rods – Nonelectrical fences shall be grounded to protect livestock from lightning strikes. Electrical fences shall have the electrical fence charger grounded as per manufacturers recommendations. Lighting arrestors on electrical fences shall also be grounded, all as per manufacturer's recommendations.

Electrical Fence Chargers – Electrical fence chargers provide an electrical charge to control livestock. Electrical chargers are usually rated in joules. The greater the joules the greater amount of fence can be charged. Electric fence chargers may be AC powered, battery powered, or solar powered with battery backups.

Insulators – Electric fence will need insulators. They shall be UV stabilized (plastic) high density

polypropylene, on ends and corners use high strain tube insulators or high strain porcelain corner insulators.

Fasteners and Hardware- All hardware that touches the fence post and/ or wire shall be galvanized.

3. INSTALLATION

Preparation

Once the fence location is determined in the field clear all trees, brush and mow as needed to install the fence

Fence Alignment

Construction shall be as straight as practicable between corners or turns. Construct fences along curved lines by using straight segments with posts adjusted closer together or install brace assemblies to facilitate the bends.

Posts

Set posts in the ground by driving, auguring, or hand digging. Backfill material shall be hand tamped in 6-inch lifts. Posts need to be set below the frost line to prevent heaving. For corner and end posts, and line posts on curves, install posts approximately 2 inches off vertical (leaning away from the direction of pull). In extremely wet or very sandy soils, and in cases where posts cannot be set to the specified depth, the posts of permanently installed fences must be set in concrete to secure them. *In all cases, posts must be set firmly so that they cannot be moved horizontally or vertically by hand.*

Grounding Rods

For electrical fence chargers ground rods shall be at least ten feet apart and at least 50 feet from other existing grounding systems. Avoid water pipes or buildings where the electrical charge may affect livestock or people. Install the proper number of grounding rods as per manufacturers recommendations.

Electrical Fence Chargers

The electrical fence charger shall be low impedance, high voltage, and shall be installed as per manufacturer's recommendations. No constant current chargers shall be used. The electrical fence charger shall have proper surge protection and lightning protection as per manufacturer's recommendations. Electric fence warning signs shall be installed every 300 feet where the public has access to the fence. Size the charger for the miles of

fence and the livestock that it needs to control following manufacturer's recommendations.

Undergrounds and Electrical Connections

Undergrounds shall be installed using insulated wire of the same size and material as the fences it is connecting. Place the insulated wire inside plastic water pipe to protect it from damage by livestock and equipment before burying at a minimum depth of 6 inches.

Electrical connections shall be made by using crimping sleeves, split bolt connectors, or proper hand tied knots. Follow manufacturers recommendations.

Streams/Water courses

For streams or water crossings where the depth of the stream is less than 1/3 the height of the fence, the fence may run uninterrupted. For streams of greater depth, end the main fence at the top of the stream bank on each side with an appropriate brace end assembly. From separate end brace assemblies construct a separate section of fence that will run at 90 degree angles to the stream to cross the watercourse that shall be de-energized during high flow or flooding conditions. The only tie between the main fence and the section spanning the watercourse shall be a single electrical connection.

Waste Storage Facilities, Waste Transfer, and Heavy Use Areas

Install at location shown on drawings and construct as per details provided under the additional conditions and /or drawings.

Re-vegetation

Vegetated areas that were disturbed during fence construction shall be replanted as needed. Based on land use and site conditions, use one of the following Pennsylvania NRCS conservation practice standards to specify the appropriate grasses or other vegetation: Conservation Cover (Code 327), Critical Area Planting (Code 342), or Pasture and Hay Planting (Code 512).

REFERENCES

American Association for Vocational Materials 1980. *Planning Fences*. Second Edition. Winterville, Georgia.

Craven, Scott R., and Scott E. Hygnstrom, 1994. *Deer Damage Prevention and Control*. Contained in the series: *Prevention and Control of Wildlife Damage*, issued by University of Nebraska Cooperative Extension, Great Plains Agricultural Council, and USDA-APHIS.

<http://www.ces.ncsu.edu/nreos/wild/pdf/wildlife/deep.pdf>

Gallagher, W.M. 2005. *Gallagher Power Fence Systems Manual*. 12th Edition. New Zealand.

Knapp, J.W. 1980. *How to Build Fences with Max-Ten 200 High-Tensile Fence Wire*. USSC Pittsburgh, PA.

Kencove Farm Fence Inc. *Kencove Farm Fence Supplies 2008*.

www.kencove.com

Pennsylvania Engineering Field Manual Chapter 5 Standard Detail Drawings

4. ADDITIONAL CONDITIONS

EXHIBIT 1: Fence Type by Species for *Critical Confinement/Exclusion*^{1/}

Type of Livestock	Type of Fence				
	Non-Electric High Tensile Smooth Wire	Woven Wire	Barbed Wire	Wooden Board (minimum 4 inch wide boards)	Electric High Tensile Smooth Wire
Equine and Foals	Special considerations for visibility should be taken when using high tensile fence. Plastic coated wire or rail products can be used. Minimum 4 strands spaced 20, 30, 42 and 54 inches above the ground. Adjust spacing for small or large Equine.	Minimum of 48 inches high – Max. opening 3 ½ inches x 3 inches on first 18". Verticals, minimum 3 inches apart on entire height. Install at least one additional electrified smooth wire at the top. Alternatively, a wooden rail (board) or a plastic coated product may be added at the top of the woven wire to prevent Equine from stretching the fence.	Not recommended.	Minimum of 3 and a maximum of 4 boards. Boards spaced on 16-inch centers; bottom board at approximately 16 inches above the ground. 3-board fence – top board at 48 inches above the ground. 4-board fence – top board at 64 inches above the ground.	Special considerations for visibility should be <i>taken</i> when using high tensile fence. Plastic coated wire or rail products can be used. Equine (no foals) – Minimum 3 strands spaced 30(+) ^{2/} , 40(+), 50(+) ^{2/} above the ground. Equine with foals – Minimum 5 strands spaced 10, 20(+), 30(+), 40, 50(+) ^{2/} above ground.
Beef – Steers, Cows and Calves	Minimum of 7 strands spaced at 9, 14, 19, 25, 31, 38 and 46 inches above the ground.	Minimum of 48 inches high – 5 horizontal wires woven, plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.	Minimum of 3 stands spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.	Minimum of 3 and a maximum of 4 boards. 3-board fence – top board at 48 inches above the ground. Boards spaced on 16-inch center; bottom board at approximately 16 inches above the ground. 4-board fence – top board at 56 inches above the ground. Boards spaced on 14-inch center; bottom board at approximately 14 inches above the ground.	Minimum of 3 strands – spaced at 18(+), 30(+), and 42(+) ^{2/} inches above the ground. Or a minimum of 4 strands (only 2 electrified) – spaced at 10, 22(+), 34(+), and 46 inches above the ground.
Dairy Cows and Heifers	Minimum of 7 strands spaced at 9, 14, 19, 25, 31, 38 and 46 inches above the ground.	Minimum of 48 inches high 5 horizontal wires woven plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.	Minimum of 3 strands spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.	Minimum of 3 and a maximum of 4 boards. 3-board fence – top board at 48 inches above the ground. Boards spaced on 16-inch center; bottom board at approximately 16 inches above the ground. 4-board fence – top board at 56 inches above the ground. Boards spaced on 14-inch center; bottom board at approximately 14 inches above the ground.	Dairy Cows only – Minimum 2 strands (2 electrified), spaced at 20(+) ^{2/} and 34(+) ^{2/} inches above the ground. With Heifers – Minimum of 3 strands (2 electrified), spaced at 18, 30(+) ^{2/} and 42(+) ^{2/} inches above the ground.

EXHIBIT 1: Fence Type by Species for *Critical Confinement/Exclusion*^{1/}

Type of Livestock	Non-Electric High Tensile Smooth Wire	Woven Wire	Barbed Wire	Wooden Board (minimum 4 inch wide boards)	Electric High Tensile Smooth Wire
Goats and Kids	See Note 2, below.	Minimum of 36 inches high – 5 horizontal wires woven, plus one additional electrified smooth wire as an offset 5 inches from the inside of the fence at a height of 12-18 inches above the ground.	Not recommended.	Not recommended	Minimum of 5 strands all are electrified – spaced at 6(+), 12(+), 20(+), 28(+) and 36(+) ^{3/} inches above the ground.
Sheep and Lambs	See Note 2, below.	Minimum of 40 inches high – 5 horizontal wires woven, plus one additional electrified smooth wire as an offset 5 inches from the inside of the fence at a height of 12-18 inches above the ground.	Not recommended.	Not recommended.	Minimum of 5 strands (at least 2 electrified) – spaced at 6, 12(+), 20(+), 28 and 36 inches above the ground. Or a minimum of 4 strands, if all are electrified – spaced at 6(+), 13(+), 23(+), 35(+) ^{3/} inches above the ground.
Hogs	Not recommended.	Minimum of 35 inches high – 5 horizontal wire woven, plus one additional wire (either barbed or electrified smooth) at 8 inches above the ground.	Not recommended.	Not recommended.	Minimum of 5 strands (at least 2 electrified) – spaced at 6, 12(+), 20(+), 28 and 36 inches above the ground.

EXHIBIT 1 NOTES:

^{1/} Based on the type of livestock use the information in this table only as a guide to determine the number of strands and spacing. Adjustments to the number of strands and spacing may be made based on the fence manufacturer's recommendations and landowner preference for critical confinement/exclusion fences.

^{2/} Non-electric high tensile fence is not recommended for these animals unless: (a) there are electric fences elsewhere on the farm and, as a result, the animals are trained to avoid wire fences, or (b) the fence will be used for non-critical confinement/exclusion.

^{3/} (+) indicates wire is electrified.

EXHIBIT 2: Fence Type by Species for <i>Non-Critical Confinement/Exclusion</i>	
Type of Livestock	Recommended Number of Strands and Spacing ^{1/}
Mature Equine	Minimum of 1 strand – spaced at 28 to 34 inches above the ground. Consider fence visibility.
Equine and Foals	Minimum of 2 strands – spaced at 17 to 22 inches, and 32 to 38 inches above the ground. Consider fence visibility.
Cows and Calves	Minimum of 2 strands – spaced at 17 to 22 inches, and 32 to 38 inches above the ground.
Mature Beef and Dairy Cattle	Minimum of 1 strand – spaced at 28 to 34 inches above the ground. For hard to hold animals, use: Minimum of 3 strands – spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.
Goats and Kids	Minimum of 2 strands – spaced at 14 inches and 30 inches above the ground. For kids and stream bank fencing, an additional wire may be needed and the bottom wire should be set at 7, 14 and 30 inches above the ground.
Sheep and Lambs	Minimum of 2 strands – spaced at 14 inches and 30 inches above the ground. Minimum of 4 strands for lambs and stream bank fencing – spaced at 7, 14, 21, and 30 inches above the ground with the 21 inch high strand being non-electric.
Hogs	Minimum of 2 strands – spaced at 10 inches and 18 inches above the ground for sows and growing-finishing pigs, or spaced at 6 inches and 18 inches above the ground for nursing pigs.

EXHIBIT 2 NOTE:

^{1/} Electric fence materials for non-critical confinement may consist of high tensile smooth wire, plastic coated wire, electroplastic twine (polywire), electrified ribbon, or other materials as specified by the manufacturer. Electrification of barbed wire is not recommended. Based on the type of livestock, use the information in this table as a guide to determine the number of strands and spacing. Adjustments to the number of strands and spacing may be made based on the fence manufacturer's recommendations and landowner preference for non-critical confinement/exclusion fences.

EXHIBIT 3: *Non-Electric* High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Non-electric high tensile smooth wire, woven wire, and barbed wire fences are suitable for applications where a high level of confinement is needed, such as near roads and on property lines.

Wire – All wire shall be new ASTM Class 3 galvanized. For optimum strength of fencing, attach the wire to the side of the fence that will receive the greatest pressure from animals. Place wire on the outside of posts on curves and corners. The type of wire, number of wires, spacing, and minimum height of fence is based on the type of livestock to be confined. See Exhibit 1 for details. Fence wire shall consist of one of the following materials:

1. **High tensile smooth** – Wires shall be 12 ½ gauge minimum with at least 200,000 PSI tensile strength and at least 1,540 pounds breaking strength. Tension shall be set with in-line wire strainers and/or tension indicator springs at 250 pounds. Tension springs shall be full-strength Class 3 galvanized springs. Tension springs are recommended for use in the top one to two strands in areas where the fence is near trees or where animal pressure will be heavy. Tension springs may also be used for all strands. Wrap and twist wires or use crimping sleeves on end and gate posts. In flood prone areas, use no more than six strands of non-electrified high tensile wire. There is a greater possibility of flood damage if more strands are used.
2. **Woven wire** – Woven wire shall have a minimum 12 ½ gauge top and bottom wire with minimum 12 ½ gauge wire in between. High tensile woven wire may be used. Install the fencing so that the bottom wire is at ground level to exclude predators. If predators are not a concern, the bottom wire can be installed at 3 inches above ground level to facilitate maintenance. Add at least one additional wire (either barbed or electrified smooth) above the top of the woven wire. The first additional wire, if barbed, shall be no more than 3 inches above the top of the woven wire. This reduces the possibility that livestock will put their heads through the gap and push down on the woven wire fence. Woven wire is not recommended for use in flood prone areas.
3. **Barbed wire** – Standard barbed wire shall be double-strand, a minimum 12 ½ gauge with 4-point barbs spaced no more than 6 inches apart, or 15 ½ gauge for high tensile barbed wire. Barbed wire may be used in flood prone areas, but it is more subject to flood damage than high tensile smooth wire fence. Barbed wire shall not be used for Equine, goats, sheep, and hogs.

EXHIBIT 3: *Non-Electric* High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for *Critical Confinement/Exclusion*

Line Posts – Shall be either wooden or steel, and shall meet the following criteria for type of material, size, and spacing:

1. **Wooden Post** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable disease free posts of species such as southern yellow pine, red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine, landscape timbers, or peeler cores. Treated limber shall be treated with a minimum retention of 0.40 lbs./cubic foot chromated copper arsenate (CCA), type A, B, or C, or equivalent non-CCA treatment. Wooden line posts shall be at least 4 inches in diameter, or 4 inches square. Posts shall be of sufficient length to accommodate the minimum fence height and long enough for a minimum depth of 2 ½ feet driven in the ground. When set in depressions or low places, line posts shall be anchored in the ground or set at an angle to prevent lifting or longer posts may be needed. Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 12 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Install a ring of stapes 3 inches from the end of the post to be set in concrete to help prevent heaving. Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than required depth may be used with prior approval from NRCS.
2. **Steel posts** – Shall be studded or punched “T”, “U”, or “Y” shaped with anchor plates, with a minimum weight of 1.25 lbs. per foot (excluding the anchor plate). Posts shall be either galvanized or painted. Galvanized posts shall be hot-dipped with at least 2 ounces of zinc coating per square foot. Painted posts shall be clean of loose scale with one or more coats of weather resistant paint applied. Steel line posts shall be at least 5 feet long, and driven into the ground to the top of the anchor plate. Where extra strength and support for the fence is needed, use a wooden post instead of steel for every third or fourth line post.
3. **Spacing** – For non-electric high tensile fencing, line posts shall be spaced a maximum of 16 feet apart on center. When battens are used, the maximum line post spacing is 30 feet on center with battens installed at 10 and 20 feet. For conventional woven wire fences, the maximum line post spacing is 10 feet. If high tensile woven wire is used, the maximum line post spacing shall be 20 feet or as based on the manufacturer’s recommendation. For barbed wire fences, the maximum line post spacing is 16 feet.
4. **Installing curves** – Installing curves in high tensile, woven wire and barbed wire fences is permissible as long as the change in direction from one post to the next does not exceed 20 degrees. **Exhibit # 9 Fence Curve Construction** illustration.

Post numbers – 1 post is needed for changes in direction of up to 20 degrees, a minimum of 2-posts for up to 40 degrees, a minimum of 3-posts for up to 60 degrees, a minimum of 4-posts for up to 80 degrees and a minimum of 5-posts for up to 100 degrees.

Installing wire and posts – Posts must be driven 48 inches deep with a 4 inch lean to the outside of the curve. Post spacing along these curves must be no closer than 4 feet. Wire should be attached to the outside of the posts starting with the post where the direction changes.

Post Sizing – Use posts that are a minimum of 4 inches in diameter for changes in direction of up to 7 degrees, 5 inch minimum for changes in direction between 7 and 14 degrees and 6 inch minimum diameter for changes between 14 and 20 degrees.

Checking angles – To estimate the changing in direction in degrees continue along a line projected out from the straight section of fence for 8-feet and measure the distance from the straight line to the planned fence location. If the distance is 1-foot the change in direction is approximately 7 degrees, 2-feet is approximately 14 degrees and 3-feet is approximately 20 degrees.

EXHIBIT 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Battens – If battens are used, distances between line posts in high tensile fences can be increased (see Spacing, previous page). Battens shall be poly, fiberglass or other NRCS approved material with UV stabilization. Standard “T”, “U”, or “Y” shaped steel posts with anchor plates may be used in place of battens. Spacing between battens shall be 10 feet maximum for non-electric high tensile wire. Wires must be attached to the battens using Class 3 galvanized clips.

Corner, End, Gate and Brace Posts – Shall meet the following criteria for type of material and size:

1. **Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable disease free posts of species such as southern yellow pine, red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine, landscape timbers or peeler cores. Treated lumber shall be treated with a minimum retention of 0.40 lbs./cubic foot chromated copper arsenate (CCA), type A, B, or C, or equivalent non-CCA treatment. Corner, end, and gate posts shall be at least 6 inches in diameter, or 6 inches square. Brace posts shall be at least 5 inches in diameter. Posts shall be of sufficient length to accommodate the minimum fence height and long enough for a minimum depth of 3 ½ feet driven in the ground or below frost level, whichever is greater. Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 24 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 6 inch diameter post shall have a minimum 18-inch diameter hole filled and set with concrete.) Install a ring of stapes 3 inches from the end of the post to be set in concrete to help prevent heaving. Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior approval from NRCS.
2. **Spacing** – Brace post shall be set at a minimum distance of 2 times the height of the fence from each corner, end, or gate post. Brace assemblies shall be installed as described in the next section of this exhibit.

Brace Assemblies – **Single span or double span brace assemblies** are required at all corners, ends, and gates, and where the fence alignment changes direction by more than 40 degrees. **Line brace assemblies** shall also be installed at appropriate intervals in a run of fence and at all sharp breaks in grade. A **run** is the distance between a corner, end, or gate post and the next corner, end, or gate post. Types and maximum intervals for bracing are listed below. Refer to Pennsylvania Standard Drawings for typical brace assembly designs for the different types of fences located in Chapter 5 of the Engineering Field Manual.

1. **High Tensile** – For 2-6 wires a single brace assembly is needed at corner, end and gate posts (exception for a 2 wire fence, if corner, end and gate posts can be buried 4 feet deep and a 6 inch diameter post is used, no brace assemblies are needed). For more than 6 wires, double brace assemblies are needed.
2. **Woven Wire and Barbed Wire** – Single brace assemblies are needed at corner, end and gate posts. If a run is longer than 1,320 feet a single in-line brace assembly is needed.

EXHIBIT 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Horizontal brace rails shall consist of one of the following materials:

1. **Galvanized steel pipe** – Minimum 2 times height of fence, 2-inch diameter, Schedule 40 pipe.
2. **Wooden post** – Minimum 2 times height of fence, 4-inch square or 3 ½-inch diameter round.

Brace post pins shall be Class 3 galvanized pins a minimum of 3/8-inch x 9-inch and 3/8-inch x 4-inch.

Brace wires shall consist of 12 ½ gauge or stronger, galvanized, high tensile wire, double wrapped with a 1 1/2-inch x 2-inch x 2-foot twist stick. A double wire with a tightener or a double wire crimped together may also be used. Brace wires shall be tightened to secure the brace and post assemblies.

If a wide stream or gully is to be crossed, the fence section shall be terminated on each bank with a brace assembly and a separate section constructed between these ends. In flood prone areas see Exhibit 2 for minimum number of strands and spacing. There is a greater possibility of flood damage if more strands are used.

Refer to Pennsylvania Standard Drawings for typical brace assembly designs for the different types of fences located at http://www.pa.nrcs.usda.gov/technical/Engineering/standard_drawings/standard_drawings.html

Fasteners – For wood posts, use minimum 9-gauge galvanized wire staples to attach wire to the posts. Staples shall be a minimum of 1 ½ inches long for softwood and a minimum of 1 inch long for hardwood such as black locust. Staples shall be driven diagonally across the wood grain and staggered to avoid splitting. For high tensile fencing material, the staples shall not be driven into the posts (including line, corner, end, gate, and brace posts) so deeply that the wire will not move when tightened or with expansion and contraction.

For steel line posts, attach wires by wrapping with 12 ½ to 14-gauge galvanized wire or by use of the manufacturer's specially designed clips.

Grounding Rods – Non-electrified wire fences shall be grounded at least every 1,000 feet to protect livestock from lightning strikes. Grounding rods shall be galvanized or copper coated rods. Grounding rods and clamps shall be of similar materials. Fences built with metal posts set in earth will provide sufficient lightning protection, and do not require additional grounding.

EXHIBIT 4: Board or Plastic Coated Rail Fence for *Critical Confinement/Exclusion*

Board fences are suitable for applications where a high level of confinement or exclusion is needed, such as near roads and on property lines. Wooden boards (horizontal rails) and posts shall be well seasoned or kiln-dried to minimize warping. Use untreated durable disease free wood of such species as red cedar, black locust, oak, or osage-orange, or a non-durable wood that is preservative pressure treated. Treated lumber shall be treated with a minimum retention of 0.40 lbs./cubic foot ACQ or Natural Select. Boards and posts may be painted if desired. For optimum strength of fencing, attach the boards to the side of the fence that will receive the greatest pressure from animals. Where appearance is important, the boards may be placed on the outside of the fence. The number of boards, board spacing, and minimum height of fence is based on the type of livestock to be confined. Plastic coated rail fence may be used. See Exhibit 1 for details.

Posts – Shall meet the following criteria for size, installation, and spacing:

1. **Size** – Line posts shall be at least 4 inches in diameter or 4 inches square, posts shall be of sufficient length to accommodate the minimum fence height and long enough for a minimum depth of 2 ½ feet driven in the ground. Corner, gate and end posts shall be at least 6 inches in diameter or 6 inches square, posts shall be of sufficient length to accommodate the minimum fence height and long enough for a minimum depth of 3 ½ feet driven into the ground or below frost level, whichever is greater. Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 24 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 6-inch diameter post shall have a minimum 18-inch diameter hole filled and set with concrete.) Install a ring of staples 3 inches from the end of the post to be set in concrete to help prevent heaving. Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence rails shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior NRCS approval.
2. **Spacing** – Posts shall be spaced a maximum of 8 feet on center to accommodate rail lengths of a maximum of 16 feet.

Rails – The rails (horizontal boards) shall be a nominal minimum of 1-inch thick x 6 inches wide. Board lengths of 16 feet are preferred so as to stagger the unions when placed on posts on 8-foot centers. Plastic coated rail fence shall be a minimum of 4 inches wide.

Nails – Each board shall be attached to the post with a minimum of two 12d (3 ¼-inch) stainless steel nails. For better holding power, use ring-shank or screw-shank instead of common nails. Two 3-inch powder coated decking screws may be used instead of nails.

EXHIBIT 5: Chain Link Fence for Critical Confinement/Exclusion

Chain link fences are suitable for applications where a high level of confinement or exclusion is needed, such as near roads and on property lines, or adjacent to hazardous areas.

Chain Link Wire Fabric – Shall be a minimum 5 feet high, 9-gauge wire with a minimum tensile strength of 1,290 lbs. Chain link fence fabric shall conform to the requirements of ASTM A 392, “Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric,” 2-inch woven mesh, and 9-gauge galvanized steel wire. Zinc coating shall be Class 2 (i.e., 2 ounces of zinc coating per square foot).

Steel Pipes – Posts and fence framework shall conform to the requirements of ASTM F 669, “Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence,” Group 1A (Schedule 40); ASTM F 1043 “Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework,” Group 1A; and ASTM F 1083, “Standard Specification for Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded, for Fence Structures,” as applicable. Coatings shall be Type A galvanized for both internal and external surfaces.

1. **Top rail and gate frames** – Shall be a minimum 1 5/8-inch Outside Diameter standard (Schedule 40) steel pipe;
2. **Line posts** – Shall be a minimum 2-inch Outside Diameter standard (Schedule 40) steel pipe, be of sufficient length to support the height of the fence, and be set in concrete to a minimum depth of 12 inches;
3. **Corner, gate, and end posts** – Shall be a minimum 2 3/8-inch Outside Diameter standard (Schedule 40) steep pipe, be of sufficient length to support the height of the fence, and be set in concrete to a minimum depth of 12 inches and a width at least 3 times the diameter of the pipe.

Fittings and Gates – Fence fittings shall conform to the requirements of ASTM F 626, “Standard Specifications for Fence Fittings.” Fittings shall be galvanized steel. Wire ties and clips shall be 9-gauge. Gates, gate posts and gate accessories shall conform to the requirements of ASTM F 900, “Standard Specification for Industrial and Commercial Swing Gates.” Coatings shall be the same as selected for adjoining fence framework.

Installation – Unless otherwise specified by the manufacturer, line posts shall be set at intervals not exceeding 10 feet, as measured from center to center of each post. All posts shall be capped immediately after installation. Chain link fabric is generally installed on the outside of the fence post. The fabric shall not be attached to posts until at least 3 days after the posts are set in concrete wall, or at least 5 days after posts are set in the ground with concrete backfill. The fabric shall be stretched taut and securely fastened, using 9-gauge tie clips, to posts at intervals not exceeding 15 inches and to top rails or tension wires at intervals not exceeding 2 feet. Care shall be taken to equalize the tension on each side of each post. Gate frames shall be fabricated and hung so that they sag no more than 1% of the gate width.

EXHIBIT 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Electric high tensile fencing is suitable for applications where a high level of confinement is needed, such as near roads and on property lines. It may also be used for interior or divisional fences to divide large pasture acreage into manageable units, to divide the paddocks of intensive grazing systems, or for other non-critical applications.

Wire – All wire shall be ASTM Class 3 galvanized, 12 ½ gauge minimum and at least 180,000 PSI tensile strength and at least 1,300 pounds breaking strength for critical confinement and 17 gauge minimum for non-critical confinement. For optimum strength of fencing, attach the wire to the side of the fence that will receive the greatest pressure from animals. Place wire on the outside of posts on curves and corners. Tension shall be set with in-line wire strainers and/or tension indicator springs at 150 pounds. Tension springs shall be full-strength Class 3 galvanized springs. Tension springs are recommended for use in the top one to two strands in areas where the fence is near trees or where animal pressure will be heavy. Tension springs may also be used for all strands. Wrap and twist wires or use crimping sleeves on end and gate posts. At self-insulating corner posts, wrap and twist a separate wire to form an 18 to 20-inch loop to support fence strands or a wrap-around insulator may be used. Wire clips used to hold wire in batten slots should allow the wire to slide freely. The number of wires and spacing is based on the type of livestock to be confined and the purpose and location of the fence. See Exhibits 1 and 2 for details. In flood prone areas see Exhibit 2 for minimum number of strands and spacing. There is a greater possibility of flood damage if more strands are used.

Line Posts – Shall be either wooden or steel, and shall meet the following criteria for type of material, size, and spacing:

1. **Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable disease free posts of species such as southern yellow pine, red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine, landscape timbers, or peeler cores. Treated lumber shall be treated with a minimum retention of 0.40 lbs./cubic foot chromated copper arsenate (CCA), type A, B, or C, or equivalent non-CCA treatment. Wooden line posts shall be at least 4 inches in diameter, or 4 inches square. Posts shall be of sufficient length to accommodate the minimum fence height and long enough for a minimum depth of 2 ½ feet in the ground. When set in depressions or low places, line posts shall be anchored in the ground or set at an angle to prevent lifting or longer posts may be needed. Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 12 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Install a ring of staples 3 inches from the end of the post to be set in concrete to help prevent heaving. Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior approval from NRCS.
2. **Steel Posts** – Shall be studded or punched “T”, “U”, or “Y” shaped with anchor plates, with a minimum weight of 1.25 lbs. per foot (excluding the anchor plate). Posts shall be either galvanized or painted. Galvanized posts shall be hot-dipped with at least 2 ounces of zinc coating per square foot. Painted posts shall be clean of loose scale with one or more coats of weather resistant paint applied. Steel line posts shall be at least 5 feet long, and driven into the ground to the top of the anchor plate. Where extra strength and support for the fence is needed, use a wooden post instead of steel for every third or fourth line post.
3. **Spacing** – Line posts shall be spaced a maximum of 60 feet apart, on center, on smooth, level terrain, or maximum of 90 feet with battens installed at 30 and 60 feet. Reduce the spacing between posts on uneven ground or rolling terrain to maintain spacing of the bottom wire above the ground.

EXHIBIT 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

4. **Installing curves** – Installing curves in high tensile, woven wire and barbed wire fences is permissible as long as the change in direction from one post to the next does not exceed 20 degrees.

Post numbers – 1 post is needed for changes in direction for each 20 degree interval (i.e. 1 post 20 degrees, 2-posts up to 40 degrees, 3-posts up to 60 degrees, 4-posts up to 80 degrees and 5-posts up to 100 degrees.

Installing wire and posts – Posts must be driven 48 inches deep with a 4 inch lean to the outside of the curve. Post spacing along these curves must be no closer than 4 feet. Wire should be attached to the outside of the posts starting with the post where the direction changes.

Post Sizing – Posts shall be a minimum of 4 inches in diameter for changes in direction of up to 7 degrees, 5 inch minimum diameter for changes in direction between 7 and 14 degrees and 6 inch minimum diameter for changes between 14 and 20 degrees.

Checking angles – To estimate the change in direction in degrees continue along a line projected out from the straight section of fence for 8-feet. Measure the distance from the straight line to the planned fence location. If the distance is 1-foot the change in direction is approximately 7 degrees, 2-feet is approximately 14 degrees and 3-feet is approximately 20 degrees. Refer to **Exhibit 9 Fence Curve Construction** illustration.

Battens – If battens are used, distances between line posts can be increased by 30 feet on uniform terrain. Battens shall be poly, fiberglass or other NRCS approved material with UV stabilization. Wires must be attached to the battens using Class 3 galvanized clips. Spacing between battens will be 30 feet maximum. For a single strand fence, use 4-foot (minimum height) wood or insulated steel posts instead of battens.

Corner, End, Gate and Brace Posts – Shall meet the following criteria for type of material and size:

1. **Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable disease free posts of species such as southern yellow pine, red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine, landscape timbers, or peeler cores. Lumber shall be treated with a minimum retention of 0.40 lbs./cubic foot chromated copper arsenate (CCA), type A, B, or C, or equivalent non-CCA treatment. Corner, end, and gate posts shall be at least 6 inches in diameter, or 6 inches square. Brace posts shall be at least 5 inches in diameter. Posts shall be of sufficient length to accommodate the minimum fence height and long enough for a minimum depth driven in ground of 3 ½ feet or below frost level, whichever is greater. Where posts cannot be set to the specified depth, for security they must be set in concrete. Set posts in a hole that is at least 24 inches deep, with a hole diameter that is at least three times the diameter of the post. (For example, a 6-inch diameter post shall have a minimum 18-inch diameter hole filled with concrete.) Install a ring of staples 3 inches from the end of the post to be set in concrete to help prevent heaving. Portland type concrete mix shall be used and sloped at the top to provide positive drainage away from the post. Fence wire can be attached to posts after concrete has cured for a minimum of 5 days. Prior approval is required on other methods of shallow post installation from NRCS State Grassland Specialist.

2. **Spacing** – Brace posts shall be set a minimum of 2 times the height of the fence from each corner, end, or gate post. Brace assemblies shall be installed as described in the next section of this exhibit.

Brace Assemblies – Fences with 2 or more strands of high tensile wire, **single or double span brace assemblies** are required at all corner, ends, gates, and where the fence alignment changes direction by more than 40 degrees (exception for a 2 wire fence, if corner, end and gate posts are buried 4 feet deep and a 6 inch diameter post is used). **Line brace assemblies** shall also be installed at appropriate intervals in a run of fence and at all sharp breaks in grade. A *run* is the distance between a corner, end, or gate post and the next corner, end, or gate post. Types and maximum intervals for bracing are listed below.

EXHIBIT 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Horizontal brace rails shall consist of one of the following materials:

1. **Galvanized steel pipe** – Minimum 2 times height of fence, 2-inch diameter, Schedule 40 pipe.
2. **Wooden post** – Minimum 2 times height of fence, 4-inch square or 3 ½-inch diameter round.

Brace post pins shall be galvanized pins a minimum of 3/8-inch x 9-inch and 3/8-inch x 4-inch.

Brace wires shall consist of 12 ½ gauge or stronger, galvanized, high tensile wire, double wrapped with a 1 ½-inch x 2-inch x 2-foot twist stick. A double wire with a tightener or a double wire crimped together may also be used. Brace wires shall be tightened to secure the brace assemblies.

If a wide stream or gully is to be crossed, the fence section shall be terminated on one bank with a brace assembly and a new section started on the other bank. In flood prone areas see Exhibit 2 for minimum number of strands and spacing. There is a greater possibility of flood damage if more strands are used.

Refer to Pennsylvania Standard Drawings for typical brace assembly designs for the different types of fences located at http://www.pa.nrcs.usda.gov/technical/Engineering/standard_drawings/standard_drawings.html

Fasteners – For wood posts, use minimum 9-gauge galvanized wire staples to attach wire to the posts. Staples shall be a minimum of 1 ½ inches long for softwood and a minimum of 1 inch long for hardwood such as black locust. Staples shall be driven diagonally across the wood grain to avoid splitting. Staples shall not be driven into the post so deeply (including line, corner, end, gate and brace post) that the wire will not move when tightened or with expansion and contraction.

For steel line posts, attach wires by wrapping with 12 ½ to 14-gauge galvanized wire or by use of the manufacturer's specially designed clips.

All electrified wires must be properly insulated as specified by the fence manufacturer.

Electrical Fence Charger – The electric fence charger must have adequate voltage to effectively electrify the system and maintain output to control the type of animals, based on the manufacturer's recommendations. The charger shall be low impedance, high voltage, and shall include all of the safety features that are required by the manufacturer. Electric fence warning signs shall be placed a minimum of 300' apart where the public has access to the fence.

Insulators – If needed, these shall be UV stabilized (plastic) high density polypropylene, high strain end and corner tube insulator, or high strain porcelain corner. Insulators shall be strong enough to support long spans of wire and must allow the wire to slide freely. Insulators shall be used on all posts that are not self-insulating (plastic, fiberglass, etc.).

Grounding Rods – Rods shall meet or exceed the requirements of the manufacturer of the electrical fence charger, and shall be installed as per the manufacturer's recommendations. Grounding rods shall be galvanized or copper coated rods. Grounding rods and clamps shall be of similar materials. Fences built with metal posts

set in earth will provide sufficient lightning protection, and do not require additional grounding.

EXHIBIT 7: Electroplastic Twine (Polywire) and Electrified Ribbon for Non-Critical Confinement/Exclusion (or Divisional) Fences

Electrified twine and/or ribbon type fencing may be used as interior (cross) fencing to divide large pasture acreage into manageable units, to divide the paddocks of intensive grazing systems or similar applications. Electrified twine (polywire) or ribbon type fencing shall not be used in applications where a high level of confinement is needed.

Wire – Shall consist of new materials free of manufacturing or other defects. Polywire shall have a minimum of six stainless steel strands running through the material.

The number of wires and spacing is based on the type of animal to be confined. See Exhibit 2 for details.

Line Posts – Shall be manufactured fiberglass, plastic, or other suitable material as approved by NRCS. Posts shall be at least 4 feet long, set deep enough in the ground to withstand livestock. “Step-in” posts designed for this purpose may be used.

Line posts shall be installed on a spacing as specified by the manufacturer to control specific livestock. Closer spacing shall be used as topographic conditions indicate.

Corner and End Posts – When posts are needed at the end or corner of a cross fence, they may be untreated durable wood (red cedar or black locust), or pressure treated softwood with a diameter sufficient to anchor the wire. Posts must be long enough to allow them to be set at least 1 ½ feet in the ground.

Fasteners – The fence shall be fastened and insulated from line and end posts by using supplies provided by the manufacturer of the fence material.

Electrical Fence Charger – The electric fence charger must have adequate voltage to effectively electrify the system and maintain output to control the type of animals, based on the manufacturer’s recommendations. The charger shall be low impedance, high voltage, and shall include all the safety features that are required by the manufacturer. Electric fence warning signs shall be placed a minimum of 300’ apart where the public has access to the fence.

Grounding Rods – Rods shall meet or exceed the requirements of the manufacturer of the electrical fence charger, and shall be installed as per the manufacturer’s recommendations. Grounding rods shall be galvanized or copper coated rods. Grounding rods and clamps shall be of similar materials.

EXHIBIT 8: Summary of Fence Types and Selected Materials ^{1/}

Fence Materials and Installation Requirements								
Type of Fence	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, and Gate Post Size	Brace Post Size	Brace Intervals
Non-Electric High Tensile Smooth Wire	ASTM Class 3 galvanized, min. 12 ½-gauge, 200,000 PSI, 1,540 lbs. breaking strength	Untreated disease free durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu.ft. CCA or equivalent), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	<u>Wooden posts:</u> min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2 ½ feet. (See Note 2 at the end of this Exhibit.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 30 feet apart on center if spacers or battens are used at 10-foot intervals. Otherwise, max. spacing at 16 feet apart, on center.	Untreated disease free durable wood (e.g., red cedar, black locust) with bark removed or Non-durable wood that is preservative pressure treated (0.40 lbs./cu.ft. CCA or equivalent).	Min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3 ½ feet or below frost level whichever is greater. (See Note 2 at the end of this Exhibit.)	Min. 5 inches diameter. Set in ground to min. depth of 3 ½ feet or below frost level whichever is greater. (See Note 2 at the end of this Exhibit.)	<u>Single span braces</u> needed when 2-6 wires are used, exception for a 2 wire fence, if corner, end and gate posts can be installed 4 feet deep, no brace assemblies are needed. <u>Double span braces</u> needed when more than 6 wire are used.
Woven Wire	ASTM Class 3 galvanized, min. 12 ½-gauge top and bottom wire with 12 ½-gauge wire in between.	Same as above.	Same as above.	Max. 10 feet apart, on center, for standard wire. Max 20 feet apart, on center, if high tensile wire.	Same as above.	Same as above.	Same as above.	<u>Single span braces:</u> Needed at corner, end and gate posts. <u>Line Braces</u> needed if run is longer than 1,320 feet.

EXHIBIT 8: Summary of Fence Types and Selected Materials ^{1/}

Fence Materials and Installation Requirements								
Type of Fence	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, and Gate Post Size	Brace Post Size	Brace Intervals
Barbed Wire	ASTM Class 3 galvanized, double-strand, min. 12 ½ gauge with 4-point barbs spaced no more than 6 inches apart, or 15 ½ gauge for high tensile	Untreated disease free durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	<u>Wooden posts:</u> min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2 ½ feet. (See Note 2 at the end of this Exhibit.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 16 feet apart, on center.	Untreated disease free durable wood (e.g., red cedar, black locust) with bark removed or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent).	Min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3 ½ feet or below frost level whichever is greater. (See Note 2 at the end of this Exhibit.)	Min. 5 inches diameter. Set in ground to min. depth of 3 ½ feet or below frost level whichever is greater. (See Note 2 at the end of this Exhibit.)	<u>Single span braces:</u> Needed at corner, end and gate posts. <u>Line Braces</u> needed if run is longer than 1,320 feet.
Wooden Board	Wood rails – use well seasoned or kiln-dried wood to minimize warping. Rails are min. 1-inch thick x 4 inches wide, and at least 8 feet long. Plastic coated rails are min. 4 inches wide.	Untreated disease free durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. ACQ or Natural Select), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	Wooden posts min. 4 inches diameter or 4 inches square. Length sufficient to support desired height of fence and to be set in the ground a min. of 2 ½ feet deep. (See Note 2 at the end of this Exhibit.)	Max. 8 feet apart, on center.	Untreated disease free durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. ACQ or Natural Select).	Wooden posts min. 6" diameter or 6" square. Length sufficient to support desired height and be set in ground to min. depth of 3 ½' or below frost level whichever is greater. (See Note 2 at the end of this Exhibit.)	Not applicable.	Not applicable.

EXHIBIT 8: Summary of Fence Types and Selected Materials^{1/}

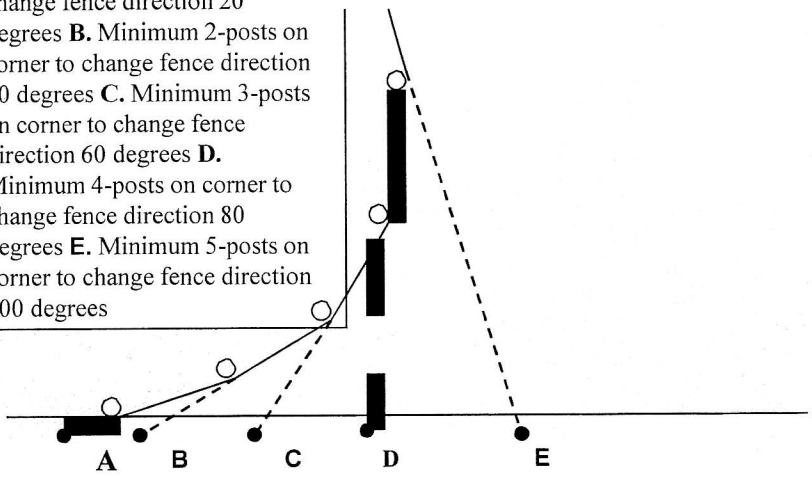
Fence Materials and Installation Requirements

Type of Fence	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, and Gate Post Size	Brace Post Size	Brace Intervals
Chain Link	Min. 9-gauge galvanized wire with 2 ounces of zinc coating per sq. ft. Minimum tensile strength of 1,290 lbs., 2-inch woven mesh.	Steel post, galvanized with 2 ounces of zinc coating per sq. ft., or painted	Min. 2-inch Outside Diameter standard (Schedule 40) steel pipe. Length sufficient to support desired height of fence and be set in concrete a min. of 12" deep	Max. 10 feet apart on center	Steel post, galvanized with 2 ounces of zinc coating per sq. ft., or painted	Min. 2 3/8-inch Outside Dia-meter standard (Schedule 40) steel pipe. Length sufficient to support desired height & be set in concrete min. of 12" deep.	Not applicable.	Not applicable.
Electric High Tensile Smooth Wire	ASTM Class 3 galvanized, min. 12 1/2-gauge 180,000 PSI, 1,300 lbs. breaking strength	Untreated disease free durable wood (e.g., red cedar, black locus) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu.ft. CCA or equivalent), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	<u>Wooden posts:</u> min. 4" diameter or 4" square. Set in ground to min. depth of 2 1/2'. (See Note 2 at the end of this Exhibit.) <u>Steel posts:</u> min. 5' long. Driven into the ground so that the top of the anchor plate is buried	Max. 60 feet apart, on center, or Max. 90 feet apart, on center, with battens installed at 30 and 60 feet.	Untreated disease free durable wood (e.g., red cedar, black locus) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu.ft. CCA or equivalent).	Min. 8 feet long, min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3 1/2 feet or below frost level whichever is greater. (See Note 2, below)	Min. 8 feet long, min. 5 inches diameter. Set in ground to min. depth of 3 1/2 feet or below frost level whichever is greater. (See Note 2, below.)	<u>Single span braces</u> needed when 2-6 wires are used, except for a 2 wire fence, if corner, end and gate posts can be installed 4' deep, no brace assemblies are needed. <u>Double span braces</u> needed when more than 6 wire are used.
Electroplastic Twine (Polywire) and Electrified Ribbon	Polywire: min. 6 stainless steel strands running through the material.	Manufactured fiberglass, plastic, or other suitable material as approved by NRCS.	Min. 4 feet long, set deep enough in the ground to withstand livestock. Can use "step-in" posts.	Use spacing specified by the manufacturer to control livestock.	Untreated durable wood (i.e. red cedar, barkless black locus), or Non-durable wood that is preservative pressure treated	Diameter sufficient to anchor the wire. Posts must be long enough so to set at least 1 1/2' in ground.	Not applicable.	Not applicable.
EXHIBIT 8 NOTES:	<p>1/ This exhibit briefly summarizes some of the major components and installation requirements for each fence type. Refer to Exhibits 1-7 for more detailed criteria.</p> <p>2/ Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 12 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Install a ring of staples 3 inches from the end of the post to be set in concrete to help prevent heaving. Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post.</p>							

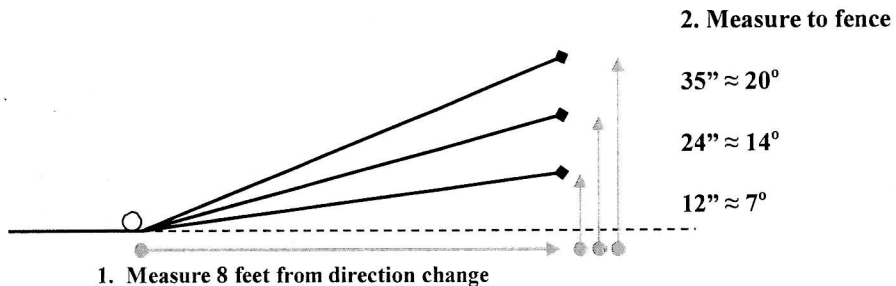
**Exhibit 9 Fence Curve
Construction**

Fencing Curves - Minimum Number of Posts Required

A. Minimum 1-post on corner to change fence direction 20 degrees
B. Minimum 2-posts on corner to change fence direction 40 degrees
C. Minimum 3-posts on corner to change fence direction 60 degrees
D. Minimum 4-posts on corner to change fence direction 80 degrees
E. Minimum 5-posts on corner to change fence direction 100 degrees



Fencing Curves – Determining angle of direction change



Additional Conditions for Fencing which apply to this project:

Chain Link Safety Fence Around the Concrete Manure Storage

1. Supply and install approximately 377 feet of 5-foot-high chain link fence with one 12-foot opening for gates.
2. The gate is to be lockable and will serve as the pump out location.
3. Fence shall be minimum of 9 ga. galvanized wire.
4. Line post shall be 2" Sch 40 galvanized pipe zinc coating inside and out spaced no more than 8 feet apart.
5. End post and gate posts shall be 2 3/8" Sch 40 galvanized steel pipe.

SUBSURFACE DRAIN CONSTRUCTION SPECIFICATION

1. SCOPE

The work shall consist of furnishing materials and installing all components of the subsurface drain as outlined in the specification and the drawings.

2. MATERIALS

a. DRAINFILL AGGREGATE shall meet the requirements of Penn DOT, Publication 408, Section 703, fine and coarse aggregate. The size and gradation shall be as specified in the additional conditions of this specification or on the drawings.

b. PIPE shall meet the requirements of Table 1, and as set forth in Section 9 and/or on the drawings.

All pipes shall be clearly marked with the appropriate specification designation. If plastic pipe is stored on site for a length of time, it should be protected from sunlight. At the time of installation, it should be kept as cool as possible to minimize elongation of the pipe during installation.

c. Geotextile shall meet the requirements as outlined in PennDOT Publication 408, Section 735, Class 1, Subsurface Drainage.

Table 1 – Drain Pipe Requirements

Type	Specification
Clay drain tile, solid & perforated	ASTM-C-4
Clay pipe, perforated, standard and extra strength	ASTM-C-700
Clay pipe testing	ASTM-C-301
Concrete drain tile	ASTM-C-412
Concrete pipe for irrigation or drainage	ASTM-C-118
Concrete pipe or tile, determining physical properties of	ASTM-C-497
Concrete sewer, storm drain and culvert pipe	ASTM-C-14
Reinforced concrete culvert, storm drain and sewer pipe	ASTM-C-76
Perforated concrete pipe	ASTM-C-444
Portland cement	ASTM-C-150
Pipe, bituminized fiber & fitting	Federal Specification SS-P-1540
Styrene rubber (SR) plastic drain pipe & fitting	ASTM-D-2852
Polyvinyl chloride (PVC) sewer pipe & fitting	ASTM-D-2729
Polyvinyl chloride (PVC) pipe	ASTM-D-3034, type PSM
Corrugated polyethylene tubing & fitting (3-6 inch)	ASTM-F-405
Corrugated polyethylene tubing & fitting (8-24 inch)	ASTM-F-667
Pipe, corrugated (steel, polymer coated)	ASTM-A-762
Pipe, corrugated (steel, zinc coated)	ASTM-A-760

3. SITE PREPERATION

All trees, brush, fences and rubbish shall be cleared within the area that the subsurface drain will be installed. All material removed by the clearing and grubbing operation shall be disposed of as directed by the Owner or his/her Representative.

4. INSPECTION AND MATERIAL HANDLING

Material for subsurface drains shall be carefully inspected before the drains are installed. If applicable, clay and concrete tile shall be checked for damage from freezing and thawing before it is installed. Bituminized fiber and plastic pipe and tubing shall be protected from hazard causing deformation or warping. Plastic pipe and tubing with physical imperfections shall not be installed. Any damaged section shall be removed and replaced. All material shall be satisfactory for its intended use and shall meet applicable specifications and requirements.

5. SAFETY

All positive responses from the Pennsylvania One Call System should be shown on the drawings and the Pennsylvania One Call serial number noted on the plans. It is the Contractor's or Landowner's responsibility to contact the affected utility for marking at the time of construction.

The Contractor must comply with OSHA requirements Part 1926, subpart P, for protection of workers entering trench.

6. INSTALLATION

Flexible conduits, such as plastic pipe or tubing and bituminized fiber pipe, shall be installed, according to the requirements in ASTM-F-449, "Standard Recommended Practice for Subsurface Installation of Corrugated Thermoplastic Tubing for Agricultural Drainage or Water Table Control."

All subsurface drains shall be laid to line and grade and covered with approved blinding, envelope or filter material to a depth of not less than three inches over the top of the pipe. If an impervious sheet is used over the drain, at least three inches of blinding material must cover the sheet. No reversals in grade of the conduit shall be permitted.

If the conduit is to be laid in a rock trench or if rock is exposed at the bottom of the trench, the rock shall be removed below grade so that the trench can be backfilled, compacted and bedded. When completed, the tile conduit shall be not less than two inches from the rock.

Joints between drain tiles shall not exceed 1/8 inch except in sandy soils where the closest possible fit must be obtained and in organic soil where some of the more fibrous soil types make it desirable to slightly increase the space between tiles.

Earth backfill material shall be placed in the trench in a manner to ensure that the conduit does not become displaced and so that the filter and bedding material, after backfilling, meet the requirements of the plans and specifications.

If a filter is needed, no part of the conduit containing openings shall be left exposed. If a sand-gravel filter material is used, it shall be a gradation that is compatible with the base material in the trench. The trench shall be over excavated three inches and backfilled to grade with filter material. After the conduit is placed on the filter material, additional filter material shall be placed over the conduit to fill the trench to a depth of three inches over the conduit.

7. FITTINGS AND CONNECTIONS

All fitting and connections for pipe shall be made with manufacturer-supplied components made for the intended purpose.

8. CONDUIT PERFORATIONS

If perforations are specified, the water inlet area shall be at least 1 inch/foot of the pipe length. The perforations shall be either circular or slots equally spaced around the circumference of the pipe in not less than three rows. Circular perforations shall not exceed 3/16 inch in diameter and slots shall not be more than 1/8 inch wide and 1 1/4 inch long for 3, 4 and 5 inch diameter pipe, or 1 1/2 inch for 6 and 8 inch diameter pipe, or 1 3/4 inch for 10 and 12 inch diameter pipe. All slots and circular perforations shall be cleanly cut.

**9. ADDITIONAL CONDITIONS WHICH
APPLY TO THIS PROJECT ARE:**

1. Supply and install 390 feet of footer drain and 380 feet of leak detection drain around the concrete manure storage structure of 4" perforated corrugated tile line ASTM-F-405.
2. Footer drain shall be installed under the HDPE liner and be daylighted with an animal guard installed. The leak detection drain shall be placed on top of the HDPE liner and run to a sump. The sump shall be daylighted with a shut off valve and animal guard.
3. 4-inch subsurface drain will attach to 4-inch underground outlet to be discharged down slope of the structures towards the north of the structure.

CONSTRUCTION SPECIFICATION

PA 620 – UNDERGROUND OUTLET

1. SCOPE

The specification covers the fabrication, installation, and construction of underground outlets.

2. MATERIALS

The materials required for the underground outlet shall be as shown on the drawings or as otherwise required in Section 6.

All materials shall be carefully inspected prior to installation. Clay and concrete tile shall be checked for damage by freezing. Plastic pipe and tubing shall be protected from hazards causing deformation. Any damaged or imperfect pipe or tubing shall not be installed. Any pipe or tubing which is damaged during installation shall be removed and replaced.

3. EXCAVATION

Construction operations shall be done in such a manner that soil and water pollution are a minimum and all state and local erosion regulations are followed.

Unless otherwise specified, excavation for each underground outlet shall begin at the outlet end and progress upstream. The trench shall be excavated to the grades and cross sections shown on the drawings. The trench width above the conduit may increase as necessary for safe installation or for the convenience of the Contractor. Trench shields, shoring, or bracing are required whenever workers will be in a trench deeper than four feet, or as otherwise required by OSHA Regulations.

4. INSTALLATION

Bedding- In stable soils, the conduit shall be firmly and uniformly bedded throughout its entire length as required on the drawings or Section 6. Where the underground outlet foundation is in unstable soils, the bedding shall be as shown on the drawings or as

otherwise required by the Engineer. Where the conduit is to be laid in rock, or rock is exposed at the trench bottom, the rock shall be removed at least two inches below the invert grade to allow for compacted bedding under the conduit.

Placement- Debris inside of pipes and tubing shall be removed prior to installation. The conduit ends shall be protected during placement. Similarly, all appurtenances, including trash guards and animal guards, shall be protected during installation to avoid damage. All underground outlets shall be laid to line and grade, and immediately covered with an approved blinding, envelope, or the required depth of filter material. No reversals in grade of the conduit are permitted, no more than five percent stretch is allowed. Special precautions must be taken in hot weather to observe this stretch limit.

5. BACKFILL

Initial backfill shall be of selected material that is free of rocks or other sharp-edged material that could damage the pipe. Earth backfill shall be placed in the trench in such a manner that the conduit is not displaced, and that the filter and bedding materials are not contaminated or displaced. Unless otherwise specified, where the underground outlet is laid under roads or at other designated locations, the backfill shall be placed in successive layers of not more than six inches, and each lift compacted before the subsequent layer. Backfill shall extend above the adjacent ground to allow for settlement, and be well rounded over the trench.

Work areas shall be restored to their pre-construction condition or as otherwise required in the plans or Section 6.

Addition Conditions for Underground Outlet Which Apply To This Project:

1. This item includes the supply and installation of approximately 250 feet of underground drain (125 feet for the footer drain and 125 feet for the leak detection) to rock aprons.
2. The underground outlets will be attached to the leak detection drain and footer drain of the storage structure.
3. The underground outlets shall consist of 250 feet of 4" ASTM d1785 Sch 40 PVC pipe. The PVC pipe will be placed at approximately a 1/2% grade. The pipe will discharge onto a rock apron 1.5' wide x 5' long x 1' thick.
4. Rock apron shall be placed on a non-woven geo-textile. Rock apron shall consist of R-4 material.
5. An animal guard will be place on the end of each of the 4" ASTM D-1785, Sch. 40 PVC pipes.
6. The leak detection line shall have a sump (500 gal septic tank or 24" manure hole) placed in line with a shut off valve installed on the daylight side of the sump.

Nolt Trucking Circular Concrete Storage Tank with HDPE Foundation Liner for Food Processing Waste

Spring City Acres, LLC

East Coventry & East Vincent Townships, Chester County

CRITICAL STAGES OF INSPECTION

- THE LANDOWNER WILL ARRANGE FOR A PRE-CONSTRUCTION MEETING BETWEEN THE CONTRACTOR, CONSERVATION DISTRICT, LOCAL PERMITS, INSURERS AND LAND OFFICE TO REVIEW PLANS AND SPECIFICATIONS PRIOR TO THE START OF CONSTRUCTION.
- THERE WILL BE NO CHANGES IN PRESCRIPTIONS, DIMENSIONS OR MATERIALS UNLESS APPROVED BY THE ENGINEER.
- IT IS THE RESPONSIBILITY OF THE LANDOWNER OR CONTRACTOR TO NOTIFY THE ENGINEER OR HIS REPRESENTATIVE, IN WRITING PRIOR TO A REQUIRED INSPECTION. IF AN INSPECTION IS MISSED, THE UNEXPECTED ITEM SHALL BE REMOVED AND RECONSTRUCTION UNDER THE INSPECTION OF THE ENGINEER OR HIS REPRESENTATIVE.
- THE FOLLOWING IS A LIST OF ITEMS THAT MUST BE INSPECTED TO RETAIN THE ENGINEER'S FINAL CERTIFICATION (ADD ANY NOTES OR COMMENTS NEXT TO EACH ITEM)

ALL QUALITY ASSURANCE INSPECTIONS WILL BE PERFORMED BY PENN DEL ENGINEERING AND CONSULTING LLC ON HIS DESIGNATION FROM AET CONSULTING, INC.

ROCK REMEDIATION PLAN

- IF ROCK IS ENCOUNTERED DURING THE EXCAVATION OF THE MANHOLE STORAGE STRUCTURE, ROCK SHALL BE REMOVED BY A TRACKHOE, HYDRO HAMMER OR BY BLASTING.
- THE CONTRACTOR WILL FIRST ATTEMPT TO REMOVE THE ROCK WITH A LARGE EXCAVATOR. IF THIS IS NOT POSSIBLE BECAUSE THE ROCK IS NOT PRACTICED, THE CONTRACTOR WILL ATTEMPT TO REMOVE THE ROCK. IF THIS FAILS, THE CONTRACTOR WILL CONTACT A BLASTING COMPANY TO OBTAIN THE PROPER PERMITS AND REMOVE THE ROCK WITH BLASTING. THE BLASTING COMPANY WILL FOLLOW THEIR STANDARD PROCEDURES FOR REMOVING THE ROCK.
- THE ROCK SHALL BE OVER EXCAVATED A MINIMUM OF THREE FEET. CLEAN FILL SHALL BE PLACED IN SIX INCH LIFTS AND AN 8" COMPACTED MINIMUM ON THREE PASSES WITH A VIBRATOR SHEEP FOOT ROLLER TO THE PROPER SUB-GRADE ELEVATION PRIOR TO STONE PLACE.

OPERATION AND MAINTENANCE PLAN

- THE CONCRETE STORAGE TANK SHOWN IN THE ATTACHED DESIGN DRAWINGS MUST BE OPERATED AND MAINTAINED AS FOLLOWS:
 - THE TANK SHALL BE OPERATED IN ACCORDANCE WITH THE DESIGN ENGINEER'S APPROVAL OF THE PROJECT AS TO OPERATING SPEEDS (11) STANDARD. IF AT ANY TIME THE SYSTEM IS NOT OPERATED OR MAINTAINED AS PER THE APPROVAL FROM THE DESIGN ENGINEER SHALL BE RETRACTED. THE ATTACHED DRAWINGS WERE PREPARED BY PENN DEL ENGINEERING FOR MEETING PRACTICE STANDARD 11 OF THE PACTE CODE.
 - DURING EXTENSION WARE AROUND INSPECTIONS, THE TANK SHALL ALSO BE INSPECTED. WALK AROUND INSPECTION SHALL OCCUR AT MINIMUM OF MONTHLY.
 - ALL WAYS SPREAD PER WASTE IN ACCORDANCE TO AN APPROVED NUTRIENT MANAGEMENT PLAN.
 - THE TANK SHALL BE OPERATED IN SUCH A MANNER AS TO HAVE A MINIMUM OF 2' OF FREEBOARD AT ALL TIMES. THERE WILL ALLOW FOR STORAGE OF THE 12-MONTH STORM EVENT AND STILL MAINTAIN THE MINIMUM REQUIRED 2' FEET OF FREEBOARD.
 - DANGER SIGN WARNINGS OF GROUNDING AND AT-TENTION SHALL BE POST AROUND STORAGE TANK AND AT ALL ACCESS POINTS. SIGNS SHALL BE INSPECTED TWICE ANNUALLY AND REPLACED AS NEEDED.
 - TANK SHALL HAVE ADEQUATE FENCING TO EXCLUDE ANIMALS, VEHICLES AND TRAFFIC AS SHOWN IN THE DESIGN DRAWINGS AND MUST REMAIN BE CHAIN-LINK SAFETY FENCE. FENCE SHALL BE INSPECTED AT A MINIMUM OF MONTHLY AND REPAIRED AS NEEDED.
 - TANK WILL ONLY BE ACCESS AT DESIGNATED PUMP OUT LOCATIONS.
 - THE LEAK DETECTION SYSTEM WILL BE MONITORED TO ENSURE THAT THE TANK DOES NOT LEAK. IF CONTAMINATED FLOW IS DETECTED, THE STORAGE TANK WILL BE IMMEDIATELY STOPPED AND REPAIRED UNDER THE SUPERVISION OF THE ENGINEER.
 - EXCEPTIONS TO THE DESIGN NUMBERS SHALL BE DISCUSSED AND ADEQUATELY DELAYED FOR EMPLOYER IN THE EVENT OF A SPILL. EMPLOYER SHALL BE EMPLOYED ON THE EMERGENCY PLAN FOR A SPILL.
 - IF AN EMERGENCY WELL OCCURS, IT MUST BE CONTAINED, CROWNED, BARRIERS CAN BE USED TO BARRIERS SHALL BE. THE AVAILABILITY OF BULLDOZERS OR OTHER HEAVY EQUIPMENT FOR SITE SHOULD BE KNOWN IF IT BECOMES NECESSARY TO CONTROL AN EMERGENCY SPILL OR DIVERSION. IF HEAVY EQUIPMENT IS NOT AVAILABLE ON SITE, PHONE NUMBERS SHALL BE PROVIDED OF THE NEAREST LOCATION WITH EQUIPMENT AVAILABLE TO CONTROL EMERGENCY CONTAINMENT.

NOLT TRUCKING WASTE STORAGE ADDITIONAL REQUIREMENTS

IN ADDITION TO THE DESIGN SPECIFICATIONS, THE FOLLOWING SHALL BE INCLUDED IN THE CONSTRUCTION OF THE 14' X 12' DIAMETER CONCRETE TANK:

- A GEO-TEXTILE LAYER IS TO BE PLACED BETWEEN THE BASE (UNDISTURBED EARTH) AND THE HDPE LINER TO PROTECT LINER FROM ROCKS AND OTHER CONCRETE FOUNDATION STONE PLACEMENTS.
- PLACE A FOOTER DRAIN UNDER THE HDPE LINER PRIOR TO PLACEMENT OF THE LINER TO CONVEY ANY POSSIBLE GROUND WATER FROM PERSEEPING UPON THE STORAGE TANK. THE FOOTER DRAIN SHALL BE DRAINAGE AND IT SHALL NOT CONNECT TO LEAK DETECTION SYSTEM.
- PLACE HDPE LINER BETWEEN FOUNDATION STONE AND GEO-TEXTILE THAT EXTENDS TO THE OUTER EDGE OF EXCAVATION AND TO THE REAR OF THE EXCAVATION TOILET TO OR ABOVE THE FINISHED FLOOR ELEVATION OF THE STORAGE WITH REQUIRED STONE AND FOOTER DRAIN BEING PLACED ON TOP OF LINER.
- DO NOT RUN OR TOP OF HDPE LINER ONCE INSTALLED UNLESS REQUIRED STONE THICKNESS IS INSTALLED TO PREVENT DAMAGE TO LINER.
- THE LEAK DETECTION LINE SHALL BE PERFORMED BY CORROSION PROOF. IT SHALL ATTACH TO A 4" SCH 40 PVC PIPES TO A MANHOLE TOP OR TO THE HDPE LINER AND DISCHARGE IN AN OBSERVATION MANHOLE.
- CARE SHALL BE TAKEN TO SEAL THE HDPE LINER TO THE LEAK DETECTION SOLID PVC PIPE LINE BY USING THE PIPE THROUGH AN APPROVED JOINTING. THE EXCESS HDPE LINER SHALL BE CLAMPED TO THE PVC PIPE USING A STAINLESS STEEL CLAMP.
- DRAIN WILL BE RUN INTO AN OBSERVATION MANHOLE. ON THE OUTLET OF THE MANHOLE, A GATE VALVE WILL BE INSTALLED THAT CAN BE SHUT IN THE EVENT OF FLOODING OCCURRING. THE MANHOLE IF APPLICABLE, ANY FLOOD CAPTURED IN THE MANHOLE WILL BE TESTED FOR CONTAMINATION. IF MANHOLE OUTLET CAN NOT BE SHUT, A SMALL SUBMERSIBLE PUMP WILL BE INSTALLED TO KEEP MANHOLE DRY.
- FRAM OR GEO-TEXTILE WILL BE PLACED ON TOP OF FOOTER DRAIN STONE TO PREVENT FOOTER FROM ON LEAK DETECTION DRAIN FROM BEING CONTAMINATED DURING BACKFLOWS.

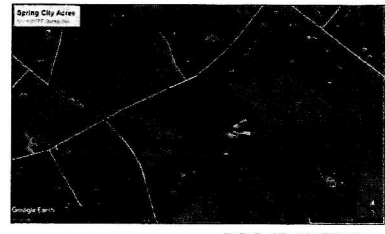


TABLE OF CONTENTS	
COVER	1
PLAN VIEW	2
DETAILS	3
E&S	4

General Notes

LEGEND

- PROPERTY LINE
- STORAGE STRUCTURE
- CONCRETE
- HIDDEN CONCRETE
- STEEL
- LEAK DETECTION LINE
- GRAVEL
- ACCESS ROAD
- EARTH

LEGEND

- Property Line
- Storage Structure
- Concrete
- Hidden Concrete
- Steel
- Leak Detection Line
- Gravel
- Access Road
- Earth

EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT

EROSION AND SEDIMENT CONTROL HAS BEEN ADDRESSED ON PAGE 4 OF THIS DESIGN PACKAGE AND HAS BEEN ADDRESSED USING THE EROSION AND SEDIMENT CONTROL PROGRAM MANUAL FROM THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION. STORMWATER MANAGEMENT IS ADDRESSED USING BMP 4.1.5. GROUND WATER AND REUSE FROM THE PENNSYLVANIA STORMWATER BEST MANAGEMENT PRACTICES MANUAL WHERE PRECIPITATION FROM THE STORAGE STRUCTURE WILL BE CAPTURED AND LAND APPLIED WHEN GROUND CONDITIONS PERMIT INFILTRATION. THIS PRACTICE WILL REDUCE POST DEVELOPED RUNOFF TO LESS THAN PRE DEVELOPED CONDITIONS.

To the best of my professional knowledge, judgement and belief, the plans listed on this cover page have been designed to meet the 25 PA Code Chapter 299 for storage of Food Processing Residual Waste.

Date: _____

In my professional opinion, I certify that the practices have been designed as per the attached drawings and specifications, based on the information provided in the major observation I have made.

To the best of my knowledge, I certify that the practices have been designed as per the attached drawings and specifications, based on my observations and information provided to me.

Signature of Professional Engineer Date: _____

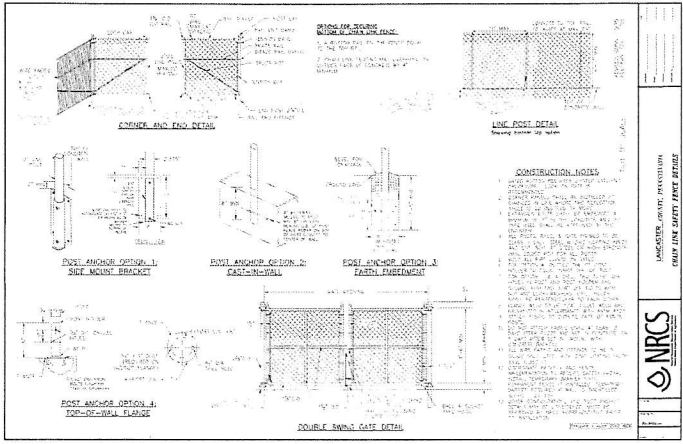
Signature of Quality Assurance Person Date: _____



Penn Del Engineering & Consulting LLC
 306 S. 1st St., Suite 100
 Williamsport, PA 16899
 717-321-1001

Food Processing Waste Tank
 Nolt Trucking
 1250 Lincoln Road
 Litzitz, PA 17543

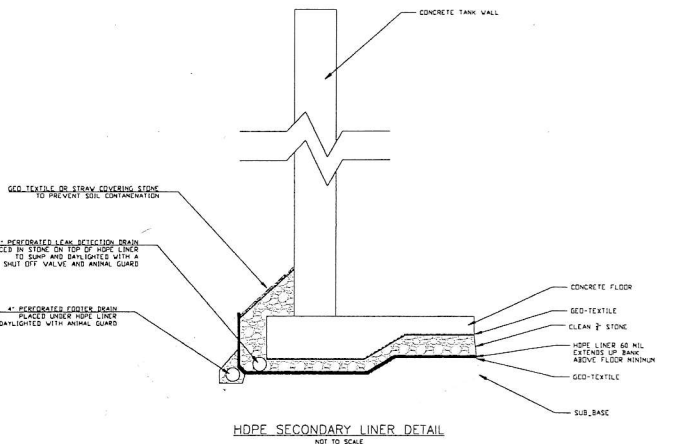
Project Name	Food Processing Waste Tank
Client	Spring City Acres, LLC
Date	6/13/2021
Sheet No.	1 of 4
Notes	As Noted



General Notes

- All concrete shall be placed in the least edition of "Concrete Reinforcing Steel Institute Handbook" (ACI 318-05).
- All concrete shall be placed in a minimum 28 day design strength of 4000 psi. All concrete shall have 3/4 inch maximum aggregate size and a slump of 5 inches ± 1 inch.
- All concrete shall be finished with the proper admixture to obtain 95 ± 1% of air entrainment.
- All concrete shall be placed in the least edition of "Concrete Reinforcing Steel Institute Handbook" (ACI 318-05).
- All concrete shall be placed in a minimum 28 day design strength of 4000 psi. All concrete shall have 3/4 inch maximum aggregate size and a slump of 5 inches ± 1 inch.
- All concrete shall be finished with the proper admixture to obtain 95 ± 1% of air entrainment.
- All concrete shall be placed in the least edition of "Concrete Reinforcing Steel Institute Handbook" (ACI 318-05).
- All concrete shall be placed in a minimum 28 day design strength of 4000 psi. All concrete shall have 3/4 inch maximum aggregate size and a slump of 5 inches ± 1 inch.
- All concrete shall be finished with the proper admixture to obtain 95 ± 1% of air entrainment.
- All concrete shall be placed in the least edition of "Concrete Reinforcing Steel Institute Handbook" (ACI 318-05).
- All concrete shall be placed in a minimum 28 day design strength of 4000 psi. All concrete shall have 3/4 inch maximum aggregate size and a slump of 5 inches ± 1 inch.
- All concrete shall be finished with the proper admixture to obtain 95 ± 1% of air entrainment.
- All concrete shall be placed in the least edition of "Concrete Reinforcing Steel Institute Handbook" (ACI 318-05).
- All concrete shall be placed in a minimum 28 day design strength of 4000 psi. All concrete shall have 3/4 inch maximum aggregate size and a slump of 5 inches ± 1 inch.
- All concrete shall be finished with the proper admixture to obtain 95 ± 1% of air entrainment.

NORTON & SCHMIDT **PRECISE**
CONSULTING ENGINEERS L.L.P. CONCRETE WALLS **PC16UE07**



REINFORCING TABLE FOR 150" DIA. TANK w/ INVERT BACKFILL

Bar #	Quantity (ft)	Quantity (ft)
1	330	330
2	480	480
3	150	150
4	210	210
5	210	210
6	210	210
7	210	210
8	210	210
9	210	210
10	210	210
11	210	210
12	210	210
13	210	210
14	210	210
15	210	210
16	210	210
17	210	210
18	210	210
19	210	210
20	210	210
21	210	210
22	210	210
23	210	210
24	210	210
25	210	210
26	210	210
27	210	210
28	210	210
29	210	210
30	210	210
31	210	210
32	210	210
33	210	210
34	210	210
35	210	210
36	210	210
37	210	210
38	210	210
39	210	210
40	210	210
41	210	210
42	210	210
43	210	210
44	210	210
45	210	210
46	210	210
47	210	210
48	210	210
49	210	210
50	210	210
51	210	210
52	210	210
53	210	210
54	210	210
55	210	210
56	210	210
57	210	210
58	210	210
59	210	210
60	210	210
61	210	210
62	210	210
63	210	210
64	210	210
65	210	210
66	210	210
67	210	210
68	210	210
69	210	210
70	210	210
71	210	210
72	210	210
73	210	210
74	210	210
75	210	210
76	210	210
77	210	210
78	210	210
79	210	210
80	210	210
81	210	210
82	210	210
83	210	210
84	210	210
85	210	210
86	210	210
87	210	210
88	210	210
89	210	210
90	210	210
91	210	210
92	210	210
93	210	210
94	210	210
95	210	210
96	210	210
97	210	210
98	210	210
99	210	210
100	210	210

NORTON & SCHMIDT **PRECISE**
CONSULTING ENGINEERS L.L.P. CONCRETE WALLS **PC16UE15**

LEGEND

1. LEAK DETECTION LINE
2. CANAL
3. ACCESS ROAD
4. EARTH

REVISIONS

No.	Revision/Issue	Date

Prepared by: [Signature]
Checked by: [Signature]

Project Name and Address:
Food Processing Waste Tank
N&S Trucking
1250 Lincoln Road
Lancaster, PA 17603

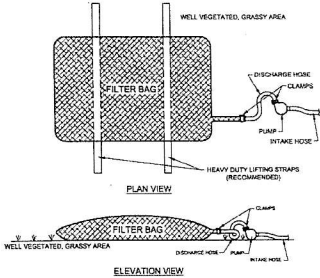
Scale: As Noted

Sheet: 3 of 4

Date: 6/13/2021

Nolt Trucking Circular Concrete Storage Tank Spring City Acres Farm Erosion & Sediment Control Plan

STANDARD CONSTRUCTION DETAIL # 3-18
Pumped Water Filter Bag



LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH DOUBLE STITCHED 1/2" WIDE SEAMS. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS MAY BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AND WOVEN STRENGTH	ASTM D-5884	80 LB/24"
SEAM TENSILE	ASTM D-4437	200 LB
PUNCTURE	ASTM D-4833	130 PSI
MULLIN BURST	ASTM D-3786	250 PSI
UV RESISTANCE	ASTM D-4353	70%
ASH 5 RETAINED	ASTM D-4731	80 SOX

A SUITABLE MEANS OF ACCESSING THE BAGS WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME IN FULL SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT IN CASE THAT HAVE FAILED OR ARE FILLED. IT IS RECOMMENDED THAT BAGS BE PLACED ON STRIPS TO FACILITATE REMOVAL.

BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASS) AREA, AND DISCHARGE INTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAMENT AND FLOW PATH SHALL BE PROVIDED.

BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 3% FOR SLOPES EXCEEDING 3%, CLEAN ROCK OR OTHER NON-ERODIBLE AND NON-FLOTTING MATERIAL MAY BE PLACED UNDER THE BAGS TO REDUCE SOIL STIFFNESS.

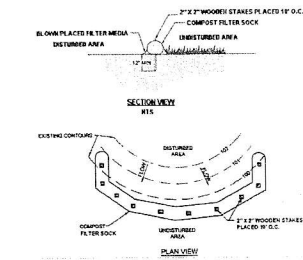
NO DOWNSTREAM SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHOULD BE INSTALLED BELOW BAGS LOCATED WITHIN 50 FEET OF RECEIVING STRAIN OR WHERE SHOULDER AREA IS NOT AVAILABLE, A COMPOST BERM OR COMPOST FILTER SOCK SHALL BE PLACED BELOW ANY BAG DISCHARGING TO A SPECIAL PROTECTION SURFACE WATER.

THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.

THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR 1/2" MINIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHOULD BE FLOWING AND SCREENED.

FILTER BAGS SHALL BE REPLACED ONLY IF ANY PROBLEM IS DETECTED. PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

STANDARD CONSTRUCTION DETAIL # 4-1
Compost Filter Sock



SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1. COMPOST SHALL MEET THE FOLLOWING STANDARDS:

ORGANIC MATTER CONTENT	80% - 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBRUS AND FLOCCULANTS
PH	5.0 - 8.5
MOISTURE CONTENT	50% - 55%
PARTICLE SIZE	80% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	500 PPB MAXIMUM

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE HORN SOCK. ALSO SEE FIGURE 4.11 MAXIMUM SLOPE LENGTH ABOVE ANY SOCK SHALL NOT EXCEED THAT SHOWN ON FIGURE 4.2.

TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.

ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2" ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RAINY EVENT. DAMAGED SOCKS SHALL BE REPLACED.

ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.

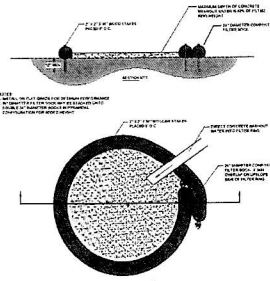
BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS. PHOTODEGRADABLE SOCKS AFTER 1 YEAR. NON-DEGRADABLE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MESH SHALL BE USED AS A SOIL SUPPLEMENT.

LOCATION	DIAMETER	LENGTH	SLOPE	SLOPE	PERMISSIBLE LENGTH
BELOW STORAGE TANK	18"	250'	25%	4%	350'

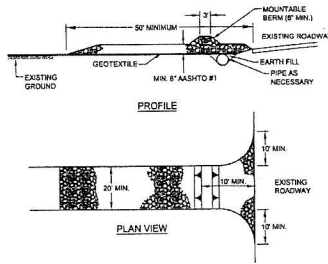


FIGURE 3.18
Typical Compost Sock Washout



A SUITABLE IMPERVIOUS GEOTEXTILE BARRIER SHALL BE PLACED AT THE LOCATION OF THE WASHOUT. COMPOST SOCKS SHALL BE STAKED IN THE MANNER RECOMMENDED BY THE MANUFACTURER AROUND THE PERIMETER OF THE GEOTEXTILE SO AS TO FORM A BUNG WITH THE CORNER OF THE SOCK LOCATED AT THE UPSLOPE CORNER. CARE MUST BE TAKEN TO ENSURE CONTINUOUS CONTACT OF THE SOCK WITH THE GEOTEXTILE AT ALL LOCATIONS. WHEN NECESSARY, SOCKS MAY BE STACKED TO FORM A TRIANGULAR CROSS SECTION.

STANDARD CONSTRUCTION DETAIL # 3-1
Rock Construction Entrance



TOPSOIL SHOULD BE REMOVED PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXCEED ROCK OVER FULL WIDTH OF ENTRANCE. RUNOFF SHALL BE DIVERTED FROM ROADWAY TO A SUITABLE SEDIMENT REMOVAL BMP PRIOR TO ENTERING ROCK CONSTRUCTION ENTRANCE. MOUNTABLE BERM SHOULD BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED. PIPE TO BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED. MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY. EXCEED LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FEET MINIMUMS UNLESS OTHERWISE ALLOWED OR INSTALLED WASH BACK TOWARD THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWER, CULVERTS, OR OTHER DRAINWAYS IS NOT ACCEPTABLE.

General Notes

LEGEND

- PROPERTY LINE
- STORAGE STRUCTURE
- CONCRETE
- MODERN CONCRETE
- STEEL
- LEAK DETECTION LINE
- CRACK
- ACCESS ROAD
- EARTH

LEGEND

- 1. 20' x 20' x 12" concrete storage tank
- 2. 20' x 20' x 12" concrete storage tank
- 3. 20' x 20' x 12" concrete storage tank
- 4. 20' x 20' x 12" concrete storage tank
- 5. 20' x 20' x 12" concrete storage tank
- 6. 20' x 20' x 12" concrete storage tank
- 7. 20' x 20' x 12" concrete storage tank
- 8. 20' x 20' x 12" concrete storage tank
- 9. 20' x 20' x 12" concrete storage tank
- 10. 20' x 20' x 12" concrete storage tank
- 11. 20' x 20' x 12" concrete storage tank
- 12. 20' x 20' x 12" concrete storage tank
- 13. 20' x 20' x 12" concrete storage tank
- 14. 20' x 20' x 12" concrete storage tank
- 15. 20' x 20' x 12" concrete storage tank
- 16. 20' x 20' x 12" concrete storage tank
- 17. 20' x 20' x 12" concrete storage tank
- 18. 20' x 20' x 12" concrete storage tank
- 19. 20' x 20' x 12" concrete storage tank
- 20. 20' x 20' x 12" concrete storage tank

No.	Revision/Issue	Date

Prepared and issued by:
Penn Del Engineering & Consulting LLC
 200 Spring Farm Lane
 Williamsport, PA 16899
 814-933-3981

Project name and address:
Food Processing Waste Tank
 Nolt Trucking
 1220 Lincoln Road
 LEBANON, PA 17043

Project	Sheet
FPW Tank	4 of 4

Date: 6/13/2021
 Issue: As Noted