

REQUEST FOR PROPOSAL (RFP)

Chesapeake Conservancy is a non-profit organization that works with conservation partners and landowners to implement Best Management Practices on agricultural land.

Chesapeake Conservancy is soliciting proposals for a heavy use area/waste storage facility and associated practices for a beef operation near Aaronsburg, PA. Services include the following:

- Excavation
- Concrete/Building

Contractors may bid on one or more of the services.

RFP OVERVIEW AND PROJECT DESCRIPTION

RFP Release Date: February 18, 2026

Landowner Name: Derek Hart

Project Location: 216 Mountain View Lane
Aaronsburg, PA 16820
Centre County, Haines Township

RFP Issuing Office: Chesapeake Conservancy
Email: paprograms@chesapeakeconservancy.org
Phone: 570-372-4075

Consultant: TeamAg Inc

**Site Showing/
Pre-Bid Meeting:** A **mandatory** site showing will be held at the Project Location on:
March 5, 2026 at 10:00 am EDT

Proposals will not be accepted from bidders who do not attend the site showing.

Registration for the Site Showing and Pre-Bid Meeting is required:

Registration Deadline: March 2, 2026
Registration by Phone: 570-372-4075
Registration by Email: paprograms@chesapeakeconservancy.org

Mention "Hart Site Showing" in the email or phone message.

RFP Due Date: **All proposals must be submitted by:**
March 20, 2026 at 4:00 pm EDT
Proposals will not be accepted after this date and time.

RFP Submission: **All proposals must be submitted electronically to the following email address*:**

Email: paprograms@chesapeakeconservancy.org
Include "Hart RFP Response" in the subject line.

**If bidder is unable to submit proposal via email, please contact Chesapeake Conservancy to arrange another method to submit proposal.*

RFP Results: RFP results and notification of award will be distributed no later than:
March 30, 2026

Questions:

All questions regarding this RFP should be submitted no later than March 13, 2026 to: Kathy Rohrer, 570-372-4075, paprograms@chesapeakeconservancy.org

Project Description:

The successful bidders will be responsible for the excavation and building of a roofed heavy use area/waste storage facility and associated Best Management Practices (BMPs) for a beef operation. The proposed structure is 52' x 228'. BMPs include waste storage facility, heavy use area protection (concrete pads, curbs, scrape alley), roof and covers, roof runoff structures, access road, animal trail and walkway, underground outlet, subsurface drain, rock lined outlet and other associated practices.

The contracts include, but are not limited to, the labor, material, and installation of the items as shown in Attachment A - TeamAg Design/Drawings and NRCS Specifications. The proposed BMPs are to be constructed in the areas shown on the plans and must meet NRCS specifications.

Excavation items include, but are not limited to the following:

- Excavation and Backfill - Includes all E&S controls, cut, compacted fill, AASHTO# 57 stone for concrete subgrade, compacted backfill of walls, general backfill, and all final grading.
- Footer Drain – Includes materials and installation of the 4" footer drain and gravel around the perimeter of the proposed structure walls.
- Footer Drain Outlet – Includes materials and installation of the 4" PVC outlet pipe for the footer drain.
- Roof Gutter Outlets – Includes materials and installation of the 6" and 8" PVC outlet pipe for the roof gutters.
- Water line and Waterers – Includes materials and installation of the waterline and waterers on the barnyard pad.
- Access Road – Includes materials and installation of compacted stone access road.

Concrete and Building items include, but are not limited to the following:

- Concrete – Includes materials and installation of the concrete post footings, perma-columns, concrete floor, concrete curbs, and concrete walls.
- Roof Structure – Includes materials and installation of the proposed roof structure.
- Gates and feed rail fence – Includes materials and installation of all feed rail fences and interior fencing and gates.
- Gutters – Includes materials and installation of roof gutters and downspouts on both sides of the new roof structure.

RFP TERMS AND CONDITIONS

Selected contractors will be working with Chesapeake Conservancy, TeamAg Inc and NRCS on the implementation of this project.

CONSTRUCTION TIMELINE AND SCHEDULE:

Contractors shall include with their response a proposed construction schedule. At a minimum the construction schedule should include the proposed start date, how long it will take to complete the critical tasks of the project and the estimated completion date.

Target construction is Spring/Summer 2026.

If the contracted services are not completed within the designated time period (as specified in the resulting contract from this RFP), the contract can be extended if agreed to in writing by Chesapeake Conservancy and the contractor.

PENNSYLVANIA ONE CALL:

Contractor shall follow all laws and regulations relating to the Pennsylvania One-Call System, including submitting all required locate requests to the Pennsylvania One-Call System to assist with the prevention of accidental damage to underground public utilities.

PA One Call: 1-800-242-1776 or 811
Project Final Design Serial #: 20252091350

EROSION AND SEDIMENT POLLUTION CONTROL PLAN:

The Excavation contractor is responsible for implementing the E&S plan enclosed in the design.

COMMUNICATION AND PROJECT MILESTONES:

Communication between the contractor, TeamAg, NRCS and Chesapeake Conservancy is crucial to a successful project. Contractor(s) awarded the contract will be required to attend a pre-construction meeting with TeamAg, NRCS and Chesapeake Conservancy to review the design and discuss the construction schedule and quality assurance inspection requirements.

Each contractor shall notify TeamAg when they will be working onsite. Notification to TeamAg is required for "Project Milestones". Work must be done Monday through Friday between the hours of 7:00 am and 5:00 pm unless approved by TeamAg. Failure to notify TeamAg may result in inadequate inspection of construction and the inability to certify that the installation meets the design and NRCS specifications. Payment cannot be made on practices that have not been certified by TeamAg.

Supervision by TeamAg is required for "Project Milestones". The contractor must contact TeamAg at a minimum of 48 hours before the start of work on that milestone. Below are the Project Milestones requiring notification and supervision:

- Starting construction
- Subgrade condition and stone placement
- Installation of curb, wall footers and slab
- Installation of curbs and wall
- Backfilling of concrete walls
- Setting trusses and associated truss bracing (trusses must be approved by the Engineer prior to ordering. Final truss design needs a P.E. seal)
- Installation of water line
- Final inspection

PAYMENT INFORMATION:

This project is being funded by **multiple grant sources** including an NRCS Regional Conservation Partnership Program (RCPP) grant. The remaining project is being funded through Chesapeake Conservancy grants. Selected contractors will receive payments from the landowner and the Conservancy. Payments made by NRCS to the landowner will determine the Conservancy’s portion. The Conservancy cannot pay more than it cost to install the practices. Contractors should expect payment from the landowner at the completion of the project when NRCS certifies that the project was installed to NRCS specifications.

Contractor shall invoice the Conservancy for services rendered during the preceding month. The Conservancy will issue payment after all required documentation has been received and approved AND the Conservancy receives reimbursement from its funding source. We anticipate the time from invoice submission to payment to be 60 calendar days. This may be longer if our payment from our funder is delayed. Since this is an NRCS project, the Conservancy’s portion of the payment may be capped until final NRCS certification is calculated to ensure the payment to the Contractor doesn’t exceed the total project cost.

GRANTS:

The terms and conditions of the National Fish and Wildlife Foundation Small Watershed Grant (Centre County), National Fish and Wildlife Foundation Innovative Nutrient and Sediment Reduction Grant and Pennsylvania Hamer Foundation apply to the contracts that result from this RFP. Copies of the grant are available upon request.

LOBBYING CERTIFICATION FORM:

As required by National Fish and Wildlife Foundation grants, the successful bidder will be required to sign a Lobbying Certification Form acknowledging compliance with 43 CFR §18 New Restrictions on Lobbying. This form will be signed at the time of contract execution.

INSURANCE REQUIREMENTS:

Bidders shall include a copy of their current (not expired) Certificate of Insurance (COI) that reflects their existing levels of liability insurance coverage. Prior to executing a contract with the Conservancy, the successful bidder and all subcontractors must obtain the following minimum levels of liability insurance, ***at their own expense***.

Contractors who do not carry commercial liability insurance for religious reasons and/or are self-insured should provide applicable documentation with their bid response.

<i>Type of Insurance Coverage</i>	<i>Limit Required</i>
General Liability -	
Each Occurrence:	\$1,000,000
Automobile Liability -	
Combined Single Limit (Each Accident):	\$1,000,000
Excess or Umbrella Liability -	
Each Occurrence:	\$2,000,000
Workers Compensation and Employer’s Liability* -	
E.L. Each Accident:	\$1,000,000
E.L. Disease - Each Employee:	\$1,000,000
E.L. Disease - Policy Limit:	\$1,000,000
Installation Floater Coverage** -	
Aggregate:	equal to cost of materials

* *Workers Compensation and Employer’s Liability can be waived for sole proprietors.*

** *Installation Floater Coverage applies to building contracts only. Installation floater coverage is for materials for the project. This may be a standalone policy or an endorsement to an existing policy. The Certificate of Insurance must clearly indicate that materials are included in the coverage. The limit for installation floater coverage should cover the cost of the materials for the project.*

Contractors and subcontractors will be required to include a waiver of subrogation in favor of Chesapeake Conservancy on all liability policies.

“Chesapeake Conservancy” and “National Fish and Wildlife Foundation” must be named as additional insured on all contractor’s and subcontractor’s policies except workers compensation.

Contractors shall include the cost to obtain additional insurance coverage that is above what they currently carry when calculating their price on the Contractor Response Form.

Immediately following the RFP award notification, the successful bidder shall work with their insurance agent to obtain the insurance requirements noted above. The awarded Contractor and all subcontractors shall provide Chesapeake Conservancy with a current COI certified by a licensed insurance broker within 14 days of award notification. The approved COIs need to be provided to Chesapeake Conservancy prior to signing a contract.

Note: Bidders **do not** need to change their current liability insurance or add additional insured and waiver of subrogation to their policies when responding to the RFP. Only the successful bidder will be required to meet the insurance requirements noted above after the bid is awarded. The Certificate Holder should be as follows: Chesapeake Conservancy, 1212 West Street, Annapolis, MD 21401.

BIOSECURITY:

The successful bidder is encouraged to follow basic farm biosecurity practices.

SAFETY PERFORMANCE:

Bidders shall provide safety performance information including OSHA records and EMR on their company and any subcontractors.

OSHA Records:

- OSHA reportable incidents for the past three (3) years. If there were no OSHA reportable incidents, indicate “none”. See <https://www.osha.gov/recordkeeping/> for additional information.
- TRIR (Total Recordable Incident Rate) which is the number of incidents x 200,000 / total number of employee hours worked in a year.
- DART (Days Away, Restricted or Transferred Rate). See <https://data.bls.gov/iirc/> to determine the value.

Contractors whose business is not required to keep OSHA records because they have 10 employees or less should check the applicable box on the Contractor Response Form.

Experience Modifier Rate (EMR):

- EMR provided by the insurance company.

DOMESTIC PREFERENCE FOR PROCUREMENT:

In accordance with 2 C.F.R. 200.322, the successful bidder shall to the greatest extent practicable, purchase, acquire, or use goods, products or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

For purposes of this RFP, the following definitions apply:

- i. Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States; and
- ii. Manufactured products means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

DEBARMENT AND TAX LIABILITY:

Contractors will be required to certify that they and any subcontractors are not listed on the Debarment and Suspension List maintained by the Pennsylvania Department of General Services (<https://www.dgs.internet.state.pa.us/debarmentsearch/debarment/index>) and the General Services Administration's List of Parties Excluded from Federal Procurement or Nonprocurement Programs (www.SAM.gov) in accordance with Executive Orders 12549 and 12689, "Debarment and Suspension" and have no outstanding tax liabilities. Contractors will also be required to certify that they and any subcontractors are not in default of a loan or funding agreement administered by any Commonwealth agency.

SMALL BUSINESS AND SMALL DIVERSE BUSINESS:

Chesapeake Conservancy encourages the use of small and small diverse businesses when soliciting Requests for Proposals. Contractors are encouraged to register with the federal government at www.sam.gov and with the Pennsylvania Department of General Services at www.dgs.pa.gov (search [Small Diverse Business Verification](#)). Please note Pennsylvania Department of General Service registration is only valid for three years. Contractors are encouraged to verify that their registration is current.

Contractors and any subcontractors who register on Sam.gov and with the PA Dept of General Services and who qualify as a small and/or small diverse business should check the applicable boxes on the Contractor Response Form. Points will be awarded as per the scoring sheet in Attachment B to contractors whose registration is confirmed by Chesapeake Conservancy.

EQUAL EMPLOYMENT OPPORTUNITY:

Chesapeake Conservancy is an equal opportunity employer. The successful bidder shall comply with all federal, state, and local equal employment opportunity requirements. Additional information can be found at <https://www.ecfr.gov> and searching [41 CFR 60-1.4\(b\)](#).

SUBMISSION OF PROPOSALS AND SELECTION CRITERIA

SUBMISSION OF PROPOSALS:

Proposals are requested for the items described in the Project Description and TeamAg Design Drawing and NRCS Specifications included in Attachment A, in accordance with the Terms and Conditions included in this RFP. Any estimated quantities included in this RFP are for information only. Bidders are responsible for determining the quantities needed to complete the project based on the provided design and bid documents.

At a minimum each proposal response must include:

- Contractor Response Form
 - Price
 - List of subcontractors used (if applicable)
 - Three references
 - Proposed start dates
 - Proposed completion dates
 - Safety performance
 - Debarment and tax liability certification
 - Insurance requirements - agreement to obtain or documentation of self-insurance
 - Signed by authorized representative
- Construction Schedule
- Current Certificate of Insurance

All proposals must be submitted electronically to Chesapeake Conservancy by the RFP due date specified on Page 1 of the RFP.

It is the responsibility of each contractor to ensure that the proposal is received prior to the due date and time for submission of proposals. No proposal shall be considered if it was sent or received after this date and time.

CONTRACTOR SELECTION CRITERIA:

Proposals will be evaluated based on the criteria listed in Attachment B.

Proposals must be firm. The proposal may be rejected if the items offered by the contractor are not in conformance with the specifications as determined by the Issuing Office.

Proposals will be awarded to the most qualified economic bidder, as determined by Chesapeake Conservancy. Chesapeake Conservancy reserves the right to reject any or all proposals and/or cancel the RFP for any reason and to waive any technical defects, if it determines that it is in the best interest of the landowner, partner or Chesapeake Conservancy.

Chesapeake Conservancy reserves the right to check with other conservation partners and landowners for feedback on working relationship and quality of work of bidders.

CONTRACTOR RESPONSE FORM

Page 1 of 2

Contractor Name: _____

Project Name: Hart HUA/Waste Storage Facility

Project Location: 216 Mountain View Lane, Aaronsburg, PA 16820, Centre County

1. Total price to supply materials, labor, equipment and insurance for performing the work outlined in the Project Description and Attachment A – Hart TeamAg Design and NRCS specifications. Contractors may bid on one or more services – **Required:**

<u>Service Type</u>	<u>Price</u>
Excavation	\$ _____
Concrete & Building	\$ _____

2. I/We plan to use the following subcontractors in order to perform parts of this project (include Tax ID):

Name: _____ EIN: _____

Name: _____ EIN: _____

3. The following three references are provided with telephone numbers of projects completed of similar scope and size - **Required:**

Name: _____ Telephone: _____

Name: _____ Telephone: _____

Name: _____ Telephone: _____

4. Proposed start date of construction (Excavation) - **Required:** _____

5. Proposed completion date of construction (Excavation) - **Required:** _____

6. Proposed start date of construction (Concrete) - **Required:** _____

7. Proposed completion date of construction (Concrete) - **Required:** _____

8. Proposed start date of construction (Building) - **Required:** _____

9. Proposed completion date of construction (Building) - **Required:** _____

10. Small Business or Small Diverse Business (See Terms and Conditions for details) - *Check if Applicable*

I have registered with Sam.gov and my business (or any subcontractors listed above) qualifies as a

Small Business and/or Small Diverse Business

I have registered with the PA Dept of General Services and my business (or any subcontractors listed above) has been certified as a Small Business and/or Small Diverse Business.

CONTRACTOR RESPONSE FORM

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11. Safety performance (See Terms and Conditions for details) - **Required:**

OSHA Records

I certify that my business does not need to keep OSHA records because we have 10 employees or less.

_____ OSHA reportable incidents for the past three years (attach documentation if applicable)

_____ TRIR (Total Recordable Incident Rate) (show calculation, if none, write 0)

_____ DART (Days Away, Restricted or Transferred Rate) (attach documentation/screen printout, if applicable)

Experience Modifier Rate

_____ EMR (attach documentation from insurance company, write N/A if not applicable)

12. Debarment and tax liability status (See Terms and Conditions for details) - **Required:**

I certify that my business, and any subcontractors, are not debarred by the State of Pennsylvania or the federal government.

I certify that my business, and any subcontractors, have no tax liabilities and are not in default of a loan or funding agreement administered by the State of Pennsylvania.

13. Insurance Requirements (See Terms and Conditions for details) - **Required:**

I have included a copy of my current COI. If awarded the contract, I agree to obtain the levels of insurance outlined in the Terms and Conditions of the RFP within 14 days of award notification and prior to signing a contract.

I do not carry commercial liability insurance due to religious reasons and/or I am self-insured. I have included supporting documentation with my response.

This proposal is submitted in response to the RFP for the project described within. The proposal is based on my knowledge of the plans and specifications identified within. I acknowledge that I or my representative attended the site showing. This proposal will remain valid for 90 days after submission. If awarded the RFP, I agree to sign a contract with the Chesapeake Conservancy.

Company Name: _____ Company Tax ID (EIN): _____

Company Address: _____

Representative's Name: _____ Telephone: _____

Email Address: _____

Signature: _____ Title: _____ Date: _____

ATTACHMENTS:

The following Attachments are included for reference as part of this RFP:

Attachment A – TeamAg Design and NRCS Specifications

Attachment B – RFP Scoring Sheet



- SOILS LEGEND**
- ANB - Andover channery silt loam, 0-8% slopes
 - AoB - Andover very stony loam, 0-8% slopes
 - AoC - Andover very stony loam, 8-15% slopes
 - BKD - Berks channery silt loam, 15-25% slopes
 - BMF - Berks and Weikert soils, 25-70% slopes
 - BuB - Buchanan channery loam, 3-8% slopes
 - BuC - Buchanan channery loam, 8-15% slopes
 - BuB - Buchanan channery loam, 0-8% slopes, rubbly
 - CkB - Clarksburg silt loam, 3-8% slopes
 - CvB - Clymer very stony sandy loam, 0-8% slopes
 - EdB - Edom silt loam, 2-8% slopes
 - EdC - Edom silt loam, 8-15% slopes
 - EdD - Edom silt loam, 15-25% slopes
 - HSD - Hazleton extremely stony sandy loam, moderately steep
 - HTF - Hazleton-Dekalb association, very steep
 - LdB - Laidig extremely stony loam, 0-8% slopes
 - LdD - Laidig extremely stony loam, 8-25% slopes
 - LdF - Laidig extremely stony loam, steep
 - OhB - Opequon-Hagerstown complex, 3-8% slopes
 - OhC - Opequon-Hagerstown complex, 8-15% slopes
 - OhD - Opequon-Hagerstown complex, 15-25% slopes
 - Ru - Rubble land 7.7' 1-5%
 - WeC - Weikert shaly silt loam, 5-15% slopes

- BENCHMARK INFORMATION**
- BM-1 : WELL CAP "FIRST R", 1279.17
 - BM-2 : NIH NEAR COF, 1280.16
 - BM-3 : NIH NEAR COF, 1287.91

- EROSION CONTROL FEATURES LEGEND**
- FF - STANDARD FABRIC FENCE
 - RFF - REINFORCED FABRIC FENCE
 - SFF - SUPER FABRIC FENCE
 - FS - COMPOST FILTER SOCK
 - FC - DIVERSION CHANNEL
 - RC - ROCK CONSTRUCTION ENTRANCE
 - SL - SHALE/SLOPE LINING
 - RR - RIP-RAP
 - TS - TOPSOIL STOCKPILE

- Existing Features Legend**
- Contour
 - Contour Index
 - LIDAR / GIS Contour
 - Building
 - Concrete
 - Edge of Pavement
 - Edge of Gravel
 - Centerline
 - Fence
 - Property Boundary
 - Property Adjoiner
 - Right-of-Way
 - Stormwater Pipe
 - Edge of Water
 - Treeline
 - Soil Boundary

- PROPOSED FEATURES LEGEND**
- CONTOUR
 - CONTOUR INDEX
 - BUILDING
 - CONCRETE
 - EDGE OF PAVEMENT
 - EDGE OF GRAVEL
 - FENCE
 - EASEMENT
 - LIMITS OF DISTURBANCE
 - NPDES PERMIT BOUNDARY
 - SETBACK
 - INLET, STORMWATER PIPE, ENDWALL / HEADWALL
 - SUBSURFACE DRAIN
 - TOP OF BERM
 - MANURE TRANSFER PIPE

TeamAg inc 120 LAKE STREET EPHRATA, PA 17522 PHONE: 717-721-6795 FAX: 717-721-9275 www.TeamAgInc.com TeamAg@TeamAgInc.com	SCALE 0' 10' 20'	PROJECT TITLE ROOFED HUA & STACKING AREA	CLIENT DEREK HART 216 MOUNTAIN VIEW LN AARONSBURG, PA 16820 814-404-8286	PROJECT NO.: 5235-24-05
PROJECT MANAGER NATE DENING	DESIGN BY : JBG/ND	DRAWN BY : GDG	DATE : 1/13/25	REVISION
DATE AUG. 20, 2024	BY LTR			
PER C.S. DAVIDSON, INC. REVIEW LETTER DATED JULY 26, 2024				
DRAWING : SP-1				

GENERAL EROSION CONTROL NOTES:

- All earth disturbances, including clearing and grubbing as well as cuts and fills shall be done in accordance with the approved EES plan. A copy of the approved drawings (stamped, signed and dated by the reviewing agency) must be available at the project site at all times. The reviewing agency shall be notified of any changes to the approved plan prior to implementation of these changes. The reviewing agency may require a written submittal of those changes for review and approval at its discretion.
- At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, the landowner, appropriate municipal officials, the EES plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.
- At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.
- All earth disturbances shall proceed in accordance with the sequence provided on the plan drawings. Deviation from that sequence must be approved in writing from the local conservation district or by the Department prior to implementation.
- Areas to be filled are to be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots and other objectionable material.
- Clearing, grubbing, and topsoil stripping shall be limited to those areas described in each stage of the construction sequence. General site clearing, grubbing and topsoil stripping may not commence in any stage or phase of the project until the EES BMPs specified by the BMP sequence for that stage or phase have been installed and are functioning as described in this EES plan.
- At no time shall construction vehicles be allowed to enter areas outside the limits of disturbance boundaries shown on the plan maps. These areas must be clearly marked and fenced off before clearing and grubbing operations begin.
- Topsoil required for the establishment of vegetation shall be stockpiled at the location(s) shown on the plan map(s) in the manner necessary to complete the final grading of all exposed areas that are to be stabilized by vegetation. Each stockpile shall be protected in the manner shown on the plan drawings. Stockpile heights shall not exceed 35 feet. Stockpile slopes shall be 2H:1V or flatter.
- Immediately upon discovering unforeseen circumstances posing the potential for accelerated erosion and/or sediment pollution, the operator shall implement appropriate best management practices to minimize the potential for erosion and sediment pollution and notify the local conservation district and/or the regional office of the Department.
- All building materials shall be removed from the site and recycled or disposed of in accordance with the Department's Solid Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. No building materials or wastes or unused building materials shall be burned, buried, dumped, or discharged at the site.
- All off-site waste and borrow areas must have an EES plan approved by the local conservation district or the Department fully implemented prior to being activated.
- The contractor is responsible for ensuring that any material brought on site is clean fill. Form FF-001 must be retained by the property owner. Fill material affected by a spill or release of a regulated substance but qualifying as clean fill due to analytical testing.
- All pumping of water from any work area shall be done according to the procedure described in this plan, over undisturbed vegetated areas.
- Until the site is stabilized, all erosion and sediment BMPs shall be maintained properly. Maintenance shall include inspections of all erosion and sediment BMPs after each runoff event and on a weekly basis. All preventative and remedial maintenance work, including clean out, repair, replacement, regrading, reseeding, re-mulching and renetting must be performed immediately. If EES BMPs fail to perform as expected, replacement BMPs, or modifications of those installed will be required.
- A log showing dates that EES BMPs were inspected as well as any deficiencies found and the date they were corrected shall be maintained on the site and be made available to regulatory agency officials at the time of inspection.
- Sediment tracked onto any public roadway or sidewalk shall be returned to the construction site by the end of each work day and disposed in the manner described in this plan. In no case shall the sediment be washed, shoveled, or swept into any roadside ditch, storm sewer, or surface water.
- All sediment removed from BMPs shall be disposed of in the manner described on the plan drawings.
- Areas which are to be topsoiled shall be scarified to a minimum depth of 3 to 5 inches (6 to 12 inches on compacted soils) prior to placement of topsoil. Areas to be vegetated shall have a minimum 4 inches of topsoil in place prior to seeding and mulching. Fill outcrops shall have a minimum of 2 inches of topsoil.
- All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence or other related problems. Fill intended to support buildings, structures and conduits, etc. shall be compacted in accordance with local requirements or codes.
- All earthen fills shall be placed in compacted layers not to exceed 9 inches in thickness.
- Fill materials shall be free of frozen particles, brush, roots, sod, or other foreign or objectionable materials that would interfere with or prevent construction of satisfactory fills.
- Frozen materials or soft, mucky, or highly compressible materials shall not be incorporated into fills.
- Fill shall not be placed on saturated or frozen surfaces.
- Seeps or springs encountered during construction shall be handled in accordance with the standard and specification for subsurface drain or other approved method.
- All graded areas shall be permanently stabilized immediately upon reaching finished grade. Cut slopes in competent bedrock and rock fills need not be vegetated. Seeded areas within 50 feet of a surface water, or otherwise shown on the plan drawings, shall be blanketed according to the standards of this plan.
- Immediately after earth disturbance activities cease in any area or subarea of the project, the operator shall stabilize all disturbed areas. During non-germinating months, mulch or protective blanketing shall be applied as described in the plan. Areas not at finished grade, which will be reactivated within 1 year, may be stabilized in accordance with the temporary stabilization specifications. Those areas which will not be reactivated within 1 year shall be stabilized in accordance with the permanent stabilization specifications.
- Permanent stabilization is defined as a minimum uniform, perennial 70% vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated erosion. Cut and fill slopes shall be capable of resisting failure due to slumping, sliding, or other movements.
- EES BMPs shall remain functional as such until all areas tributary to them are permanently stabilized or until they are replaced by another BMP approved by the local conservation district or the Department.
- Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the owner and/or operator shall contact the local conservation district for an inspection prior to removal/conversion of the EES BMPs.
- After final site stabilization has been achieved, temporary erosion and sediment BMPs must be removed or converted to permanent post construction stormwater management BMPs. Areas disturbed during removal or conversion of the BMPs shall be stabilized immediately. In order to ensure rapid revegetation of disturbed areas, such removal/conversions are to be done only during the germinating season.
- Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the owner and/or operator shall contact the local conservation district to schedule a final inspection.
- Failure to correctly install EES BMPs, failure to prevent sediment-laden runoff from leaving the construction site, or failure to take immediate corrective action to resolve failure of EES BMPs may result in administrative, civil, and/or criminal penalties being instituted by the Department as defined in Section 622 of the Pennsylvania Clean Streams Law. The Clean Streams Law provides for up to \$10,000 per day in civil penalties, up to \$10,000 in summary criminal penalties, and up to \$25,000 in misdemeanor criminal penalties for each violation.

SEQUENCE OF CONSTRUCTION:

- All earth disturbance activities shall proceed in accordance with the following sequence. Each stage shall be completed in compliance with Chapter 102 regulations before any following stage is initiated. Clearing and grubbing shall be limited only to those areas described in each stage.
- At least 7 days before starting any earth disturbance activities, the operator shall invite all contractors involved in these activities, the landowner, all appropriate municipal officials, the erosion and sedimentation control plan preparer, and a representative of the County Conservation District to schedule an on-site pre-construction meeting. Also, at least 3 days before starting any earth disturbance activities, all contractors involved in these activities shall notify the Pennsylvania One Call System Inc. at 1-800-242-1776 for the location of buried utilities.
- Before implementing any revisions to the approved erosion and sediment control plan or revisions to other plans which may affect the effectiveness of the approved EES control plan, the operator must receive approval of the revisions from the Centre County Conservation District.
- The operator shall remove from the site, recycle or dispose of all building materials and wastes in accordance with the Department's Solid Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 et seq. and 287.1 et seq.
- Before disposing of soil or receiving borrow for the site, the operator must assure that each spill or borrow area has an erosion and sediment control plan approved by the County Conservation District, and which is being implemented and maintained according to Chapter 102 regulations. The operator shall also notify the County Conservation District in writing of all receiving soil and borrow areas when they have been identified.
- Construct and stabilize gravel drive to access the site. Install rock construction entrance.
- Install filter fabric as shown on the drawings.
- Remove topsoil and rough grade area for the proposed structures.
- Place excess soil in stockpile as needed. Stockpile height shall not exceed 35 ft. Side slopes must be 2:1 or flatter. Install fabric fence below topsoil and excess material stockpiles.
- A crushed aggregate base course shall be immediately applied to the driveway system which is to service the proposed site.
- Stabilize gravel access to site and begin construction of the structures.
- Fine grade the lawn areas and seed or soil immediately with a perennial grass cover. Lawns shall be maintained on a regular basis and repaired, reseeded and mulched until stabilization is achieved.
- Prior to seeding and placement of compost mixture, the infiltration basin floors shall be chisel plowed to a depth of 12-18 inches with suitable equipment.
- Plant a seed mix containing "Virginia Wild rye" such as "Retention Basin Floor Seeding Mix ERN1X-126" from Ernst Conservation Seeds at 1/2 to 1 pound per 1,000 square feet.
- After final grading, seeding will take place to establish a dense vegetative cover.
- After permanent stabilization of site (i.e. a minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation) has been achieved, the

- temporary erosion and sedimentation controls must be removed. Areas disturbed during the removal of the controls shall be restabilized.
- Upon completion of an earth disturbance activity or any stage or phase of an activity, the site shall be immediately seeded, mulched or otherwise protected from accelerated erosion and sedimentation. Erosion and sediment control BMPs shall be implemented and maintained until the permanent stabilization is completed. For an earth disturbance activity or any stage or phase of an activity to be considered permanently stabilized, the disturbed area shall be covered with one of the following: (1) A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation. (2) An acceptable BMP which permanently minimizes accelerated erosion and sedimentation.
 - Within 30 days after the completion of earth disturbance activities authorized by this permit, including the permanent stabilization of the site and proper installation of PCSM BMPs in accordance with the approved PCSM Plan, or upon submission of the NOT if not sooner, the permittee shall file with the Department or authorized Conservation District, a statement signed by a licensed professional and by the permittee certifying the work has been performed in accordance with the terms and conditions of this permit and the approved EES and PCSM Plans. Completion certificates are needed to ensure that all work is performed in accordance with the terms and conditions of the permit and the approved EES and PCSM Plans.

MAINTENANCE OF EROSION CONTROL FACILITIES:

- The General Contractor, or in the absence of a General Contractor, the Operator/Owner, shall be responsible for implementing and maintaining all Soil Erosion Controls. The Contractor shall, at the end of each week as well as with each rainfall, inspect all drainage and erosion control facilities to determine if they still function. Silt fence shall be cleared of silt when silt reaches halfway up fence. Additional stone ballast shall be placed, if necessary, to control the tracking of mud by construction vehicles onto the adjacent roads.
- Check basin embankments, spillways, and outlets for erosion, piping and settlement. Make necessary repairs immediately. Replace displaced riprap within the outlet, energy dissipator immediately after it is displaced and especially after major storm discharge events.
- If additional silt fence or diversions are necessary, they shall be provided as required. The County Conservation District must review all changes. Sediment deposited behind silt barriers shall be removed and incorporated into the final grading operations.
- Until the site is stabilized, all erosion and sedimentation controls must be maintained properly. Maintenance must include inspections of all erosion and sedimentation controls after each storm event and on a weekly basis. All site inspections will be documented in an inspection log kept for this purpose. The compliance actions and the date, time and name of the person conducting the inspection. The inspection log will be kept on site at all times and made available to the district or request.
- All preventative and remedial maintenance work, including clean out, repair, replacement, regrading, reseeding, re-mulching and renetting must be performed immediately. If erosion and sedimentation BMPs fail to perform as expected, replace or modify installed BMPs. An extra supply of stone, seed, mulch and silt fence shall be kept on site for emergency purposes.
- When the entire project has become stabilized (i.e. uniform vegetative cover), any temporary sediment and erosion controls shall be removed and the areas stabilized.
- Sediment must be removed from basins when sediment has accumulated to the clean out elevation. Sediment basins must be protected from unauthorized acts of third parties.
- Stockpile heights must not exceed 35'. Stockpile slopes must be 2:1 or flatter.
- An area shall be considered to have achieved final stabilization when it has a minimum of 70% uniform perennial vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated surface erosion and subsurface characteristics sufficient to resist sliding or other movements.
- Mulch with mulch control netting or erosion control blankets must be installed on all slopes 3:1 and greater.

PROCEDURES FOR RECYCLING AND WASTE HANDLING & DISPOSAL:

The developer or its authorized representative shall to the greatest extent possible recycle and reuse construction materials when no longer needed on the site. Concrete forms will be reused in other construction projects. Excess materials will be used in other projects as much as is feasible, rather than disposal on the site. Construction waste anticipated for this project includes wood forms, excess concrete, cardboard and other typical construction wastes. All wastes shall be handled and disposed of in accordance with governing state and federal regulations. Manure shall be handled and disposed of according to PA Act 38 and other governing manure management plan requirements and applicable regulations.

FILL MATERIALS:

- The General Contractor, or in the absence of a General Contractor, the Operator/Owner shall be responsible for performing Environmental Due Diligence to ensure that all fill material associated with the project qualifies as Clean Fill. All fill material must be used in accordance with the Department's policy "Management of Fill", document number 258-2182-773.
- Clean Fill is defined as: Uncontaminated, non-water soluble, non-decomposable, inert, solid material. The term includes soil, rock, stone, dredged material, used asphalt, and brick, block or concrete from construction and demolition activities that is separate from other waste and is recognizable as such. The term does not include materials placed in or on the waters of the Commonwealth unless otherwise authorized. (The term "used asphalt" does not include milled asphalt or asphalt that has been processed for re-use.)
- Environmental due diligence is defined as: Investigative techniques, including, but not limited to, visual property inspections, electronic data base searches, review of property ownership, review of property use history, Sanborn maps, environmental questionnaires, transaction screens, analytical testing, environmental assessments or audits. Analytical testing is not a required part of due diligence unless visual inspection and/or review of the past land use of the property indicates that the fill may have been subjected to a spill or release of regulated substance. If the fill may have been affected by a spill or release of a regulated substance, it must be tested to determine if it qualifies as clean fill. Testing should be performed in accordance with Appendix A of the Department's policy "Management of Fill".

GENERAL SEEDING NOTES

- Any disturbed area on which activity has ceased and which will remain exposed must be seeded and mulched immediately. During non-germinating periods, mulch must be applied at the recommended rates. Disturbed areas which are not at finished grade and which will be redisturbed within 1 year may be seeded and mulched with a quick growing temporary seeding mixture and mulch. Disturbed areas which are either at finished grade or will not be redisturbed within one year must be seeded and mulched with a permanent seed mixture and mulch.
- Diversions, channels, sedimentation basins sediment traps and stockpiles must be seeded and mulched immediately.
- Hay or straw mulch must be applied at rates of at least 3.0 tons per acre. Mulch shall be anchored immediately after application. Mulch shall be held down by synthetic binders or mechanical means.

TEMPORARY SEEDING NOTES

Site preparation: Apply 1 ton/acre agricultural grade limestone and 10-10-10 fertilizer at a rate of 500 lbs./acre and work in where possible. Mulch seeded areas immediately after seeding.

PERMANENT SEEDING NOTES

Site preparation: Grade as necessary to bring the subgrade to a true, smooth slope parallel to and six inches below finished grade. Place topsoil over specified areas to a depth sufficiently greater than six inches so that after settlement and light rolling the complete work will conform to lines, grades, and elevations shown.

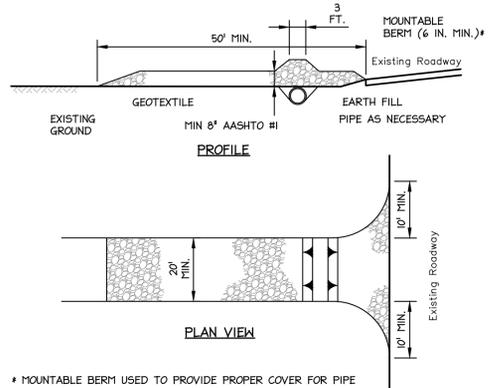
Apply 6 tons/acre agricultural grade limestone and 10-20-10 fertilizer at a rate of 1,000 lbs./acre or as per soil test. Limestone and fertilizer may not be required in agricultural fields.

Fertilizer and agricultural limestone shall be thoroughly incorporated into the soil by rototilling or other method to a minimum depth of four inches. The entire surface shall be done in two separate operations. The second seeding shall be done immediately after the first and at right angles to the first seeding and lightly raked into the soil. Mulch seeded areas immediately after seeding.

RECOMMENDED SEED MIXTURES

CONDITION	MIXTURE NUMBER	SPECIES	SEEDING RATES PURE LIVE SEED ⁽¹⁾		
Temporary	1	Spring oats, or Annual ryegrass (spring or fall), or Winter wheat (fall), or Winter rye (fall)	64 90 56		
		Laun area flatter than 3 to 1 and permanent slopes ⁽²⁾	2	Temporary mixture, plus Tall fescue, or Fine fescue, or Kentucky bluegrass, plus Redtop, or Perennial ryegrass	60 35 25 15
				Laun area 3 to 1 and steeper	3

Adapted from PA DEP Erosion and Sediment Pollution Control Program Manual
⁽¹⁾ PLS is the product of the percentage of pure seed times percentage germination divided by 100.
⁽²⁾ This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.



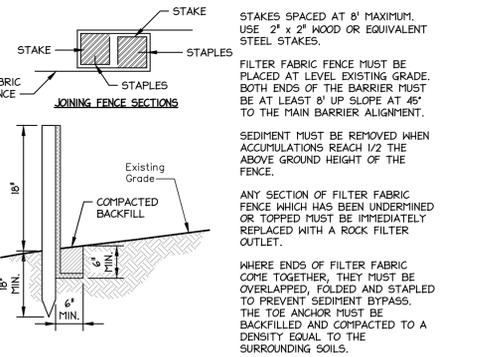
* MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

NOTES:
 REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND 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 SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.

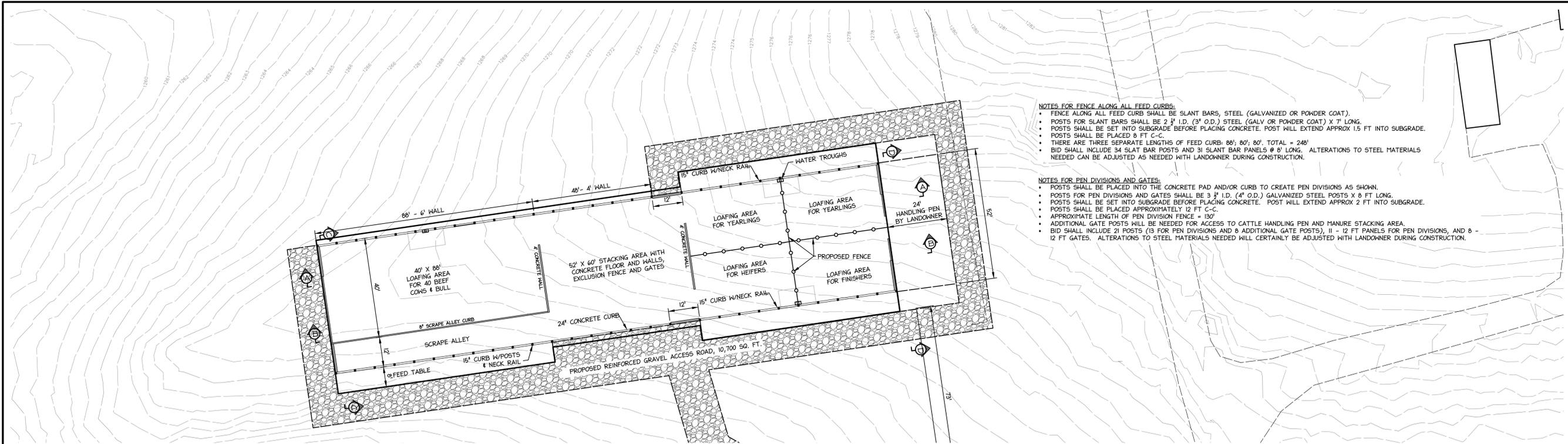
MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK, WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

**STANDARD CONSTRUCTION DETAIL #3-1
 ROCK CONSTRUCTION ENTRANCE**
 NOT TO SCALE



STANDARD FILTER FABRIC FENCE (18" HIGH)
 NOT TO SCALE

REVISION	BY	DATE	PROJECT MANAGER	DATE DURING	PROJECT NO.: 5235-24-05
PER C.S. DAVIDSON, INC. REVIEW LETTER DATED JULY 26, 2024	LHR	AUG. 20, 2024	NATE DENING	JBG/ND	
			DESIGN BY :	DRAWN BY :	
				DATE :	
				PROJECT NO. :	
SEAL	120 LAKE STREET EPHRATA, PA 17522 PHONE: 717-721-6795 FAX: 717-721-9275 www.TeamAgInc.com TeamAg@TeamAgInc.com				
PROJECT TITLE	ROOFED HUA & STACKING AREA HAINES TOWNSHIP CENTRE COUNTY				
CLIENT	DEREK HART 216 MOUNTAIN VIEW LN AARONSBURG, PA 16820 814-404-8286				
DRAWING :	ES-2				

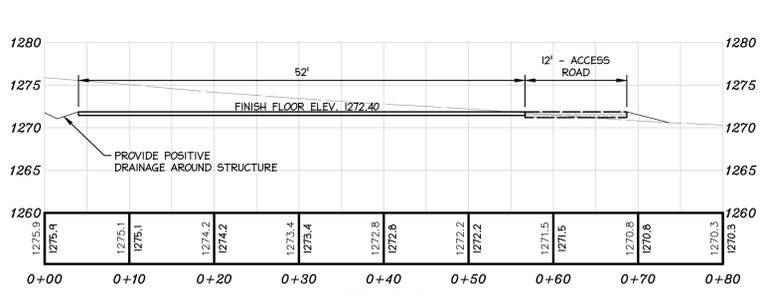
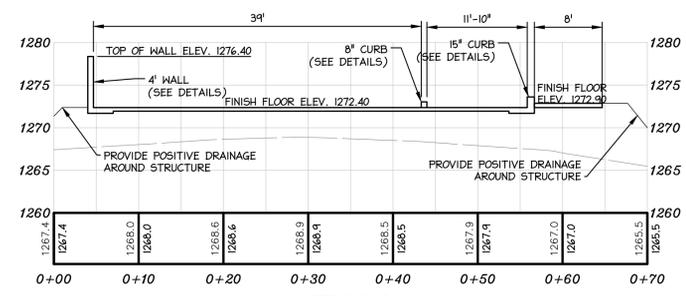
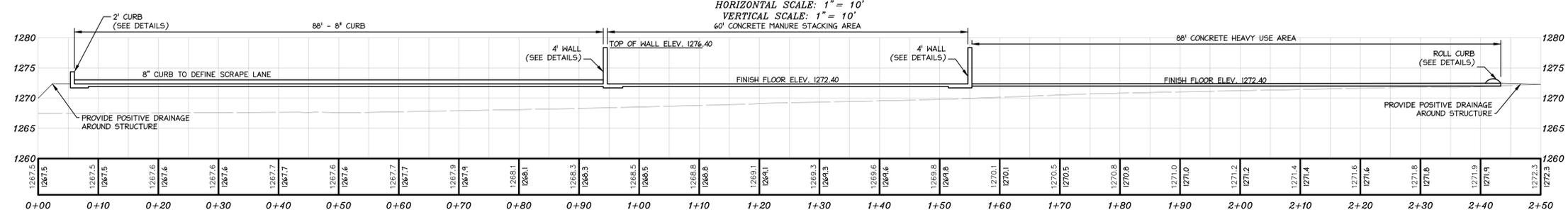
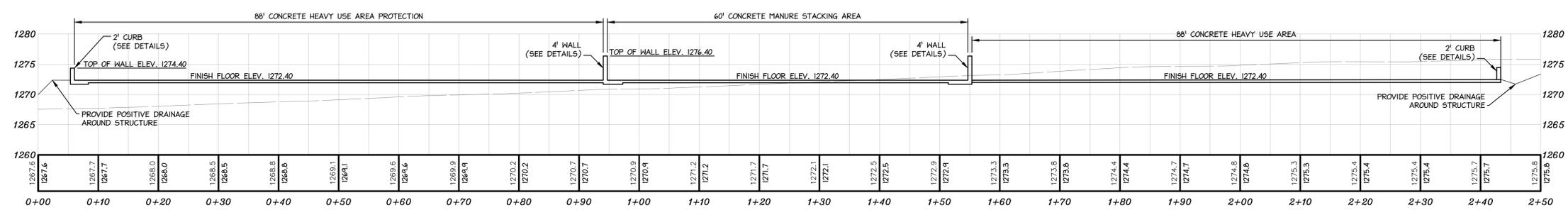


NOTES FOR FENCE ALONG ALL FEED CURBS:

- FENCE ALONG ALL FEED CURB SHALL BE SLANT BARS, STEEL (GALVANIZED OR POWDER COAT).
- POSTS FOR SLANT BARS SHALL BE 2" I.D. (3" O.D.) STEEL (GALV OR POWDER COAT) X 7' LONG.
- POSTS SHALL BE SET INTO SUBGRADE BEFORE PLACING CONCRETE. POST WILL EXTEND APPROX 1.5 FT INTO SUBGRADE.
- POSTS SHALL BE PLACED @ 8 FT C-C.
- THERE ARE THREE SEPARATE LENGTHS OF FEED CURB: 88', 80', 80'. TOTAL = 248'
- BID SHALL INCLUDE 34 SLANT BAR POSTS AND 31 SLANT BAR PANELS @ 8' LONG. ALTERATIONS TO STEEL MATERIALS NEEDED CAN BE ADJUSTED AS NEEDED WITH LANDOWNER DURING CONSTRUCTION.

NOTES FOR PEN DIVISIONS AND GATES:

- POSTS SHALL BE PLACED INTO THE CONCRETE PAD AND/OR CURB TO CREATE PEN DIVISIONS AS SHOWN.
- POSTS FOR PEN DIVISIONS AND GATES SHALL BE 3" I.D. (4" O.D.) GALVANIZED STEEL POSTS X 8 FT LONG.
- POSTS SHALL BE SET INTO SUBGRADE BEFORE PLACING CONCRETE. POST WILL EXTEND APPROX 2 FT INTO SUBGRADE.
- POSTS SHALL BE PLACED APPROXIMATELY 12 FT C-C.
- APPROXIMATE LENGTH OF PEN DIVISION FENCE = 130'
- ADDITIONAL GATE POSTS WILL BE NEEDED FOR ACCESS TO CATTLE HANDLING PEN AND MANURE STACKING AREA.
- BID SHALL INCLUDE 21 POSTS (13 FOR PEN DIVISIONS AND 8 ADDITIONAL GATE POSTS), 11 - 12 FT PANELS FOR PEN DIVISIONS, AND 8 - 12 FT GATES. ALTERATIONS TO STEEL MATERIALS NEEDED WILL CERTAINLY BE ADJUSTED WITH LANDOWNER DURING CONSTRUCTION.



REVISION	DATE	BY
	AUG. 20, 2024	LMR
PROJECT MANAGER	NATE DENING	
DESIGN BY	JBG/ND	
DRAWN BY	GDG	
DATE	1/13/25	
PROJECT NO.	5235-24-05	

SEAL

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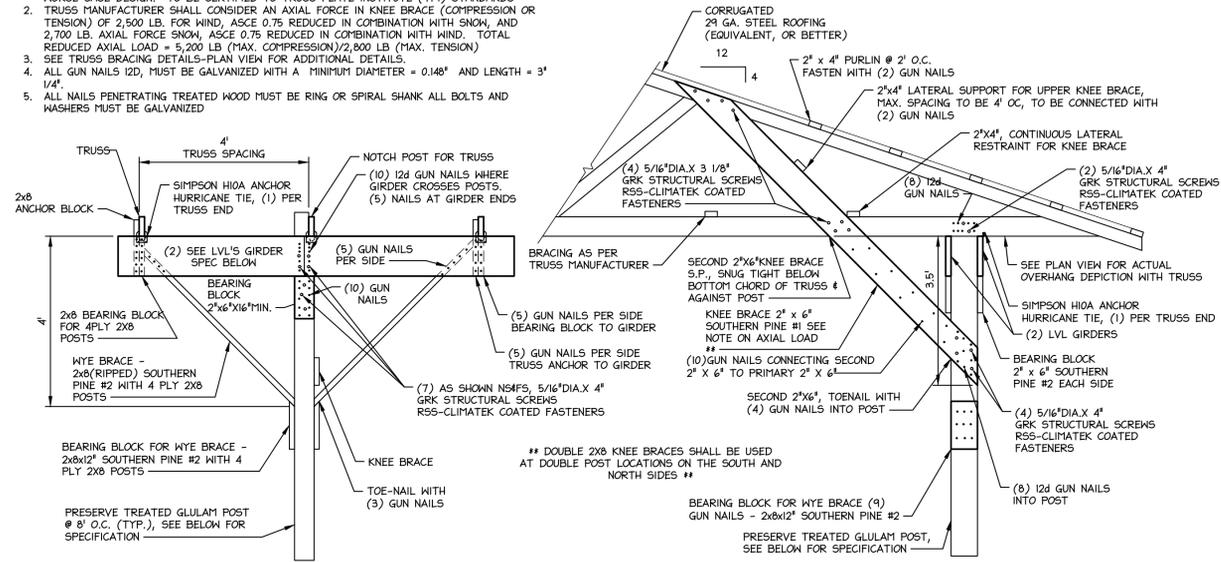
SCALE: 1" = 100'

PROJECT TITLE: **ROOFED HUA & STACKING AREA**
 HAINES TOWNSHIP CENTRE COUNTY

CLIENT: **DEREK HART**
 216 MOUNTAIN VIEW LN
 AARONSBURG, PA 16820
 814-404-8286

DRAWING: **CROSS SECTIONS**
 CS-1

- NOTES:**
- TRUSS SHALL BE DESIGNED FOR OPEN AND PARTIALLY ENCLOSED CONDITIONS TO PROVIDE A WORSER CASE DESIGN. TO BE CERTIFIED TO TRUSS PLATE INSTITUTE (TPI) STANDARDS
 - TRUSS MANUFACTURER SHALL CONSIDER AN AXIAL FORCE IN KNEE BRACE (COMPRESSION OR TENSION) OF 2,500 LB. FOR WIND, ASCE 0.75 REDUCED IN COMBINATION WITH SNOW, AND 2,700 LB. AXIAL FORCE SNOW, ASCE 0.75 REDUCED IN COMBINATION WITH WIND. TOTAL REDUCED AXIAL LOAD = 5,200 LB. (MAX. COMPRESSION)/2,800 LB. (MAX. TENSION)
 - SEE TRUSS BRACING DETAILS-PLAN VIEW FOR ADDITIONAL DETAILS.
 - ALL GUN NAILS 12D, MUST BE GALVANIZED WITH A MINIMUM DIAMETER = 0.148" AND LENGTH = 3" 1/4".
 - ALL NAILS PENETRATING TREATED WOOD MUST BE RING OR SPIRAL SHANK ALL BOLTS AND WASHERS MUST BE GALVANIZED



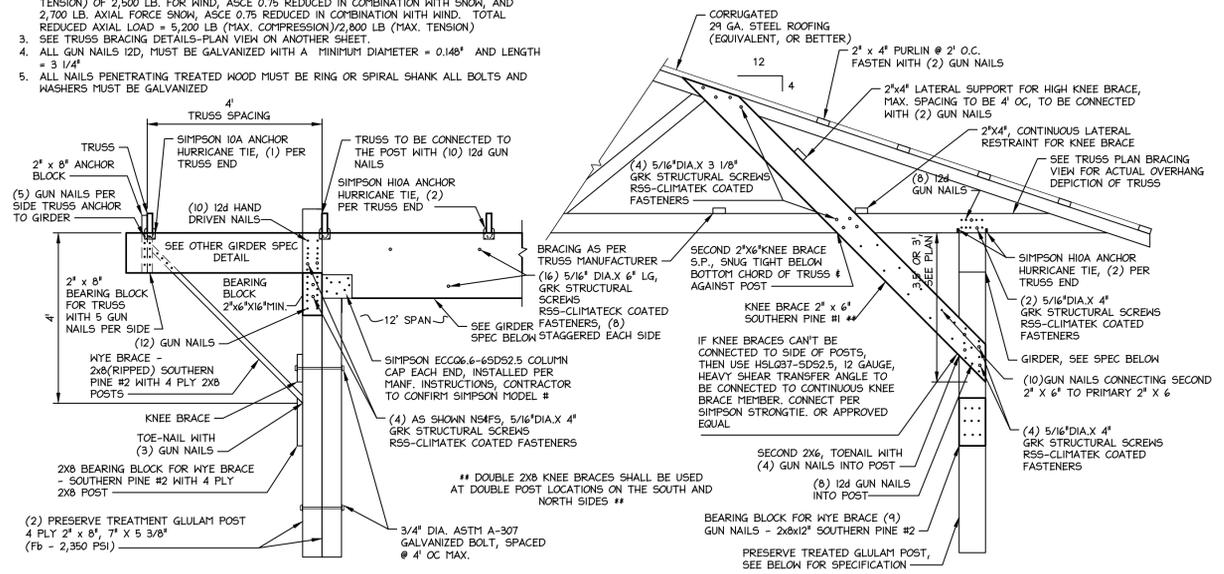
GIRDERS:
GIRDERS WITH 8' SPANS ON NORTH & SOUTH SIDES SHALL BE (2) 1 3/4" X 11 7/8" X 16' LVL'S, MINIMUM Fb = 2,600 psi, E = 2,000,000 psi.

POSTS:
POSTS ON NORTH & SOUTH SIDES SHALL BE 5 PLY 2x8, 7" X 6" 11/16" @ 8' BOTTOM CHORD OVERHANG LOCATIONS & 4 PLY 2x8, 7" X 5 3/8" @ ALL OTHER LOCATIONS, RIGID-PLY GLU-LAM, EQUIVALENT OR BETTER Fb-y = 2,350 psi, Fc = 2,150 psi, E-y = 1,700,000 psi.
POSTS ON WEST & EAST GABLE END WALLS SHALL BE 4 PLY, 2" X 6", 5 1/4" X 5 3/8", RIGID-PLY GLU-LAM, EQUIVALENT OR BETTER Fb-y = 2,350 psi, Fc = 2,150 psi, E-y = 1,700,000 psi

1 TYPICAL BRACING DETAIL ROOFED STRUCTURE

NOT TO SCALE

- NOTE:**
- TRUSS SHALL BE DESIGNED FOR OPEN AND PARTIALLY ENCLOSED CONDITIONS TO PROVIDE A WORSER CASE DESIGN. TO BE CERTIFIED TO TRUSS PLATE INSTITUTE (TPI) STANDARDS
 - TRUSS MANUFACTURER SHALL CONSIDER AN AXIAL FORCE IN KNEE BRACE (COMPRESSION OR TENSION) OF 2,500 LB. FOR WIND, ASCE 0.75 REDUCED IN COMBINATION WITH SNOW, AND 2,700 LB. AXIAL FORCE SNOW, ASCE 0.75 REDUCED IN COMBINATION WITH WIND. TOTAL REDUCED AXIAL LOAD = 5,200 LB. (MAX. COMPRESSION)/2,800 LB. (MAX. TENSION)
 - SEE TRUSS BRACING DETAILS-PLAN VIEW ON ANOTHER SHEET.
 - ALL GUN NAILS 12D, MUST BE GALVANIZED WITH A MINIMUM DIAMETER = 0.148" AND LENGTH = 3" 1/4".
 - ALL NAILS PENETRATING TREATED WOOD MUST BE RING OR SPIRAL SHANK ALL BOLTS AND WASHERS MUST BE GALVANIZED

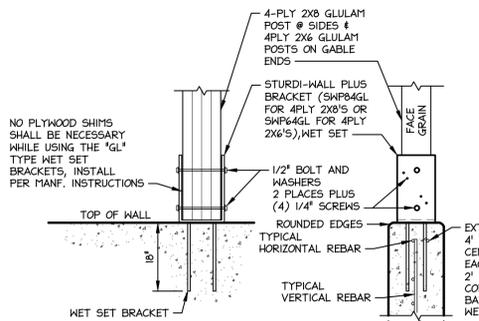


GIRDERS:
GIRDERS WITH 12' SPAN ON BOTH NORTH AND SOUTH SIDES SHALL BE (3) 1 3/4" X 14" LVL'S, MINIMUM Fb = 2,600 psi, E = 2,000,000 psi.

POSTS:
POSTS AT EACH END OF ALL 12' GIRDER SPANS SHALL BE DOUBLE 4 PLY, 2" X 8", 7" X 5 3/8", RIGID-PLY GLU-LAM, EQUIVALENT OR BETTER Fb-y = 2,350 psi, Fc = 2,150 psi, E-y = 1,700,000 psi

2 12' SPAN BRACING DETAIL ROOF STRUCTURE HUA AREA

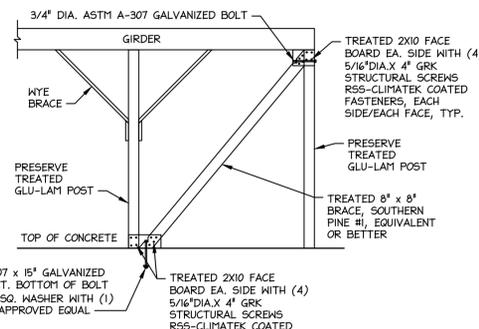
NOT TO SCALE



NOTE: ALL BOLTS AND WASHERS MUST BE GALVANIZED SEE MANUFACTURER'S RECOMMENDATIONS FOR ADDITIONAL INSTALLATION NOTES.

3 ROOFED STRUCTURE POST TO WALL CONNECTION

NOT TO SCALE



4 K-BRACE

NOT TO SCALE

REVISION	DATE	BY	PROJECT MANAGER	DATE	BY	REVISION
	AUG. 20, 2024	LMR	NATE DENING			
			DESIGN BY: JBG/ND			
			DRAWN BY: GDG			
			DATE: 1/13/25			
			PROJECT NO.: 5235-24-05			

SCALE

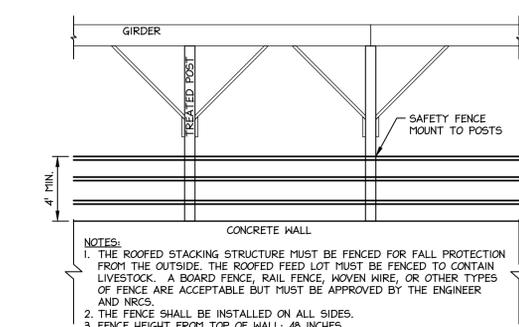
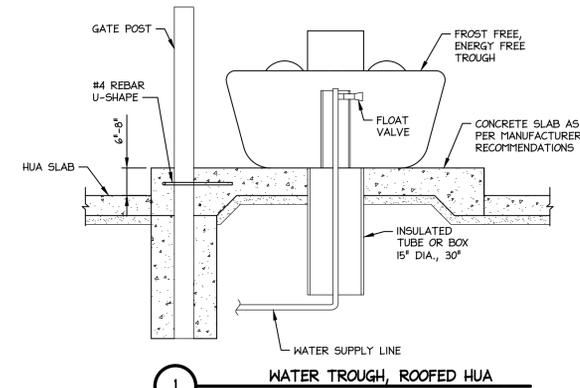
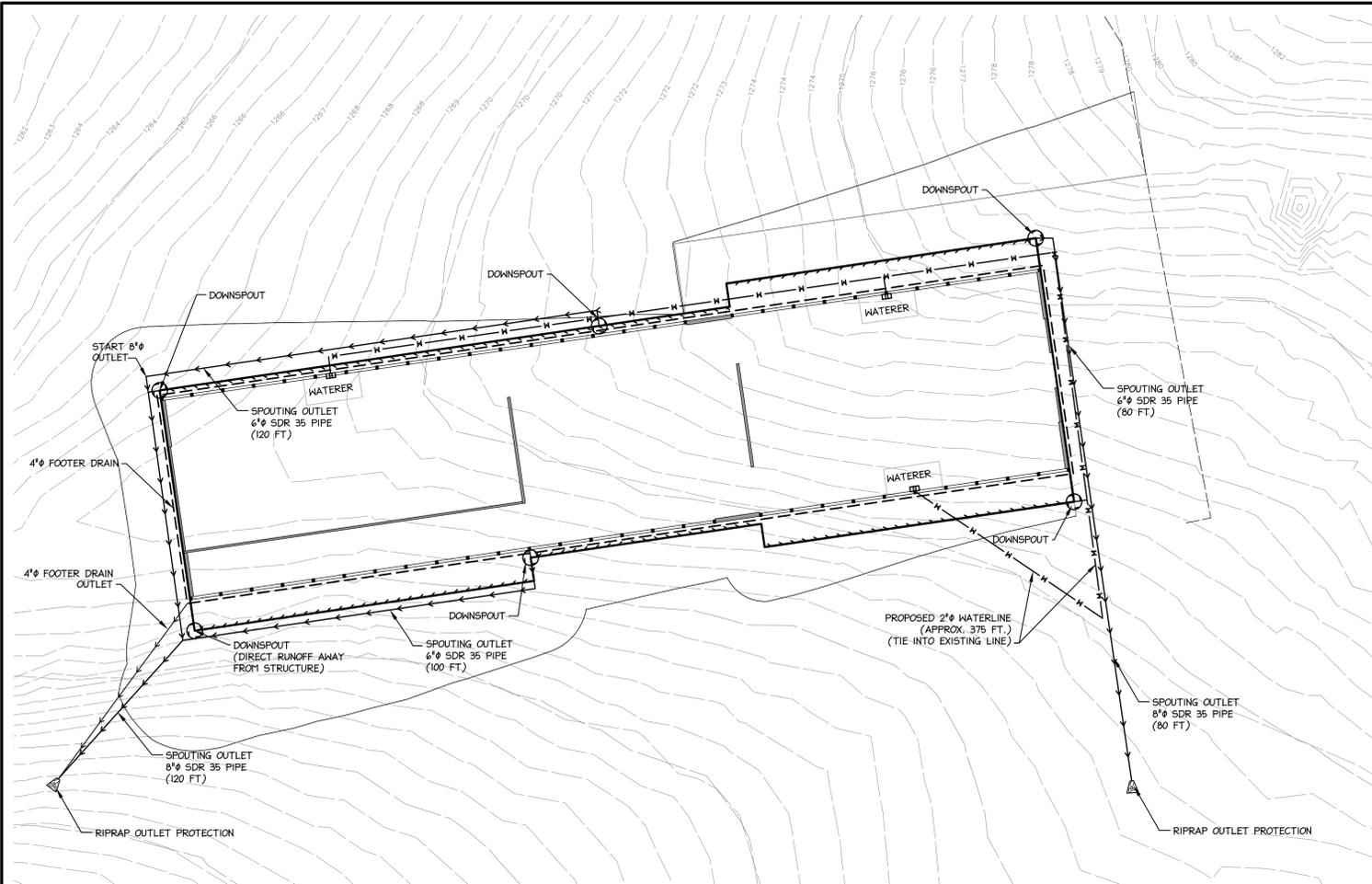
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www.TeamAgInc.com TeamAg@TeamAgInc.com

PROJECT TITLE
ROOFED HUA & STACKING AREA
HAINES TOWNSHIP CENTRE COUNTY

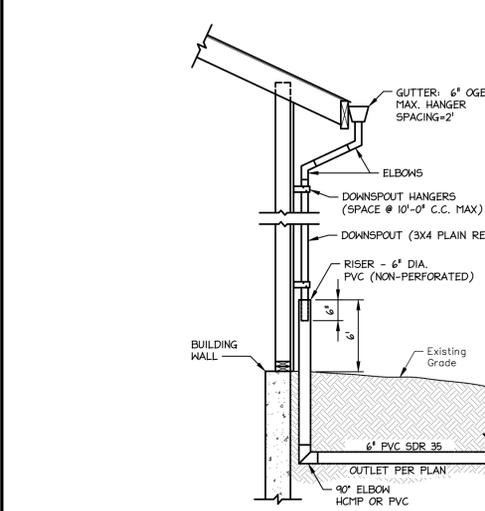
CLIENT
DEREK HART
216 MOUNTAIN VIEW LN
AARONSBURG, PA 16820
814-404-8286

STRUCTURAL DETAILS

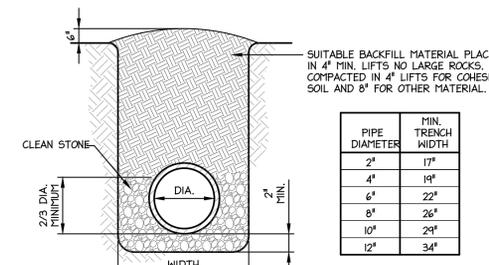
DRAWING: D-2



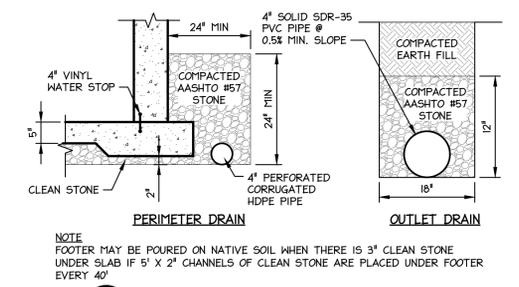
NOTES:
 1. THE ROOFED STACKING STRUCTURE MUST BE FENCED FOR FALL PROTECTION FROM THE OUTSIDE. THE ROOFED FEED LOT MUST BE FENCED TO CONTAIN LIVESTOCK. A BOARD FENCE, RAIL FENCE, WOVEN WIRE, OR OTHER TYPES OF FENCE ARE ACCEPTABLE BUT MUST BE APPROVED BY THE ENGINEER AND NRCS.
 2. THE FENCE SHALL BE INSTALLED ON ALL SIDES.
 3. FENCE HEIGHT FROM TOP OF WALL: 48 INCHES
 4. MINIMUM NUMBER OF RAILS: 3



CONSTRUCTION NOTES (GUTTERS):
 1. GUTTER SHALL BE CORROSION RESISTANT MATERIAL OF SUFFICIENT THICKNESS TO PREVENT FLEXING BETWEEN SUPPORTS. ALUMINUM GUTTERS SHALL HAVE A NOMINAL THICKNESS OF (0.027) INCHES. ALUMINUM DOWNSPOUTS SHALL HAVE A NOMINAL THICKNESS OF (0.020) INCHES. GALVANIZED STEEL GUTTERS SHALL HAVE A MINIMUM THICKNESS OF (28) GAUGE. ALL GUTTERS SHALL HAVE END CAPS.
 2. DISSIMILAR METALS SHALL NOT BE IN CONTACT WITH EACH OTHER.
 3. GUTTERS SHALL HAVE CONTINUOUS BACKING WITH A VERTICAL FACE. A WEDGE SHAPED STRINGER MAY BE USED FOR SUPPORT. RAFTER ENDS AND FASCIA BOARDS SHALL BE SOUND.
 4. HANGERS SHALL BE LOCATED A MAXIMUM OF 2 FEET APART AND NAILED TO FASCIA BOARDS OR ROOF SHEATHING AT RAFTER LOCATIONS.
 5. DOWNSPOUTS SHALL BE SECURELY FASTENED AT THE TOP AND BOTTOM WITH SUPPORT BRACKETS AND SHALL HAVE INTERMEDIATE SUPPORT BRACKETS AT A MINIMUM SPACING OF (10) FEET WHERE NOT HOUSED WITHIN A PROTECTIVE SLEEVE.
 6. ALL GUTTER JOINTS SHALL BE MADE WATERTIGHT BY USE OF PASTIC OR CAULKING.
 7. EXPANSION JOINTS SHALL BE USED ON STRAIGHT RUNS OF (40) FEET OR MORE AND WHERE THE GUTTER SYSTEM IS NOT FREE FLOATING. IF GUTTERS ARE CO-EXTRUDED FOLLOW THE MANUFACTURER'S RECOMMENDATIONS.
 8. GUTTERS SHALL BE PLACED BELOW THE ROOF SLOPE LINE PROJECTION WITH A MINIMUM CLEARANCE OF 2'.
 9. GUTTER AND LEADER SLOPE SHALL BE A MINIMUM OF 1/8" PER 16 FEET.
 10. WHEN DOWNSPOUT EMPTIES ONTO GROUND, THERE SHALL BE AN ELBOW OR SPLASH PAD.
 11. A PROTECTIVE SLEEVE OF PVC SCH-40 OR STEEL PIPE SHALL BE PLACED AROUND DOWNSPOUT IF EXPOSED TO MACHINERY TRAFFIC OR LIVESTOCK. SLEEVE SHALL BE A MINIMUM HEIGHT OF (6) FEET.
 12. DOWNSPOUTS SHALL BE 4" X 5" OR 4" ROUND (MIN) AS NOTED ON PLAN.



NOTES:
 PRESSURE OR PUMPED TRANSFER PIPES
 1. PIPE LENGTHS SHALL BE JOINED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. ALL PIPE SHALL BE INSTALLED WITH WATER TIGHT, PRESSURE RATED JOINTS.
 2. ELBOWS OR BENDS IN THE PIPE ALIGNMENT GREATER THAN 5 DEGREES SHALL BE SUPPORTED BY THRUST BLOCKS, OR OTHER MECHANICAL THRUST RESTRAINTS.
 GRAVITY TRANSFER PIPES
 1. PIPE SHALL BE INSTALLED TO PROVIDE WATER TIGHT JOINTS. JOINTS IN PVC AND HDPE GRAVITY PIPELINES WITH PUSH-ON (GASKETED) JOINTS SHALL MEET THE FULL REQUIREMENTS OF ASTM-D2212 FOR JOINT TIGHTNESS.
 2. HDPE PIPE AND JOINTS SHALL BE ADVERTISED AS WT (WATER TIGHT). ST OR SILT TIGHT FITTINGS SHALL NOT BE USED.



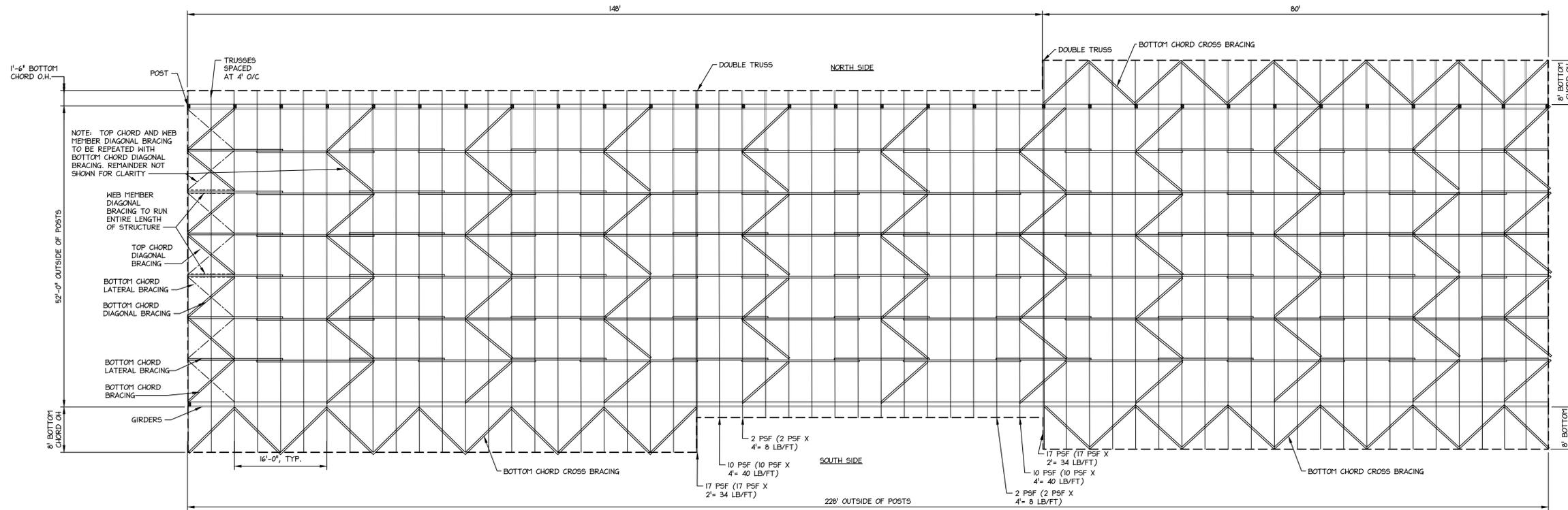
NOTE
 FOOTER MAY BE POURED ON NATIVE SOIL WHEN THERE IS 3" CLEAN STONE UNDER SLAB IF 5' X 2' CHANNELS OF CLEAN STONE ARE PLACED UNDER FOOTER EVERY 40'

3 TYPICAL DOWNSPOUT NOT TO SCALE

3 UNDERGROUND PIPES 4

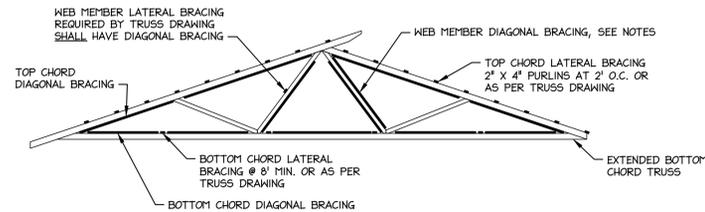
5 PERIMETER DRAIN NOT TO SCALE

REVISION	BY	DATE	PROJECT MANAGER	SEAL	 120 LAKE STREET EPHRATA, PA 17522 PHONE: 717-721-6795 FAX: 717-721-9275 www.teamAginc.com TeamAg@teamAginc.com
	LMR	AUG. 20, 2024	NATE DENING		
			DESIGN BY: JBG/ND		SCALE
			DRAWN BY: GDG		
			DATE: 1/13/25		PROJECT TITLE ROOFED HUA & STACKING AREA HAINES TOWNSHIP CENTRE COUNTY
			PROJECT NO.: 5235-24-05		
					CLIENT DEREK HART 216 MOUNTAIN VIEW LN AARONSBURG, PA 16820 814-404-8286
					PROJECT DETAILS
					DRAWING: D-4



HUA LOT / STACKER STRUCTURE TRUSS BRACING DETAILS

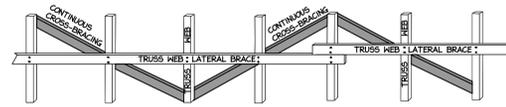
** TRUSS MANUF. TO CONSIDER SNOW DRIFT LOADS AS ADDITIONAL LOADING ONTO THE STANDARD ROOF SNOW LOADS. LOADS SHOWN ABOVE ARE THE ENTIRE LENGTH OF THE TRUSSES



NOTES:

- ROWS OF DIAGONAL BRACING SHALL BE PLACED AT INTERVALS OF NO MORE THAN 20' ALONG THE LENGTH OF THE BUILDING TO PROVIDE STABILITY AND TRANSFER THE FORCES FROM THE LATERAL RESTRAINT TO A LATERAL FORCE RESISTING SYSTEM.
- WHERE TRUSS DRAWINGS REQUIRE WEB MEMBER LATERAL BRACING, WEB MEMBER DIAGONAL BRACING SHALL BE INSTALLED.
- WHEN NO WEB MEMBER LATERAL BRACING IS REQUIRED, INSTALL DIAGONAL BRACING AT VERTICAL WEBS (WHEN POSSIBLE) AND AT OR NEAR BOTTOM CHORD LATERAL BRACING.
- USE (2) 16D (0.135" X 3.5") NAILS AT EACH TRUSS/BRACE CONNECTION.
- BOTTOM CHORD AND WEB LATERAL BRACING SHALL BE OVERLAPPED BY ONE TRUSS. BUTT JOINTS ARE NOT ALLOWED.
- SEE "CHORD DIAGONAL BRACING" AND "CROSS BRACING" DRAWINGS FOR FURTHER DETAILS.
- REFERENCE TRUSS DRAWINGS FOR ANY SPECIAL BRACING REQUIREMENTS.
- REFERENCE BCSI GUIDES FOR FURTHER INFORMATION ON HANDLING, INSTALLING, AND BRACING TRUSSES.
- TRUSS MANUFACTURER TO CONSIDER KNEE BRACE AXIAL FORCES AS SHOWN IN THE FRAMING/BRAACING DETAILS.
- TRUSS MANUFACTURER TO CONSIDER SNOW DRIFT/SLIDING AS ADDITIONAL LOADING ONTO THE STANDARD ROOF SNOW LOADS, AS NOTED ON THE TRUSS BRACING PLAN DETAILS.
- TO BE CERTIFIED TO TRUSS PLATE INSTITUTE (TPI) STANDARDS.
- TRUSS DESIGNER SHALL PROVIDE A P.E. SEALED TRUSS DESIGN DRAWING.

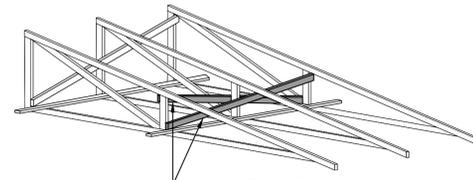
REVISION		PER C.S. DAVIDSON, INC. REVIEW LETTER DATED JULY 26, 2024	
BY	DATE	PROJECT MANAGER	DESIGN BY
LMR	AUG. 20, 2024	NATE DENING	JBG/ND
		DRAWN BY	DATE
		GDG	1/13/25
		PROJECT NO.	5235-24-05
SEAL		 120 LAKE STREET EPHRATA, PA 17522 PHONE: 717-721-6795 FAX: 717-721-9275 www.TeamAgInc.com TeamAg@TeamAgInc.com	
PROJECT TITLE		CLIENT	
ROOFED HUA & STACKING AREA		DEREK HART	
HAINES TOWNSHIP CENTRE COUNTY		216 MOUNTAIN VIEW LN AARONSBURG, PA 16820 814-404-8286	
PROJECT DETAILS		DRAWING : D-5	



NOTES FOR TRUSSES / STRUCTURES:

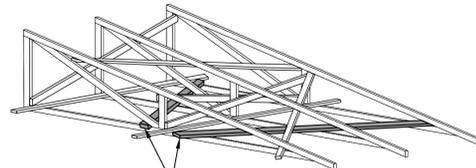
- WHERE TRUSS DRAWINGS REQUIRE WEB MEMBER LATERAL BRACING, WEB MEMBER DIAGONAL BRACING SHALL BE INSTALLED.
- INSTALL CONTINUOUS DIAGONAL BRACING ON THE OPPOSITE SIDE OF THE TRUSS WEB MEMBER AS THE LATERAL BRACE.
- THE DIAGONAL BRACING MUST RUN THE ENTIRE LENGTH OF THE BUILDING.
- OTHER DIAGONAL BRACING OPTIONS MAY BE USED THAT WILL REQUIRE BLOCKING TO AVOID "FLEXING" THE BRACES OVER MEMBERS.
- DIAGONAL CROSS-BRACING SHALL BE INSTALLED AT 45° OR LESS.
- POSITION DIAGONAL BRACE IN CLOSE PROXIMITY TO LATERAL RESTRAIN AND ATTACH DIAGONAL BRACE AS CLOSE TO THE TOP AND BOTTOM CHORD AS POSSIBLE AND TO EACH WEB THAT IT CROSSES.

1 **DIAGONAL WEB MEMBER BRACING FOR WEBS WITH REQUIRED LATERAL BRACING**
NOT TO SCALE



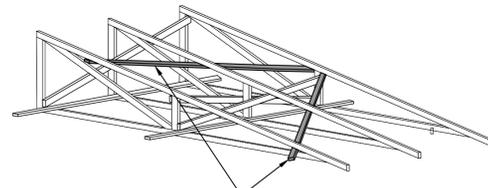
WEB MEMBER DIAGONAL BRACING AT ENDS OF BUILDINGS AND AT 20 FT. MAX. INTERVAL OR AS SPECIFIED ATTACH WITH (2) 16D NAILS AT EACH TRUSS/BRACE CONNECTION

2 **DIAGONAL WEB MEMBER BRACING**
NOT TO SCALE



BOTTOM CHORD DIAGONAL BRACING AT ENDS OF BUILDINGS AND AT 20 FT. MAX. INTERVAL OR AS SPECIFIED ATTACH WITH (2) 16D NAILS AT EACH TRUSS/BRACE CONNECTION

3 **BOTTOM CHORD DIAGONAL BRACING**
NOT TO SCALE

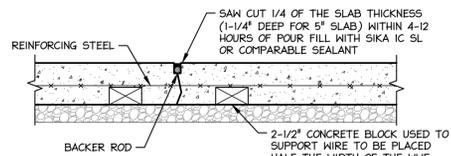


TOP CHORD DIAGONAL BRACING AT ENDS OF BUILDINGS AND AT 20 FT. MAX. INTERVAL OR AS SPECIFIED ATTACH WITH (2) 16D NAILS AT EACH TRUSS/BRACE CONNECTION

4 **TOP CHORD DIAGONAL BRACING**
NOT TO SCALE

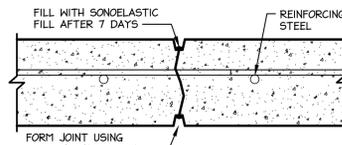
ROOF CONSTRUCTION NOTES:

- Structure is designed in accordance with the following codes:
 - ACI308-02 - Structural Concrete
 - ASCE 7-10 - Minimum design loads for buildings and other structures
 - AISC Manual of Steel Construction 2005 - Allowable stress design
- All construction shall be in accordance with the international building code and all applicable state and local codes.
- Bolts, screws or metal plate connectors may be used instead of nails. The connections must provide equal or greater strength according to the national forest products association's national design specification.
- All wood in contact with the ground or concrete shall be pressure treated.
- Solid or laminated posts shall be as shown in the drawings. If other post type is desired, it must be approved by the engineer.
- All other lumber, unless specially called out, may be spruce-pine-fir (S-P-F).
- All metal hardware and nails shall be stainless steel or hot-dip galvanized (HDG). Stainless steel shall conform to ASTM A 153 and hot-dip galvanized fasteners shall conform to ASTM Standard A 653 (Class G-165). All fasteners, connectors, and any other metal contacting ACZA, ACO, or CA treated wood shall be stainless steel. There may be additional products (other than stainless steel and hot-dip galvanized) which are suitable for use in treated wood except for the types listed in the note above. These screws and connectors have proprietary anti-corrosive technologies and are acceptable for treated wood exposed to moisture when used according to the hardware manufacturer's recommendations and must be clearly marked for use with the type of treated wood being used.
- All structural nail connections must be nailed with twisted or ring shank nails.
- Power driven nails (PDN) shall be 0.131 diameter or larger, deformed shank, and helical (spiral) or annular (ring) type. The number and length of 0.131 diameter power driven nails is specified in parenthesis next to each connection. Pressure shall be applied to wood members to insure tight joints when using power driven nails. The head of the nail may not be countersink more than 1/8" into the wood.
- Sturd-Hall Plus set post brackets shall be used for post - wall connection as noted.
- End trusses shall be faced with the same material as the roof. Fascia boards shall be installed on all truss ends.
- The southern and western sides of the structure may be enclosed either with adjustable drop down curtains or by permanent means. Permanent walls should have studs secured to posts with (2) 16d nails at each connection. Corrugated 29 GA. Steel siding to be secured to studs.
- Permanent, continuous lateral truss bracing is required. There shall be no butt-butt connections on lateral bracing.
- When air temperatures are 80 degrees F, a set delay admixture shall be discussed with the engineer prior to use in the concrete mix @ batch plant, except when batch plant is within 30 minutes of the job site.
- Roof fasteners shall be a combination of zinc coated steel and a neoprene washer or better. Double screw the metal seams of the roof edges. Aluminum roofing shall have a nominal thickness of .018 inches. Galvanized steel roofing shall be 29 gauge or better.
- Ventilation shall be provided at the ridge.
- Nails for general framing can be common, smooth nails. General framing includes purlins, diagonal braces, lateral braces, etc.
- A P.E. Sealed truss design must be supplied to the engineer by the contractor. Also see typical bracing details, which include knee braces.
- Butt-Butt joints in purlins must skip at least 2 ruses before repeating.
- Galvanized Washers shall be used with all bolts.
- If stored on-site, all structural lumber, including trusses, must be placed in neat stacks at least 12" off the ground.
- Wood treatment or preservatives must meet ASTM d 1760.
- Roof pitch = 4:12 (GABLE ROOF), unless noted otherwise.
- Truss spacing = 4', unless noted otherwise.
- Assumed soil bearing capacity = min. 2,000 psf at 4' depth. If soil bearing is not attained, extra excavation and compaction of granular fill will be required.
- Assumed ground snow load = 30 psf.
- Assumed wind velocity = 10 mph for 3 second gust, exposure c.
- ASCE 7-10, Risk Category II.
- Structure to be considered partially enclosed or enclosed, whichever is worse case.
- Assumed dead load = 10 psf. (5psf top chord, 5 psf bottom chord)
- All work shall be performed in accordance with the National Design Specification for Wood Construction, latest edition.
- Proper temporary bracing of all construction work in progress is the contractor's responsibility. Contractor to take extra precaution to temporarily brace as needed for this structure.
- All dimensions shall be verified by the contractor. If structural drawings are used for laying out column/post centers and wall lines, all dimensions shall be checked and coordinated between all construction documents and specifications prior to the start of work.
- The design professionals will assume no responsibility and/or liability for problems that arise from failure to follow these drawings and the design intent they convey or for problems which arise from others failure to obtain and /or follow the design professionals' guidance.
- If errors or discrepancies are found in the drawings, it shall be the contractor's responsibility to bring it to the engineers attention prior to proceeding with the work.



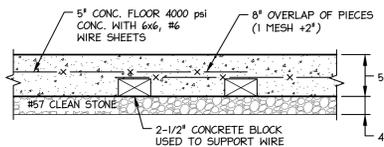
- SAW CUT 1/4" OF THE SLAB THICKNESS (1-1/4" DEEP FOR 5" SLAB) WITHIN 4-12 HOURS OF POUR FILL WITH SIKA IC SL OR COMPARABLE SEALANT
- REINFORCING STEEL
- BACKER ROD
- 2-1/2" CONCRETE BLOCK USED TO SUPPORT WIRE TO BE PLACED HALF THE WIDTH OF THE WNF.
- NOTES:**
- EXPANSION JOINTS SHALL BE INSTALLED AT A MAXIMUM SPACING OF 30 FEET.
 - CUT 50% OF REINFORCEMENT DIRECTLY UNDER THE JOINT.
 - BACKER ROD SHALL BE A LARGER WIDTH THAN THE SAW CUT.
 - SEALANT DEPTH SHALL BE 1/4" OR SLIGHTLY LESS THAN JOINT WIDTH, WHICHEVER IS LESS.

5 **CONTROLLED SHRINKAGE JOINT IN HUA SLAB**
NOT TO SCALE



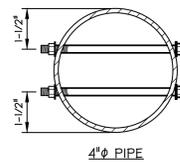
- FILL WITH SONOELASTIC FILL AFTER 7 DAYS
- REINFORCING STEEL
- FORM JOINT USING WOODEN CHAMFER STRIP
- NOTES:**
- CONTROLLED SHRINKAGE JOINT SHALL BE INSTALLED ABOVE EACH CONTROLLED SHRINKAGE JOINT IN SLAB
 - CONTROLLED SHRINKAGE JOINT SHALL BE INSTALLED AT A MAXIMUM SPACING OF 30 FEET
 - CUT EVERY OTHER HORIZONTAL BAR ACROSS THE JOINT
 - INSTALL SEALANT ON BOTH SIDES

6 **CONTROLLED SHRINKAGE JOINT IN CURBS/WALLS**
NOT TO SCALE



- 5" CONG. FLOOR 4000 psi CONG. WITH 6x6, #6 WIRE SHEETS
- 8" OVERLAP OF PIECES (1 MESH +2")
- #57 CLEAN STONE
- 2-1/2" CONCRETE BLOCK USED TO SUPPORT WIRE
- NOTES:**
- FOR CONCRETE FLOORS IN ANIMAL HUA AREAS, OWNER SHALL DETERMINE WHETHER OR NOT THE FLOOR SHALL BE GROOVED.
 - A PATTERN OF GROOVES APPROXIMATELY 1/2" WIDE AND NO MORE THAN 1/2" DEEP, 4 TO 6 INCHES APART SHALL BE INSTALLED DIAGONAL TO CATTLE FLOO OR MANURE SCRAPING.
 - ALL GROOVED EDGES SHALL BE NEAT AND FREE OF IRREGULARITIES. AREAS BETWEEN GROOVES SHALL BE FLAT AND UNIFORM.
 - THE GROOVING METHOD SHALL BE APPROVED BY THE TEAMAG REPRESENTATIVE AND LANDOWNER PRIOR TO USE. A TEST PATTERN MAY BE REQUIRED.

7 **HUA & SLAB-ON-GRADE CONCRETE FLOOR**
NOT TO SCALE



- NOTES:**
- USE 3/8" DIA. STAINLESS BOLTS WITH HEX NUTS AND WASHERS. AFTER INSTALLATION, STRIP THREADS TO PREVENT NUT FROM CAVING LOOSE.
 - BOLTS TO BE PLACED APPROX. 1-1/2" FROM END OF PIPE OPENING.

8 **ANIMAL GUARD**
NOT TO SCALE

REVISION		DATE		BY	
		AUG. 20, 2024	LTR		
PROJECT MANAGER		DESIGN BY		DRAWN BY	
NATE DENING		: JBG/ND		: GDG	
DATE		: 1/13/25		PROJECT NO. : 5235-24-05	
SEAL					
<p>120 LAKE STREET EPHRATA, PA 17522 PHONE: 717-721-6795 FAX: 717-721-9275 www.TeamAgInc.com TeamAg@TeamAgInc.com</p>					
PROJECT TITLE		CLIENT		SCALE	
ROOFED HUA & STACKING AREA		DEREK HART		1" = 10'	
HAINES TOWNSHIP CENTRE COUNTY		216 MOUNTAIN VIEW LN AARONSBURG, PA 16820		814-404-8286	
PROJECT DETAILS					
DRAWING : D-6					

SITE SPECIFIC CONSTRUCTION SPECIFICATIONS

GENERAL

1. A copy of the specifications and drawings shall be on site during all phases of construction.
2. A pre-construction meeting between Farmer, Contractor, and Engineer shall be required prior to any construction work.
3. It is the responsibility of the Contractor to implement all measures necessary to protect work-in-progress from environmental conditions such as temperature extremes, surface and ground water, etc.
4. If errors or discrepancies are found in the design drawings; it shall be the contractors responsibility to bring it to the engineers attention prior to proceeding with the work.

ROOF STRUCTURE FOUNDATION AND BACKFILL

1. Compost filter sock should be placed downhill from any earth disturbance.
2. Embankments and disturbed areas surrounding the facility shall be treated to control erosion.
3. Strip all topsoil. Excavate the roofs structures to the dimensions and elevations specified in the drawings. All fill and cut slopes shall be compacted in horizontal lifts with a smooth vibratory roller. Distribute excess fill on site. Finish grades may be adjusted slightly to better balance cut and fill (with approval of the Owner).
4. Foundation must be prepared in such a way that the structure is installed on uniform foundation. If any rock or unsuitable material such as large quantities of limestone or soft soil is encountered, this material shall be removed and undercut to a depth of 1 feet below the finished bottom elevation and replaced with suitable gravel compacted in its place. While foundation is being prepared, contractor shall provide adequate drainage for foundation. After the foundation has been excavated and unsuitable material has been replaced with suitable material, it should be recompact with a smooth vibratory roller. Fill material under concrete shall be accomplished by placing maximum 6-inch lifts (before compaction). The lifts shall be compacted by the traversing of the entire surface by not less than one track of the equipment or by a minimum of four complete passes with a sheepsfoot, vibratory, or rubber tire roller. Compaction around structures (i.e. around pipes, adjacent to walls, etc.) shall be accomplished by placing fill in maximum 4-inch lifts and compacting by means of hand tampers or other manually directed compaction equipment. The technician shall determine if the moisture content is suitable for fill placement. The contractor shall make adjustments as directed by the technician. The method of compaction shall be approved prior to placement of fill material.
5. Backfilling may occur 14 days after the final pour, except that walls can be backfilled on both sides simultaneously may be done so within 7 days. Select best native material previously excavated from site for the 4 feet next to the walls from footing to surface. Place fill in lifts of 8 inches. Compaction within 4 feet of the wall may only be done with equipment less than one ton. Avoid backfill containing large rocks, hard or frozen soil chunks, construction debris, or large amounts of clay. Where slab on grade or driveway will be placed on this backfill, compact to 100% standard proctor. Compact to 95% in all other areas. Grade backfill so that storm runoff is directed away from the structure.
7. All disturbed areas shall be seeded and mulched.

CONCRETE

1. Masonry Blocks or chairs (height as specified in construction details) shall be used to hold floor reinforcement in place during concrete placement. Blocks or chairs shall be placed at spacing equal to half the width of the welded wire fabric, or at a maximum spacing of 60" for rebar.
2. All concrete and reinforcing work shall conform to American Concrete Institute's Standard Building Code Requirements for Reinforced Concrete, (ACI 318-99), and to the Pennsylvania NRCS PA3135 Waste Storage Structure Construction Specification.
3. All concrete shall develop a minimum 28-day strength Fc of 4000 psi. All concrete shall have 3/4 inch maximum aggregate size and maximum water-cement ratio of 0.49. Slump shall be 3 to 6 inches (without superplasticizers, if any). Superplasticizers (ASTM C494, Type F or G) may be added to concrete that has a 2 to 4 inch slump, and the slump shall not exceed 7 1/2 inches with the addition of a superplasticizer. All concrete shall be furnished with the proper admixture to obtain 68 +/- 1% of air entrainment.
4. Concrete is to be mechanically vibrated. Cure concrete at air temperatures of 40° F to 90° F.

CONCRETE TESTING PROTOCOL

The concrete contractor is responsible for retaining a third-party testing firm to test slump, air entrainment, and temperature on site, and prepare cylinders for strength testing during the pours noted above (at minimum) to ensure that the concrete meets specifications. Testing requirements may be modified at the engineer's discretion. All test results shall be given to the engineer of record or his representative.

1. The concrete design mix shall be presented to the engineer of record or his representative 3 days prior to any pour.
2. The PA3135 Construction Specification shall be supplied to the concrete supplier.
3. Each truck supplying concrete shall have a batch ticket identifying the site, design mix, maximum amount of water that may be added on site, and the time the truck left the batch plant.
4. Slump: of the concrete shall be tested (1) time for 50 cubic yards of concrete poured. The concrete from this truck shall not be placed until the slump test is completed and the concrete is determined to meet slump requirements.
5. Cylinders: (4) Cylinders shall be made for every 50 cubic yards of concrete poured, or a minimum of (4) cylinders shall be made for every pour. (2) of these cylinders shall be broken at 7 days following the pour and the remaining (2) cylinders shall be broken at 28 days following the pour. Cylinders MUST be stored according to ASTM C31 and be transported to the testing facility within 48 hours.
6. Air-entrainment: of the concrete shall be tested (1) time for every 50 cubic yards of concrete poured or a minimum of (1) time for each pour.
7. Temperature: of the concrete shall be tested (1) time for every 50 cubic yards of concrete poured or a minimum of (1) time for each pour.
8. Concrete that has been mixed for greater than 90 minutes and showing signs of active hydration including a decrease in slump, a rise in temperature, or a change in workability, shall not be used.

QUALITY ASSURANCE PLAN

Pre Construction Meeting - A meeting between concrete and excavation contractors, digester contractor, engineer, and landowner must be scheduled and held prior to beginning construction.

The engineer must be contacted at the following project milestones. If the engineer is not contacted for inspections as indicated, TeamAg may not be able to certify the proposed manure storage system.

Project Milestone	Notification Requirement
--Circular Concrete Waste Storage--	
Subgrade Condition and Stone Placement	48 Hours prior to reaching subgrade
** Installation of Footers & Floor	48 Hours prior to Concrete Pour
** Installation of Walls	48 Hours prior to Concrete Pour
Inspection Prior to Backfilling Walls	Schedule at wall pour
--Concrete HUA and Stacking Area--	
Subgrade Condition and Stone Placement	48 Hours prior to reaching subgrade
Installation of Curb & Wall Footers & Slab	48 Hours prior to Concrete Pour
Installation of Curbs & Wall	48 Hours prior to Concrete Pour
--Transfer Components--	
Subgrade Condition and Stone Placement	48 Hours prior to reaching subgrade
Installation of gravity manure transfer components	48 Hours prior to Installation

* = Soil Density Testing Required
** = Concrete Testing Required

TeamAg Contacts:
Jeff Giger, Engineer
Mobile: 570-764-1775

5. Procedures for cold weather concreting must be followed when, for more than 3 consecutive days, the following conditions exist: 1) the average daily air temperature is less than 40 °F and 2) the air temperature is less than 50 °F for more than half of any 24 hour period. All procedures for cold weather concreting must follow ACI 306 and be approved by the engineer.
6. Reinforcing steel to meet ASTM Specifications A-615, latest revision grade 60. All welded wire fabric shall meet A-185, latest revision.
7. When connecting two sections of vinyl understop, the ends must be heat welded or tied together and sealed with a watertight caulking.
8. All concrete shall be reinforced with the same steel as shown in similar sections unless specifically called out as "not reinforced".
9. Maximum variation from indicated reinforcing bar spacing is 1/2 of indicated spacing.
10. The following minimum concrete cover shall be provided for reinforcement unless otherwise noted: Where cast against earth - 3 inches. Walls and slabs (exposed to earth or weather) - 1-1/2 inches. Other - 2 inches. Maximum reduction in cover from formed and exposed surfaces is 1/4 inch, from earth surfaces 1/2 inch.
11. Place concrete in the forms in horizontal lifts of no more than 5 feet when a super plasticizer is used, and no more than 2 feet when a super plasticizer is not used. Do not allow the concrete to drop more than 12 feet when a super plasticizer is used, and no more than 4 feet when a super plasticizer is not used. Consolidate each lift by vibrating.
12. All concrete must be properly cured using curing compound applied at 1 gallon per 150 square feet. Curing compound shall meet ASTM C-509 and be sprayed on as soon as the concrete can be walked on (slabs) and immediately after all wall ties are parged both inside and outside (walls). Wall forms may be taken off 24 hours after the end of the pour if the temperature is above 50° F. Alternative curing methods must be approved by the engineer prior to implementation.

SEQUENCE OF BMP INSTALLATION AND REMOVAL IN RELATION TO THE SCHEDULING OF EARTH DISTURBANCE ACTIVITIES

1. Install compost filter sock, silt fence or approved geotextile, downhill from earth disturbance activities and soil stockpiles.
2. Excavate the roofed tacking structures and rough grade the site. Provide drainage from the proposed site or have pump on-site to handle water in the excavation pit.
3. Prepare subgrade for concrete floor including: install perimeter drain and drain outlet, perimeter drain outlet, compacted stone
4. Install rebar, pour concrete floor and concrete walls.
5. The wall may be backfilled 14 days after the walls are poured. Backfill must be compacted to prevent settling.
6. Fine grade the laun areas and seed or sod immediately with a perennial grass cover. Launs shall be maintained on a regular basis and repaired, reseeded and mulched until stabilization is achieved.
7. After final site stabilization (i.e. 70% vegetative uniform cover) has been achieved, the temporary erosion and sedimentation controls must be removed. Areas disturbed during the removal of the controls shall be restabilized.

QUALITY ASSURANCE PLAN

Pre Construction Meeting - A meeting between concrete and excavation contractors, engineer, and landowner must be scheduled and held prior to beginning construction.

The engineer must be contacted at the following project milestones. If the engineer is not contacted for inspections as indicated, TeamAg may not be able to certify the proposed manure storage system.

NOTE - other inspections related to installation of erosion control and stormwater features are required. Refer to approved EIS and SMP plans for inspection requirements; contact engineer as needed appropriate.

Project Milestone	Notification Requirement
Installation of Storage Structure Footing & Floor**	48 Hours prior to Concrete Pour
Installation of Storage Structure Walls*	48 Hours prior to Concrete Pour
Prior to Backfilling of Storage Structure Walls	48 Hours prior to Backfill

Final Inspection At project completion

Inspection Contacts: Jeff Giger, PE, Mobile: 570-764-1775
Adam Keller, PE, Mobile: 570-371-0108
Gary Gallup, Engineering Tech, Mobile 570-441-1200

SEQUENCE OF BMP INSTALLATION AND REMOVAL IN RELATION TO THE SCHEDULING OF EARTH DISTURBANCE ACTIVITIES

1. Install fabric fence downhill from earth disturbance activities and soil stockpiles.
2. Install surface inlets, underground outlets, roof water drains.
3. Install roof water controls.
4. Install reinforced gravel silage bag pad and gravel surfacing on field lane.
5. Excavate for the circular manure storage and rough grade the site. Provide drainage from the proposed site or have pump on-site to handle water in the excavation pit.
6. Place stockpiles to divert storm water away from excavation.
7. Prepare subgrade for concrete floor including: install perimeter drain and drain outlet and compacted stone.
8. Install rebar, pour concrete floor and concrete walls.install gravity waste transfer components.
9. Empty the existing waste storage structure, remove solids.
10. Decommission existing storage.
11. Install gravity manure hopper and waste transfer line.
12. The circular tank wall may be backfilled 14 days after the walls are poured. Backfill must be compacted to prevent settling.
13. Install safety fence for circular storage.
14. Install compacted fill for concrete HUA and stacking area.
15. Install stone base and reinforcing for HUA and stacking area slab, curbs and walls.
16. Pour HUA slab, curb and wall footers.
17. Install forms and rebar and pour curbs and walls.
18. Install fence around HUA lot.
19. Install reinforced gravel cattle walkways and access road.
20. Install high tensile fence.
21. Fine grade the laun areas and seed or sod immediately with a perennial grass cover. Launs shall be maintained on a regular basis and repaired, reseeded and mulched until stabilization is achieved.
22. After final site stabilization (i.e. 70% vegetative uniform cover) has been achieved, the temporary erosion and sedimentation controls must be removed. Areas disturbed during the removal of the controls shall be restabilized.

CONCRETE TESTING PROTOCOL

The concrete contractor is responsible for retaining a third-party testing firm to test slump, air entrainment, and temperature on site, and prepare cylinders for strength testing during the pours noted above (at minimum) to ensure that the concrete meets specifications. Testing requirements may be modified at the engineer's discretion. All test results shall be given to the engineer of record or his representative.

1. The concrete design mix shall be presented to the engineer of record or his representative 3 days prior to any pour.
2. The PA3135 Construction Specification shall be supplied to the concrete supplier.
3. Each truck supplying concrete shall have a batch ticket identifying the site, design mix, maximum amount of water that may be added on site, and the time the truck left the batch plant.
4. Slump: of the concrete shall be tested (1) time for 50 cubic yards of concrete poured. The concrete from this truck shall not be placed until the slump test is completed and the concrete is determined to meet slump requirements.
5. Cylinders: (4) Cylinders shall be made for every 50 cubic yards of concrete poured, or a minimum of (4) cylinders shall be made for every pour. (2) of these cylinders shall be broken at 7 days following the pour and the remaining (2) cylinders shall be broken at 28 days following the pour. Cylinders MUST be stored according to ASTM C31 and be transported to the testing facility within 48 hours.
6. Air-entrainment: of the concrete shall be tested (1) time for every 50 cubic yards of concrete poured or a minimum of (1) time for each pour.
7. Temperature: of the concrete shall be tested (1) time for every 50 cubic yards of concrete poured or a minimum of (1) time for each pour.
8. Concrete that has been mixed for greater than 90 minutes and showing signs of active hydration including a decrease in slump, a rise in temperature, or a change in workability, shall not be used.

QUALITY ASSURANCE PLAN

Pre Construction Meeting - A meeting between concrete and excavation contractors, digester contractor, engineer, and landowner must be scheduled and held prior to beginning construction.

The engineer must be contacted at the following project milestones. If the engineer is not contacted for inspections as indicated, TeamAg may not be able to certify the proposed manure storage system.

Project Milestone	Notification Requirement
--Circular Concrete Waste Storage--	
Subgrade Condition and Stone Placement	48 Hours prior to reaching subgrade
** Installation of Footers & Floor	48 Hours prior to Concrete Pour
** Installation of Walls	48 Hours prior to Concrete Pour
Inspection Prior to Backfilling Walls	Schedule at wall pour
--Concrete HUA and Stacking Area--	
Subgrade Condition and Stone Placement	48 Hours prior to reaching subgrade
Installation of Curb & Wall Footers & Slab	48 Hours prior to Concrete Pour
Installation of Curbs & Wall	48 Hours prior to Concrete Pour
--Transfer Components--	
Subgrade Condition and Stone Placement	48 Hours prior to reaching subgrade
Installation of gravity manure transfer components	48 Hours prior to Installation

* = Soil Density Testing Required
** = Concrete Testing Required

TeamAg Contacts:
Jeff Giger, PE, Mobile: 570-764-1775
Adam Keller, PE, Mobile 570-371-0108
Gary Gallup, Engineering Tech, Mobile 570-441-1200

SEQUENCE OF BMP INSTALLATION AND REMOVAL IN RELATION TO THE SCHEDULING OF EARTH DISTURBANCE ACTIVITIES

1. Install fabric fence downhill from earth disturbance activities and soil stockpiles.
2. Install surface inlets, underground outlets, roof water drains.
3. Install roof water controls.
4. Install reinforced gravel silage bag pad and gravel surfacing on field lane.
5. Excavate for the circular manure storage and rough grade the site. Provide drainage from the proposed site or have pump on-site to handle water in the excavation pit.
6. Place stockpiles to divert storm water away from excavation.
7. Prepare subgrade for concrete floor including: install perimeter drain and drain outlet and compacted stone.
8. Install rebar, pour concrete floor and concrete walls.install gravity waste transfer components.
9. Empty the existing waste storage structure, remove solids.
10. Decommission existing storage.
11. Install gravity manure hopper and waste transfer line.
12. The circular tank wall may be backfilled 14 days after the walls are poured. Backfill must be compacted to prevent settling.
13. Install safety fence for circular storage.
14. Install compacted fill for concrete HUA and stacking area.
15. Install stone base and reinforcing for HUA and stacking area slab, curbs and walls.
16. Pour HUA slab, curb and wall footers.
17. Install forms and rebar and pour curbs and walls.
18. Install fence around HUA lot.
19. Install reinforced gravel cattle walkways and access road.
20. Install high tensile fence.
21. Fine grade the laun areas and seed or sod immediately with a perennial grass cover. Launs shall be maintained on a regular basis and repaired, reseeded and mulched until stabilization is achieved.
22. After final site stabilization (i.e. 70% vegetative uniform cover) has been achieved, the temporary erosion and sedimentation controls must be removed. Areas disturbed during the removal of the controls shall be restabilized.

REVISION	PER C.S. DAVIDSON, INC. REVIEW LETTER DATED JULY 26, 2024
BY	LMR
DATE	AUG. 20, 2024
PROJECT MANAGER	NATE DENING
DESIGN BY	JBG/ND
DRAWN BY	GDG
DATE	1/13/25
PROJECT NO.	5235-24-05

SEAL

TeamAg inc
120 LAKE STREET
EPHRATA, PA 17522
PHONE: 717-721-6795 FAX: 717-721-9275
www.teamaginc.com TeamAg@teamaginc.com

SCALE

PROJECT TITLE
ROOFED HUA & STACKING AREA

HAINES TOWNSHIP CENTRE COUNTY

CLIENT
DEREK HART
216 MOUNTAIN VIEW LN
AARONSBURG, PA 16820
814-404-8286

CONSTRUCTION NOTES

DRAWING : **CN-1**

**Natural Resources Conservation Service
PRACTICE SPECIFICATION
WASTE STORAGE FACILITY
(Code 313)**

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, IL, II or IIA and conform to ASTM-C150, unless otherwise set forth in Section 9. Type IS Portland blast-furnace slag cement, Type IP Portland-pozzolan cement, or Type IL Portland-limestone cement shall conform to the requirements of ASTM C595 and may be used unless prohibited by the specifications. If Type I, IL, 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 1-D or 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-533 and PennDOT publication 408 Section 714.

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.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 9. Use preservative-treated wood when wood members are exposed to animal waste or elements that deteriorate wood. Preservative-treated wood must meet the applicable American Wood Protection Association (AWPA) Standards or have an evaluation service report (ESR) prepared by an organization recognized by the International Code Council (ICC). Treated wood in contact with animal wastes or as critical components that are difficult to replace, shall meet AWPA UC4B or equivalent for heavy-duty ground contact.

FASTNERERS. Aluminum fasteners, connectors, or cladding must not be used in direct contact with treated wood unless specifically allowed by the preservative manufacturer. Use hot-dipped galvanized or stainless-steel bolts, washers, nuts, nails, and other hardware which meet American Society for Testing and Materials (ASTM) specifications A153 for fasteners and ASTM A653 coating designation G185 for sheet metal connectors, or ASTM A240 for Type 304 or 316 stainless steel, except as noted below. Fasteners and connectors of other materials may be used if specifically allowed by the preservative manufacturer. All fasteners, connectors, and any other metal in contact with Alkaline Copper Quaternary (ACQ), Copper Azole (CA), Micronized Copper Azole (MCA), or Dispersed Copper Azole (μ CA-C) treated wood shall be stainless steel if AWPA Use Category UC4B applies or if constant, repetitive, or long periods of wet conditions may occur. All fasteners, connectors, and any other metal in contact with wood treated with Ammoniacal Copper Zinc Arsenate (ACZA) or any other preservative containing ammonia must be stainless steel.

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.

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 soils shall be removed. A compacted base course (layer of drainfill placed below the concrete prior to placement of concrete) may be used to improve the stability of the foundation or to control the movement of water. In addition, geosynthetics with an AOS between 20 and 100 may be used to further separate and/or stabilize the foundation. These items shall be as noted on the design or in Section 9.

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

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. All waterstop joints must be welded or otherwise made watertight, unless otherwise note on the design or in Section 9.

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. Upon request by the design engineer, the contractor shall be responsible for providing the concrete design mix, material certifications, and test result documentation. Current certification of the design mix by Penn DOT may be accepted in lieu of additional testing. Concrete order shall not be placed until the design mix has been approved by the design engineer.

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. The slump shall not exceed 7½ inches with the addition of superplasticizer. The W/C ratio shall follow the requirements of the appropriate ACI.

Cementitious material may include fly ash meeting ASTM C-618 which may be substituted up to 25% by weight of total cement, or Ground Granulated Blast Furnace Slag meeting ASTM C-989 may be substituted up to 70% by weight of total cement unless otherwise note on the design of in Section 9.

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. In hot weather or under conditions when temperature of the concrete is 85°F or above, or conditions contribute to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and completion of truck discharge shall not exceed 45 minutes unless an approved set-retarding admixture is used in the mix.

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

Super plasticized 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 or wire shall be supported by precast concrete bricks (not clay bricks), or metal or plastic chairs. Concrete bricks supporting steel and wire must be full and not broken (unless bricks are manufactured with creases or indentations meant to be broken). 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 – $\frac{1}{4}$ inch from earth surfaces - $\frac{1}{2}$ inch

2. Maximum variation from indicated spacing: $\frac{1}{12}$ th 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 the design.

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. Column base brackets shall not be loaded until the supporting concrete is at least seven days old. Drilling and setting column base brackets shall not be performed until supporting concrete is at least seven days old.

Concrete repairs including crack repairs shall be considered by the engineer on a case-by-case basis.

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 or other approved repair products as approved by the design engineer. Dry-pack mortar shall consist of one- part Portland cement and three parts sand with just enough water to produce a workable paste or refer to the Portland Cement Association's *Design and*

Control of Concrete Mixtures (PCA) manual. All form tie holes shall be patched (both the sides of walls). Concreting in Cold Weather shall be performed in accordance with ACI- 306R or equivalent measures to adequately protect concrete from freezing risks. 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.

g. Concreting in Hot Weather

Concreting in hot weather shall be performed in accordance with ACI 305.

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.

h. 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.

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 water tightness. No pitting, corrosion, or cracks shall be allowed that would impair the strength or water-tightness of the tank.

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, water tightness, 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.

9. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

NATURAL RESOURCES CONSERVATION SERVICE PRACTICE SPECIFICATION ROOFS AND COVERS (Code 367)

1. SCOPE

The work shall consist of furnishing materials and installing all components of the roof or cover, 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 10, or as otherwise listed below:

PORTLAND CEMENT shall be Type I, IA, IL, II or IIA and conform to ASTM-C150, unless otherwise set forth in Section 10. 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 10.

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.

METAL ROOF SHEATHING shall be steel and a minimum of 29 gauge thick and shall have a protective coating installed on the face. Galvalume or other materials not warranted against corrosion associated with manure shall not be used.

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.

MANUFACTURED TRUSSES shall be certified as having been designed and built to Truss Plate Institute standards. Trusses must be designed to the minimum loading as listed in the design and sealed by a P.E.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 10. Use preservative-treated wood when wood members are exposed to animal waste or elements that deteriorate wood. Preservative-treated wood must meet the applicable American Wood Protection Association (AWPA) Standards or have an evaluation service report (ESR) prepared by an organization recognized by the International Code Council (ICC). Treated wood in contact with animal wastes or as critical components that are difficult to replace, shall meet AWPA UC4B or equivalent for heavy-duty ground contact.

Aluminum fasteners, connectors, or cladding must not be used in direct contact with treated wood unless specifically allowed by the preservative manufacturer. Use hot-dipped galvanized or stainless-steel bolts, washers, nuts, nails, and other hardware which meet American Society for Testing and Materials (ASTM) specifications A153 for fasteners and ASTM A653 coating designation G185 for sheet metal connectors, or ASTM A240 for Type 304 or 316 stainless steel, except as noted below. Fasteners and connectors of other materials may be used if specifically allowed by the preservative manufacturer. All fasteners, connectors, and any other metal in contact with Alkaline Copper Quaternary (ACQ), Copper Azole (CA), Micronized Copper Azole (MCA), or Dispersed Copper Azole (μ CA-C) treated wood shall be stainless steel if AWPA Use Category UC4B applies or if constant, repetitive, or long periods of wet conditions may occur. All fasteners, connectors, and any other metal in contact with wood treated with Ammoniacal Copper Zinc Arsenate (ACZA) or any other preservative containing ammonia must be stainless steel.

GEOMEMBRANES shall comply with the requirements of Construction Specification PA521-PE/PP, as applicable.

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.

Drainfill upon which concrete is to be placed shall be covered with a geosynthetic that has an AOS

between 20 and 100, inclusive.

4. CAST-IN-PLACE CONCRETE STRUCTURES

Refer to the Pennsylvania Field Office Technical Guide Section IV Code 313 Construction Specification for concrete requirements.

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.

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 must be handled, installed, and braced according to the Truss Plate Institute's BCSI 1-03 "Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses." The contractor is responsible for temporarily bracing the trusses during erection. Permanent bracing shall be as shown on the construction drawings.

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.

Lumber stored on the work site shall be close stacked off the ground. The ground beneath the stacked lumber shall be cleared of weeds and rubbish. Materials stacked on the work site for more than seven days shall be protected by a suitable waterproof covering.

The installation and workmanship of wood structures must meet the requirements of the American Wood Council (AWC) National Design Specification (NDS) for Wood Structures, or as otherwise shown on the construction drawings or contained in Section 10.

Roof and truss design must be based on the current version of American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures, and the AWC NDS for Wood Construction and the NDS Supplement.

Roof design and trusses will be certified as meeting the requirements as shown on the construction drawings with the seal of a professional engineer licensed in the state where the trusses will be installed. Truss design and drawings must be submitted for NRCS review according to the timeframe specified in Section 10.

6. GEOMEMBRANE STRUCTURES

Geomembrane material conforming to the requirements of Material Specification 594, Geomembrane Liner, for the geomembrane material type specified in Section 10 of this specification must be used. The minimum nominal geomembrane thickness must be as shown in table 1 for the material and purpose specified in Section 10.

Table 1, Flexible geomembrane cover materials.

Geomembrane Type	Minimum Thickness Cover (mil)	
	Contains Biogas	Divert Clean Water
HDPE	40	30
LLDPE	40	30
LLDPE-R	36	24
PVC	40	30
EPDM	45	45
FPP	40	30
FPP-R	36	23
PE-R	NR	23

1 mil = 1/1000th of an inch

HDPE - High Density Polyethylene

LLDPE - Linear Low-Density Polyethylene

LLDPE-R - Reinforced Low-Density Polyethylene

PVC – Polyvinyl Chloride

EPDM – Ethylene Propylene Diene Terpolymer

FPP – Flexible Polypropylene

FPP-R – Reinforced Flexible Polypropylene

PE-R – Reinforced, Slit-Film, Woven Polypropylene

NR – Not Recommended

All material must be free of damage or defect and stored to protect it from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, or other damage. The rolls will be stored on a prepared surface (not wooden pallets) and should not be stacked more than two rolls high. Damaged material must be repaired or replaced.

Pipe Boots will be either factory fabricated from material determined by the cover manufacturer to be compatible with the geomembrane material, or field fabricated from the same material as the geomembrane cover. Clamps used for fastening boots to pipes will be 0.5-inch-wide stainless steel.

Gaskets, unless otherwise approved by the cover manufacturer, will be neoprene, closed-cell medium, 0.25 inch thick, with adhesive on one side.

Metal Battens will be 0.25 inch thick by 2 inches wide stainless steel. Bolts used for fastening battens to concrete will be stainless steel.

Embedded Channels, angles, and other metal shapes will be as specified on the construction drawings. Pipe used for aboveground transfer of biogas for pressurized systems will be of steel or plastic materials.

Steel pipe must conform to NRCS Standard Material Specification (MS) 554, Steel Pipe for black steel pipe or steel water pipe, 6 inches and larger, unless otherwise specified. Stainless

steel pipe must conform to American Society for Testing and Materials (ASTM) A312 or American Waterworks Association (AWWA) C220.

Plastic pipe must be HDPE conforming to NRCS Standard Material Specification (MS) 547, Plastic Pipe unless otherwise specified. Polyvinyl chloride (PVC) pipe is only acceptable for aboveground biogas transfer when the pipe conforms to MS 547 specifications for pressure rated SDR series, is ultraviolet light inhibited, and is modified for high impact strength. In paragraphs B.(1) and B.(2) of MS 547, the words "Construction Specification 45, Plastic Pipe" shall be replaced with "Practice Specification 367, Roofs and Covers, Flexible Covers"

Portland cement conforming to the requirements of Material Specification 531, Portland Cement, for the type specified in Section 10 of this specification must be used.

Concrete aggregate will consist of clean, hard, strong, and durable particles that are free of silt, clay, or any other material that may affect bonding of the cement paste. Fine and coarse aggregate will meet the requirements and gradation specified in ASTM C33. The maximum size of coarse aggregate will be 1-1/2 inches or as specified in Section 10 or as shown in the construction drawings.

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

Reinforcement bars must be Grade 40 or 60 or as shown on the construction drawings and must conform to ASTM A615. Welded wire fabric reinforcement must conform to ASTM A1064. Reinforcement must be free from loose rust, oil, grease, curing compound, paint, or other deleterious coatings. Use of fiberglass reinforcement is not allowed unless otherwise specified.

Pozzolan (fly ash) meeting the requirements of ASTM C618, Class F or C may be used to replace up to 20 percent by weight of the total required cement.

Concrete admixtures must conform to ASTM C260 for air-entrainment, ASTM C494, Types A, D, F, or G for water-reduction, and Types D or G for set-retardation when the air temperature is over 80 degrees Fahrenheit.

Curing compound must meet the requirements of ASTM C309, Type 2, Class A or B, or as otherwise required in Section 10 of this specification.

Concrete Slump will be in the specified range shown in Section 10 or on the construction drawings. Samples will be obtained according to ASTM C172 and tested according to ASTM C143. If such admixtures are specifically allowed, the maximum slump prior to and after addition of high-range water reducing admixtures (super plasticizers) will be as specified in Section 10.

Drainfill. When gravel bedding is shown on the construction drawings, the fill material will conform to ASTM C33.

Other Materials. All other materials used to construct the cover will be of the size, type, and quality as shown on the construction drawings, as recommended by the cover manufacturer, or as specified herein.

Semi-rigid and flexible covers which utilize geomembranes shall be installed as required by the manufacturer, and as otherwise set forth in Section 10 and Construction Specification PA521A-PE/PP.

7. GEOMEMBRANE INSTALLATION

The geomembrane cover will be installed with a minimum of handling by using a spreader bar assembly attached to a front-end loader or a track-hoe bucket, or in a manner recommended by the cover manufacturer. The cover will be secured during installation to

protect it from wind uplift. Cover panels will be seamed and secured by the end of each workday. Avoid placing the cover during periods of fog, precipitation or excessive winds.

Follow the cover manufacturer's recommendations for operating construction equipment on the geomembrane material. In the absence of manufacturer's recommendations, allow only rubber-tired equipment with a ground pressure of less than 5 pounds per square inch to be operated on the geomembrane.

Seals around pipe penetrations will be installed using a method recommended by the cover manufacturer unless otherwise specified in Section 10.

Field seams will be field welded or joined using the fabricator's seaming apparatus and technique for the specified type of geomembrane material (see below) unless otherwise recommended by the manufacturer. Prior to seaming, all areas which are to become seam interfaces will be cleaned of dust and dirt. Seam joining will not take place unless the sheet is dry. Seam welding will not take place when the ambient temperature is below 32 degrees F or above 104 degrees F.

HDPE, LLDPE, FPP. The primary method of seaming will be hot wedge fusion welding. Fillet extrusion welding will be used for repairs, T-seams, and detail work. Hot air fusion or chemical fusion welding may be used on chemical fusion welding, or an adhesive approved by the manufacturer. For each method of welding or joining use a procedure, including equipment calibration, recommended by the material manufacturer.

EPDM. Seams will be joined using double-faced inseam tape or a cover strip. Use the manufacturer's recommended materials and procedure for completing the seams.

Non-destructive seam testing will be done using a method and procedure recommended by the cover manufacturer and conforming to ASTM D5820 (air pressure tests), ASTM D5641 (vacuum box tests), or ASTM D4437 (air lance tests), as appropriate. The location of all defective seams will be marked and repaired.

Destructive seam testing, if required by the construction drawings, will be done on seam samples cut at no more than one sample per 500 feet of weld. All destructive seam samples will be tested in shear and peel modes according to ASTM D6392 to verify seams meet the requirements of table shown in this specification.

The cover material must be readily repairable. Tears, punctures, defective material, and failed seams will be repaired using the geomembrane manufacturer's recommended methods and procedures. Failed seams and other defective areas that have been repaired will be retested using the appropriate non-destructive method (see above.)

Factory-fabricated and field-fabricated pipe boots of the same material as the cover, will be field welded to the cover using the specified seaming method, then welded and clamped to pipes of the same material as the boot using the specified type of FPP. For each method of welding, use a procedure, including equipment calibration, recommended by the material manufacturer.

PVC. Seams will be joined using hot wedge fusion welding, hot air fusion welding, clamp. Boots will be clamped to other types of pipe as shown on the construction drawings and the cover manufacturer's recommendations. All boot connections to pipes must provide a leak-free attachment.

Metal battens and embedded channels will be installed according to the construction drawings and the cover manufacturer's recommendations.

8. PRE-ENGINEERED METAL STRUCTURES

Design

The building system must be designed by, or in the responsible charge of, a professional engineer licensed in the state where the pre-engineered metal structure will be installed. The design criteria must be in accordance with the Metal Building Manufacturers' Association (MBMA) Metal Building Systems Manual. Roofing, siding, and other accessories must be designed in accordance with the MBMA Metal Building Systems Manual and the Metal Roofing Systems Design Manual. Gutters and downspouts must be sized in accordance with the MBMA Metal Building Systems Manual, and conform to the requirements of NRCS CPS Roof Runoff Structure (Code 558) where CPS 558 is an associated practice.

Structural Design Calculations

One copy of the manufacturer's design calculations for the building will be submitted to purchaser for review. Design calculations must be sealed by the manufacturer's professional engineer. Design calculations must include all necessary calculations to demonstrate that the strength and serviceability requirements of this specification have been met. Include the following:

- Summary of the criteria, codes, design loads, and load combinations used for the building design including the criteria listed in the current version of American Society of Civil Engineers (ASCE) 7, Minimum Design Loads for Buildings and Other Structures. In lieu of compliance with ASCE 7, use the applicable provisions of the current International Building Code (IBC) to develop design loads and load combinations.

- Deflection and drift calculations.

- Anchor Locations and Reactions - A drawing shall be submitted to the owner or contractor that provides the diameter, projection, and location of all required anchors and the unfactored reactions at each point influencing the foundation design for each design load (e.g., dead, live, snow, wind, seismic, etc.). For use in determining the anchor bolt diameter, anchor bolt material will be assumed to be ASTM F1554 Grade 36, unless otherwise specified in the pre-engineered metal building design documents.

Finish and Trim

Flashing, trim, caps, and closure pieces will be of the same material, finish, and color as adjacent material. Unless otherwise specified, all framing members will be factory-primed. Roofing and siding will be in manufacturer's standard colors. Trim, gutters, and downspouts will match in color.

Erection

Erection will be in accordance with the MBMA Metal Building Systems Manual, "Common Industry Practices." All field connections will be bolted, and all shop connections will be either bolted or welded.

Material Handling, Delivery, and Storage

Prefabricated components, sheets, panels, and other manufactured items, will be delivered and stored so that they cannot be damaged or deformed. If subjected to water accumulation, materials will be stored in such a manner so that they can drain freely. Sheets and panels will not be stored in contact with other materials that might cause staining or corrosion. All damaged material will be reported to purchaser to determine if replacement is required.

Maintenance Manual

Upon completion of installation, an electronic copy (such as a PDF) and one hard copy manual will be submitted that include the following letters of guarantee and warranties and maintenance instructions.

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

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.

10. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

Supplement A – “Guidelines for Selecting Corrosion-Resistant Fasteners for Use with Preservative-Treated Wood”

Based on a review of technical information posted by the major U. S. preservative manufacturers and selected fastener and connector manufacturers, the following guidelines summarize the current state-of-practice regarding the selection of metal fasteners and connectors for use with ACQ and copper azole (CA) preservative-treated wood:

AWPA Use Category and Description	Appropriate Fastener/Connector Types
UC 3A or B – Exterior Construction, Above Ground UC 4A – Ground Contact or Fresh Water, Non-critical components	<u>Fasteners</u> Hot-Dipped (HD) Galvanized per ASTM A153 or Stainless Steel (SS), Type 304 or 316 <u>Connectors</u> HD Galvanized per ASTM A653, Class G185 or Stainless steel, Type 304 or 316
UC 4B - Ground Contact or Fresh Water, Critical components or difficult to replace	Stainless steel, Type 304 or 316

Other Preservatives:

1. For CCA-treated wood, HD galvanized fasteners and connectors as specified above are recommended. CCA is less corrosive than ACQ and CA.
2. For ACZA-treated wood, SS fasteners and connectors as specified above are recommended. ACZA contains ammonia and is significantly more corrosive than ACQ and CA.
3. For other preservatives, the more stringent of the preservative manufacturer’s recommendations and the fastener/connector manufacturer’s recommendations should be followed.

Notes regarding NRCS-type structures:

1. Use Category UC 3A and B include railings, decking, bracing, and slats on composter bins.
2. Use Category UC 4A includes posts such as those used in composter bins.
3. Use Category UC 4B includes structural building poles and permanent wood foundation.

**Natural Resources Conservation Service
Practice Specification
Roof Runoff Structure (Code 558)**

1. SCOPE

The work shall consist of furnishing, fabricating, and installing all components of the roof runoff structure(s) as outlined in this specification and as shown on the drawings.

2. MATERIALS

GUTTERS, DOWNSPOUTS, AND SUPPORTS shall be made of aluminum, galvanized steel, wood, or plastic, and the size and type set forth in Section 4, or as shown on the drawings. Aluminum gutters and downspouts shall have a nominal thickness of at least 0.027 and 0.020 in (0.07 and 0.05 cm), respectively. Galvanized steel gutters and downspouts shall be at least 28 gauge. Wood gutters shall be redwood, cedar, cypress, or pressure-treated, and shall be clear and free of knots. Plastics shall contain ultraviolet stabilizers. Supports shall have sufficient strength to withstand anticipated water, snow, and ice loads. The type of supports for manufactured gutters and downspouts shall be determined by the manufacturer's requirements, given the type of installation and type of gutter or downspout.

DRAIN FILL for subsurface drains and driplines shall meet the size and quality requirements of PennDOT Publication 408, Section 704, Type A, Coarse Aggregate, with gradation as shown in Section 4 or in the drawings.

DRAIN PIPE for subsurface drains and drip lines shall be perforated corrugated polyethylene (PE) pipe and fittings meeting the requirements of ASTM F405 or ASTM F667.

APPURTENANCES, such as storage tanks, guard pipe, flush diverters, etc., if required, shall be of the materials set forth in Section 4 and/or the drawings.

3. INSTALLATION

Gutters and drainpipes shall be installed at the locations and grades shown on the drawings. Gutter supports shall have maximum spacing of 48 in (120 cm) for galvanized steel and 24 in (60 cm) for aluminum or plastic. Joints shall be made watertight with the use of mastics or by welding. Dissimilar metals shall not be in contact with each other. Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 24 in (60 cm) apart.

Gutters shall be hung so that the outer edge of the gutter is below the projection of the roof line as shown on the drawings. Roof edges shall be nearly level. Replacement or repair of structure members may be necessary to provide a nearly level and uniform roof edge.

Downspouts shall be securely fastened at the top and bottom, with intermediate supports that are a maximum of 10 ft (3 m) apart.

Drain pipe shall be installed in accordance with ASTM F449.

Drain fill shall be placed in the drip drain trench in such a manner so as not to be contaminated with adjacent soil. Geotextile may be used to envelop the bottom and sides of the drain fill to accomplish this. Geotextile shall have properties equal to or exceeding the requirements of NRCS Design Note 24.

Outlets shall be located as shown on the drawings. Where downspouts empty directly onto the ground surface there shall be an elbow to direct the flow away from the building and splash blocks or other protection to prevent erosion. Downspouts shall not outlet into foundation drains.

4. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

FENCE CODE 382

Pennsylvania Conservation Practice Specifications

These specifications supplement the conservation practice standard for Fence (382) and contain criteria primarily for livestock fences. Other types of fences may be applicable for other purposes.

Fences may be designed for permanent installation or for temporary use. **Permanent fences** are intended to be in place for long periods of time with minimum maintenance. They are constructed with durable materials that have a longer life span than temporary fencing materials.

Temporary (or portable) fences are designed to be in place for short periods of time and are often used as subdivision fences for frequent movement of animals where the location of the fence may not be the same from time to time. Temporary fencing offers maximum flexibility in rotational grazing systems for subdividing pastures to enhance grazing efficiency. **Temporary fencing may also be used to provide short-term protection for streams and riparian areas but is not a long-term solution for restricting access to these and other environmentally sensitive areas.**

Categories of Fence. Livestock fences are categorized based on the degree of protection provided for the intended use, as follows:

- Critical confinement/exclusion fences – Are permanently installed fences used in areas where a high level of confinement or exclusion is needed. Fences along property lines, near public roads, or adjacent to hazardous areas are included in this category. Table 1 provides a selected list of critical confinement fences that are recommended for various types of livestock. **Other types of critical confinement/exclusion fences may also be appropriate but must be approved in advance by NRCS.**
- Non-critical confinement/exclusion fences – Are permanently installed or temporary (portable) fences used in areas where a lower level of confinement or exclusion is acceptable. These fences are not as strong as critical confinement fences and are less effective for restraining livestock. A greater amount of attention is required of landowners and operators to contain livestock with temporary fencing. Divisional fences in pastures and other light-duty fences are included in this category. Table 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 NRCS.**

Refer to Tables 1 and 2 to determine the types of fences, fence heights, and wire spacings that are recommended for controlling specific types of livestock.

Fence Type or Style. Fence types are described based on materials, design, and uses:

- **Barbed wire fence** is generally used as a multi-strand permanent fencing material for perimeter fences, livestock containment areas, and interior subdivision fencing to facilitate grazing management. Barbed wire fencing is not recommended for horses, sheep, goats, or hogs.
- **Woven wire fences** are used as permanent fences for both perimeter and subdivision fences. Wire-spacing and height varies based on the type of animals being controlled. Woven wire fences consist of a series of horizontal (line) wires and vertical (stay) wires, and are offered in two main types: “hinge joint” and “continuous stay fixed knot.” In a hinge joint woven wire fence, the vertical stays wrap around the line wires. In a continuous stay fixed knot fence, the vertical stay wires are fixed with another separate wire to the line wire. Both main fence types come in various designs (line and stay spacing), tensile strength grades, and metallic coating types and grades.

- **High tensile smooth wire fence** is commonly used as a multi-strand permanent fence for perimeter and subdivision purposes. It can be used to control most livestock when wires are properly spaced. Smooth wire may be steel, aluminum, or vinyl coated, and can be electrified or non-electrified.
- **Electric fences** may be permanent or temporary. The electrical power source can be from 110v or 220v electrical current or from a battery. Batteries may be recharged by solar or electrical grid power. Livestock must be trained to respect electric fences. Electric fences are referred to as “psychological barriers” for livestock, as compared to the physical barrier that other types of fences create. Numerous brands and styles of electric braid, twisted strands, tape, and netting are available. Electric mesh and netting are often used for predator exclusion for small livestock and “pastured” poultry.
- **Board fences** are usually wood and can be used for permanent and subdivision purposes. Vinyl and composite materials are also available, and may be acceptable when pre-approved by NRCS and installed according to manufacturer’s instructions. Board fence is used primarily where aesthetics or animal safety is a concern and is most often used for horses and cattle.
- **Heavy use area containment fencing** is used to control access into and out of livestock feeding areas and other confinement areas. This fencing is usually constructed of board, steel pipe, high tensile smooth wire, or cable, and is built to sustain heavy use by livestock and equipment in a confined space.
- **Other fence types** include chain link, steel pipe, galvanized panel, guard rail, and cable fences. These are commonly used as safety fences adjacent to farmsteads and other structures to restrict access to unsafe or prohibited areas.
- **Non-conventional fencing** includes variations of fence systems that may be acceptable when pre-approved by NRCS and installed according to the manufacturer’s instructions. These alternatives shall meet or exceed current specifications. Alternative fence systems may be applicable for horses and other animals that have special requirements for control.

The following tables provide specifications for commonly used types of fence and degree of protection:

- [Table 3](#) – Woven Wire and Barbed Wire Fences for Critical Confinement/Exclusion.
- [Table 4](#) – Wooden Board Fence for Critical Confinement/Exclusion.
- [Table 5](#) – Chain Link Fence for Critical Confinement/Exclusion.
- [Table 6](#) – High Tensile Smooth Wire for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences.
- [Table 7](#) – Electroplastic Twine (Polywire), Electrified Ribbon, and Galvanized Steel Braided Wire for Non-Critical Confinement/Exclusion (or Divisional) Fences.
- [Table 8](#) – Summary of Fence Types and Selected Materials.

Refer to the Pennsylvania 382 Implementation Requirements sheets or Standard Drawings for details of fence types and components.

Fence Materials and Installation. The criteria in these specifications 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.

Materials requirements for specific types of fences are provided in Tables 3 to 7. Specifications are provided for wood and steel materials. Lumber dimensions are specified in **nominal (common) sizes** for commercial wood products. This is how lumber is labeled when it is sold. **Actual sizes** of commercial lumber used for fencing are usually 0.25 to 0.5 in. less than the nominal sizes for thickness and width, and are acceptable for this standard. For example, a 1 in. x 6 in. commercial wood board may actually be 0.75 in. x 5.5 in.; a 4 in. square commercial wood post may actually be 3.5 in. square. Differences in length are usually not significant. For example, a post sold as an 8-ft. 4 x 4 is generally very close to the full 8 feet in length.

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 criteria of the Fence (382) standard. Alternative materials (e.g., rigid polyvinyl chloride (PVC), fiberglass, wood/plastic composites) may be used for fence **line posts**, provided they are:

- **Not** part of a safety fence or heavy use area containment fence (e.g., a fence around a waste storage facility or livestock confinement area).
- Specified by the manufacturer as having at least a 20-year lifespan and appropriate strength for the type of livestock or other animals to be controlled.
- Installed according to the manufacturer's instructions.

Other alternative materials or installation methods not described in these specifications may also be acceptable but must be approved in advance by NRCS. Landscape timbers are not acceptable materials for fence posts, battens, or braces.

For organic operations, the USDA National Organic Program (NOP) regulations state that a producer must not use lumber treated with arsenate or other prohibited materials (creosote, pentachlorophenol, etc.) for new installations or replacement purposes in organic production areas when it can come in contact with soil, crops, or livestock. The NOP prohibits the use of most (but not all) synthetics. Naturally decay-resistant wood (e.g., red cedar, black locust, Osage orange) can be used instead of pressure-treated pine but is often more expensive and may not be readily available from local suppliers. Choose posts that are primarily heartwood; the sapwood is not as decay resistant.

Alternatives to wood (e.g., steel, fiberglass, plastics, wood/plastic composites) may be an option for organic producers, but these materials can contain coatings and/or additives that could be interpreted as unacceptable according to the NOP regulations. Given this uncertainty, it is advisable to consult with the organic certifying agent when considering the use of materials other than natural products. Alternative materials may be determined acceptable from an organic standpoint, but some (especially plastics and wood/plastic composites) may not have been on the market long enough to assess their long-term strength and durability for fence posts, especially in high-stress applications. As noted above, **alternative materials not described in these specifications must be approved in advance by NRCS.**

Prior to construction, the fence line shall be cleared of any obstruction that would hinder fence placement and operation. Clearing along stream banks will be held to a minimum except as required for stream crossings. The soil surface along the fence line shall be relatively smooth such that placement of the bottom wire does not exceed specified maximum wire spacing from soil surface.

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 fabric. For each type of permanently installed fence, criteria are established for line, corner, end, gate, and brace posts, as applicable. Posts are defined as follows:

- **Line posts** – Primarily support the fence fabric and are not under significant tension. Line posts are set between the corner, end, gate, and brace post assemblies.
- **Corner, end, gate, and brace posts** – These posts support the fence fabric and are under tension from the pull of the fence. They are usually larger in diameter and are set deeper in the ground than line posts.

Set permanent posts perpendicular to the ground by driving, augering, 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, permanent posts must be set firmly so that they cannot be moved horizontally or vertically by hand.***

Battens – Battens are narrow, slotted strips of wood or other non-conductive material (e.g., fiberglass, plastic) 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 and are not set in the ground.

Offset Brackets - Offset brackets can be attached to a standard (non-electric) fence to support an electric wire for electric subdivision fences, or to protect a standard fence from livestock damage. Offset brackets can be attached to the existing fence wires and/or fence posts. For wire attachment, use offset brackets made of galvanized (ASTM Class 3) high tensile spring wire with an insulator of high-density UV-stabilized polyethylene or porcelain. Other corrosion resistant offset brackets with insulators that attach directly to the fence posts can also be used.

Attach offset brackets spaced up to 60 feet apart to the standard fence, either on wire next to the post or on the post itself. Closer spacing is necessary in rolling terrain. Offset brackets must hold the electric wire at least 4 inches from the non-electrified fence material. Make sure no wires of the standard fence come in contact with the electric wire, as a short will occur. The electric wire should be tensioned just tight enough to take the slack out. A 12½ gauge galvanized wire (ASTM Class 3) with at least 170,000 PSI tensile strength is recommended for this purpose.

If control of livestock is desired along the standard fence, place offset brackets at nose height of the animals. For cattle, set the brackets at approximately 30 inches off the ground. For small ruminants, set brackets 18 to 24 inches off the ground. Consider adding a second offset wire at 6 to 8 inches off the ground so small ruminants cannot go under the fence, or coyotes and dogs do not get into the enclosure by digging under the fence.

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.

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.

TABLE 1: Critical Confinement/Exclusion Livestock Fences: Recommendations for Fence Type, Height and Strand Spacing ^{1/}

Type of Livestock	Type of Fence				
	Woven Wire	Barbed Wire	Wooden Board	Non-Electric High Tensile Smooth Wire	Electric High Tensile Smooth Wire
Horses and Foals	<p>Minimum of 48 inches high - 5 horizontal woven wires.</p> <p>Add at least one electrified smooth wire and/or a wooden rail (board) at the top of the woven wire to prevent horses from stretching the fence.</p> <p>If a board is used <u>without</u> an electric wire, note in the O&M that the board will need to be replaced periodically if damaged by horses.</p>	Not recommended.	<p>Minimum of 48 inches high with at least three (3) 6-inch boards. Openings between boards 6-12 inches. Bottom of the lowest board 6-12 inches above the ground.</p> <p><u>3-board fence</u> – Top board at 48 inches. Boards spaced at 15, 30, and 45 inches <i>on center</i> above the ground (~ 9-inch openings between boards). Bottom board: ~ 12-inch ground clearance.</p> <p><u>4-board fence</u> – Top board at 60 inches. Boards spaced at 12, 27, 42, and 57 inches <i>on center</i> above the ground (~ 9-inch openings between boards). Bottom board: ~ 9-inch ground clearance.</p>	<p>Minimum of 6 strands - spaced at 10, 20, 30, 40, 50, and 60 inches above the ground.</p> <p>To increase fence visibility, substitute one or more strands of vinyl coated wire or high tensile vinyl tape for the smooth wire.</p>	<p>Horses only (no foals) - Minimum of 3 strands (at least 2 electrified) - spaced at 30, 40, and 50 inches above the ground.</p> <p>With Foals - Minimum of 4 strands (at least 2 electrified) - spaced at 16, 26, 36, and 46 inches above the ground.</p> <p>To increase fence visibility, substitute one or more strands of vinyl coated wire or high tensile vinyl tape for the smooth wire.</p>
Beef – Steers, Cows and Calves	Minimum of 48 inches high - 5 horizontal woven wires.	Minimum of 3 strands - spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.	<p>Minimum of 48 inches high with at least three (3) 6-inch boards. Openings between boards 6-9 inches. Bottom of the lowest board 6-12 inches above the ground.</p> <p><u>3-board fence</u> – Top board at 48 inches. Boards spaced at 15, 30, and 45 inches <i>on center</i> above the ground (~ 9-inch openings between boards). Bottom board: ~ 12-inch ground clearance.</p> <p><u>4-board fence</u> – Top board at 48 inches. Boards spaced at 9, 21, 33, and 45 inches <i>on center</i> above the ground (~ 6-inch openings between boards). Bottom board: ~ 6-inch ground clearance.</p>	Minimum of 6 strands - spaced at 9, 16, 23, 30, 38, and 46 inches above the ground.	<p>Minimum of 3 strands (all electrified) - spaced at 18, 30, and 42 inches above the ground.</p> <p>Or a minimum of 4 strands (only 2 electrified) - spaced at 10, 22, 34, and 46 inches above the ground.</p>

TABLE 1: Critical Confinement/Exclusion Livestock Fences: Recommendations for Fence Type, Height and Strand Spacing ^{1/}					
Type of Livestock	Type of Fence				
	Woven Wire	Barbed Wire	Wooden Board	Non-Electric High Tensile Smooth Wire	Electric High Tensile Smooth Wire
Dairy Cows and Heifers	Same as above for Beef.	Same as above for Beef.	Same as above for Beef.	Same as above for Beef.	Dairy Cows only - Minimum 2 strands (2 electrified), spaced at 20 and 34 inches above the ground. With Heifers - Minimum of 3 strands (at least 2 electrified), spaced at 18, 30, and 42 inches above the ground.
Bison	Minimum of 60 inches high - fixed-knot high tensile woven wire.	Not recommended.	Not recommended.	Not recommended.	Minimum of 6 strands (at least 2 electrified) - spaced at 12, 20, 28, 36, 44, and 52 inches above the ground.
Goats and Kids	Minimum of 40 inches high - 5 horizontal woven wires, 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. No additional wire is required if the woven-wire fence is at least 48 inches high.	Not recommended.	Not recommended.	See Note 2 at the end of this table.	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.
Sheep and Lambs					
Hogs	Minimum of 35 inches high - 5 horizontal woven wires, plus one additional wire (electrified smooth) at the bottom.	Not recommended.	Not recommended.	Not recommended.	Minimum of 5 strands (at least 2 electrified) - spaced at 6, 12, 20, 28, and 36 inches above the ground.

TABLE 1: Critical Confinement/Exclusion Livestock Fences: Recommendations for Fence Type, Height and Strand Spacing ^{1/}					
Type of Livestock	Type of Fence				
	Woven Wire	Barbed Wire	Wooden Board	Non-Electric High Tensile Smooth Wire	Electric High Tensile Smooth Wire
Chickens/Turkeys	Minimum of 72 inches high - 2"x4" woven wires.	Not recommended.	Not recommended.	Not recommended.	Not recommended.
Emus/Ostriches	Minimum of 72 inches high - 6"x6" woven wires.	Not recommended.	Not recommended.	Not recommended.	Not recommended.

TABLE 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's 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.

TABLE 2: Non-Critical Confinement/Exclusion Livestock Fence: Recommendations for the Number of Strands and Spacing (Electric Fence)	
Type of Livestock	Recommended Number of Strands and Spacing ^{1/}
Mature Horses	<u>Permanent or temporary fencing</u> : Minimum of 1 strand (hot) – spaced at 28 to 34 inches above the ground. High visibility strands (e.g. coated wire) are recommended for horses.
Horses and Foals	<u>Permanent or temporary fencing</u> : Minimum of 2 strands (both hot) – spaced at 17 to 22 inches and 32 to 38 inches above the ground. High visibility strands (e.g. coated wire) are recommended for horses.
Cows and Calves	<u>Permanent or temporary fencing</u> : Minimum of 2 strands (both hot) – spaced at 17 to 22 inches and 32 to 38 inches above the ground.
Mature Beef and Dairy Cattle	<u>Permanent or temporary fencing</u> : Minimum of 1 strand (hot) – spaced at 28 to 34 inches above the ground. For hard to hold animals, use: <u>Permanent or temporary fencing</u> : Minimum of 3 strands (at least 2 hot) – spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.
Bison	<u>Permanent fencing</u> : Minimum 4 strands (at least 2 hot) - spaced at 16, 25, 34, and 43 inches above the ground. Use high tensile smooth wire.
Goats and Kids	<u>Permanent fencing</u> : Minimum 3 strands (at least 2 hot) - spaced at 6, 18, and 35 inches above the ground.
Sheep and Lambs	<u>Temporary fencing</u> : Minimum 4 strands (all hot) - spaced at 8, 16, 24, 32 inches above the ground, <u>or</u> use electric net fencing a minimum of 34 inches tall.
Hogs	<u>Permanent or temporary fencing</u> : Minimum of 2 strands (both hot)- 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. <u>Or</u> use temporary electric net fencing a minimum of 34 inches tall.
Poultry	<u>Temporary Fencing</u> : Use electric net fencing a minimum of 40 inches tall.

TABLE 2 NOTES:

^{1/} Electric fence materials for non-critical confinement may consist of high tensile smooth wire, electroplastic twine (polywire), electrified ribbon or tape, galvanized steel braided wire, electric net fencing, or other materials as specified by the manufacturer.

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.

Temporary fencing may be used to provide short-term protection for streams and riparian areas but is not a long-term solution for restricting access to these and other environmentally sensitive areas.

TABLE 3: Woven Wire and Barbed Wire Fences for Critical Confinement/Exclusion

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 or aluminum-coated material.

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 Table 1 for details.

Barbed wire and woven wire shall be spliced by means of a western union splice or by suitable compression sleeves applied with a tool designed for the purpose

Fence wire shall consist of one of the following materials:

1. **Woven wire** – Woven wire shall be a minimum 12½-gauge for all horizontal wires (top, bottom, and intermediate). High tensile woven wire may be used, according to manufacturer recommendations.

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.

For horses, a wooden rail (board) may be used instead of, or in addition to, an electric wire at the top of the woven wire to prevent horses from stretching the fence. If a board is used without an electric wire, note in the O&M that the board will need to be replaced periodically if damaged by horses.

Woven wire is not recommended for use in flood prone areas.

2. **Barbed wire** – Standard barbed wire shall be double-strand, a minimum 12½-gauge with 4-point barbs spaced no more than 6 inches apart or 15½-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 horses, sheep, goats, or hogs.

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 wood (e.g., red cedar, black locust, Osage orange) with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine. Treated lumber shall meet or exceed requirements for AWWPA Use Category 4A (UC4A), Ground Contact, General Use.

Wooden posts shall be at least 4 inches in diameter or 4 inches square. Wooden line posts must be of sufficient length to hold up the fence fabric, while allowing the post to be set in the ground to a minimum depth of 2½ feet. When set in depressions or low places, line posts shall be anchored in the ground or set at an angle to prevent lifting.

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.) 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.

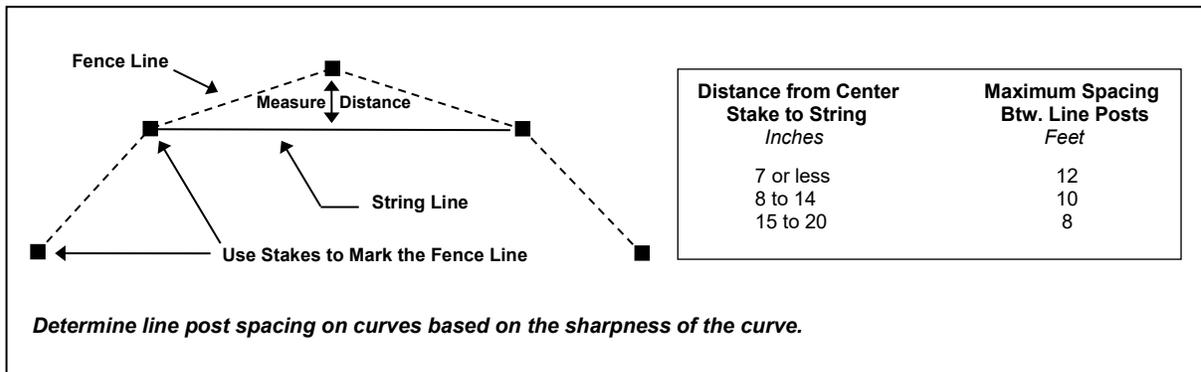
Steel line posts shall be at least 5 feet long and driven into the ground to the top of the anchor plate. Where extra strength and support for the fence is needed, use a wooden post instead of steel for every third or fourth line-post.

TABLE 3: Woven Wire and Barbed Wire Fences for Critical Confinement/Exclusion

3. **Spacing** – 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.

Line posts must be placed closer together on curves to prevent wire tension from moving the posts. Mark the location of the fence line by placing small stakes every 16 feet around the curve. Determine where the curve is greatest, and then start figuring post spacing. The sharper the curve, the closer the posts need to be.

To determine line post spacing for barbed wire fences, set three stakes at the point of maximum curvature. String a line from the first to the third stake. Measure the distance from the center stake to the string and space the posts as shown below. Lean posts outward on the curve approximately 2 inches off vertical at the top. Posts will straighten as the wire is tightened.



Corner, End, Gate, and Brace Posts – Shall be 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 wood (e.g., red cedar, black locust, Osage orange) with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine. Treated lumber shall meet or exceed requirements for AWPA Use Category 4A (UC4A), Ground Contact, General Use.
2. **Size** – 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 or 5 inches square.

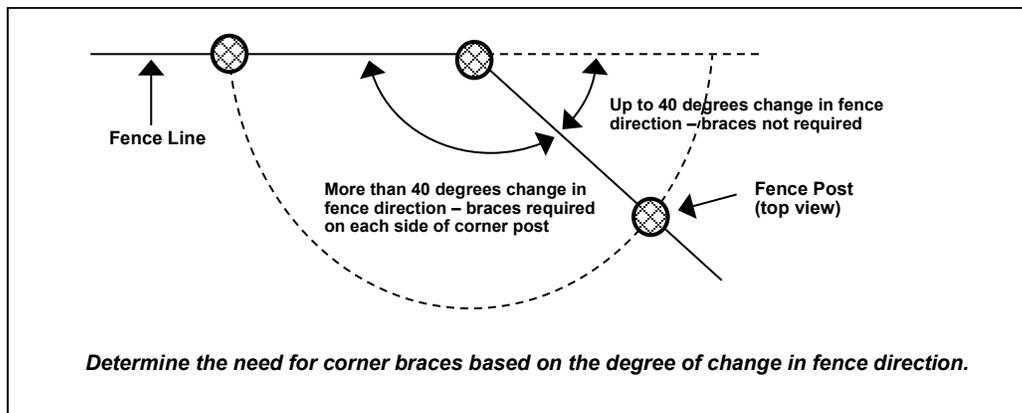
Posts shall be of sufficient length to hold the fence wires while allowing the post to be set in the ground to a minimum depth of 3½ feet for corner, end, and gate brace assemblies, and a minimum depth of 2½ feet for line brace assemblies. Where posts cannot be set to the specified depth, they must be 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.) 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.

3. **Spacing** – Brace posts shall be set a minimum of 7 and a maximum of 10 feet from each corner, end, or gate post. The total length of each brace must be double the height of the fence; a double span (“double H”) brace can be used to add length. Brace assemblies shall be installed as described in the next section of this table.

TABLE 3: Woven Wire and Barbed Wire Fences for Critical Confinement/Exclusion

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 (see diagram below). **Line brace assemblies** shall also be installed at appropriate intervals in a run of fence and at 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 shall be as shown below.

Type of Fence	Run of Fence between Corner, End, and/or Gate Posts	Type of Brace Assembly Needed at Corner, End, and/or Gate Posts	Line Brace Assembly Interval in the Run of Fence
Woven wire or barbed wire	Less than 700 feet.	The total length of each brace must be double the height of the fence; a double span (“double H”) brace can be used to add length.	Line braces are not required at fixed intervals for this run of fence. Use as needed at bottom of hills.
	More than 700 feet.		At least one every 700 feet in the run of the fence and as needed on the bottoms of hills.



Horizontal brace rails shall be installed roughly $\frac{3}{4}$ of the way up the vertical posts and shall consist of one of the following materials:

1. **Galvanized steel pipe** – Minimum 7 feet long, 2-inch diameter, with minimum wall thickness as specified for a water supply pipe.
2. **Wooden post** – Minimum 7 feet long, 4-inch square or 4-inch diameter round.

Brace post pins shall be galvanized steel rods a minimum of 5/16-inch x 9-inch and 5/16-inch x 4-inch.

Brace wires shall consist of 12½ gauge or stronger, galvanized, high tensile wire, double wrapped in a figure 8 pattern, with an in-line strainer. Brace wires shall be tightened to secure the brace assemblies.

If a wide stream or gully (i.e. greater than 16 feet) 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.

TABLE 3: Woven Wire and Barbed Wire Fences for Critical Confinement/Exclusion

Fasteners – For wood posts, use minimum 9-gauge galvanized wire staples to attach wire to the posts. Staples shall be a minimum of 1¼ 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. 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 12½ to 14-gauge galvanized wire or by use of the manufacturer's specially designed clips.

Grounding Rods – Non-electrified metal fences shall be grounded at least every 1,000 feet to protect livestock from lightning strikes. Fences built with metal posts set in the earth will provide sufficient lightning protection and do not require additional grounding.

TABLE 4: Wooden Board 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 wood (e.g., red cedar, black locust, Osage orange) with bark removed, or a non-durable wood that is preservative pressure treated. Treated lumber for boards shall meet or exceed requirements for AWPA Use Category 3B (UC3B), Above Ground, Exposed Use; posts shall meet or exceed requirements for AWPA Use Category 4A (UC4A), Ground Contact, General Use. 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. See Table 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, be of sufficient length to support the height of the fence, and be firmly set or driven in the ground a minimum of 2½ feet.

Corner, gate and end posts shall be at least 6 inches in diameter or 6 inches square, be of sufficient length to support the height of the fence, and be firmly set or driven in the ground a minimum of 3 feet.

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.) 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 in order to stagger the unions when placed on posts on 8-foot centers.

Nails – Each board shall be attached to the post with a minimum of two 12d (3 1/4-inch) galvanized nails. For better holding power, use ring-shank or screw-shank instead of common nails. Two 3-inch decking screws may be used instead of nails.

TABLE 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, on property lines, or adjacent to hazardous areas.

Chain Link Wire Fabric – Shall be a minimum 5 feet high, 9-gauge wire, standard 2-inch chain link diamond mesh, 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. **Line posts** – Shall be a minimum 1.90 inches Outside Diameter standard round (Schedule 40) steel pipe, with a minimum weight of 2.72 lbs./lin. ft. (or 2.28 lbs./lin. ft. for Grade B High Strength Steel). Posts shall be of sufficient length to support the height of the fence, and be set in concrete to a minimum depth of 2 feet;
2. **Top and brace rails** – Shall be a minimum 1.66 inches Outside Diameter standard round (Schedule 40) steel pipe, with a minimum weight of 2.27 lbs./lin. ft. (or 1.84 lbs./lin. ft. for Grade B High Strength Steel);
3. **Terminal posts** – Shall be a minimum 2.375 inches Outside Diameter standard round (Schedule 40) steel pipe, with a minimum weight of 3.65 lbs./lin. ft. (or 3.12 lbs./lin. ft. for Grade B High Strength Steel). Posts shall be of sufficient length to support the height of the fence and be set in concrete to a minimum depth of 2 feet.

Fittings and Gates – Fence fittings shall conform to the requirements of ASTM F 626, "Standard Specification 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." Coating shall be the same as selected for adjoining fence and framework.

1. **Gate posts** – Shall be a minimum 2.875 inches Outside Diameter standard round (Schedule 40) steel pipe, with a minimum weight of 5.79 lbs./lin. ft. (or 4.64 lbs./lin. ft. for Grade B High Strength Steel). Posts shall be of sufficient length to support the height of the fence, and be set in concrete to a minimum depth of 2 feet and a width at least 3 times the diameter of the pipe;
2. **Gate frame members** – Shall be a minimum 1.66 inches Outside Diameter standard round (Schedule 40) steel pipe, with a minimum weight of 2.27 lbs./lin. ft. (or 1.84 lbs./lin. ft. for Grade B High Strength Steel).

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 installed vertically. Where posts are installed on an inclined surface, the angle of the post shall be adjusted so that the post will be vertical.

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 walls, 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.

TABLE 6: High Tensile Smooth Wire for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

High tensile fencing (**electrified or non-electrified**) 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. Wire may also be poly-coated for improved visibility and livestock safety.

For critical confinement, use 12½ gauge minimum with at least 200,000 PSI tensile strength and at least 1,000 pounds breaking strength. For non-critical confinement, use a minimum of 17 gauge.

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.

Wire shall be tight enough that it does not sag. Tension shall be set with in-line wire strainers and/or tension indicator 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 use a wrap-around insulator. 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 Tables 1 and 2 for details. In flood prone areas, use no more than six strands of high tensile wire. 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 wood (e.g., red cedar, black locust, Osage orange) with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine. Treated lumber shall meet or exceed requirements for AWPA Use Category 4A (UC4A), Ground Contact, General Use.

Wooden posts shall be at least 4 inches in diameter or 4 inches square.

Wooden line posts must be of sufficient length to hold up the fence fabric while allowing the post to be set in the ground to a minimum depth of 2½ feet. When set in depressions or low places, line posts shall be anchored in the ground or set at an angle to prevent lifting.

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 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) 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 a post 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.

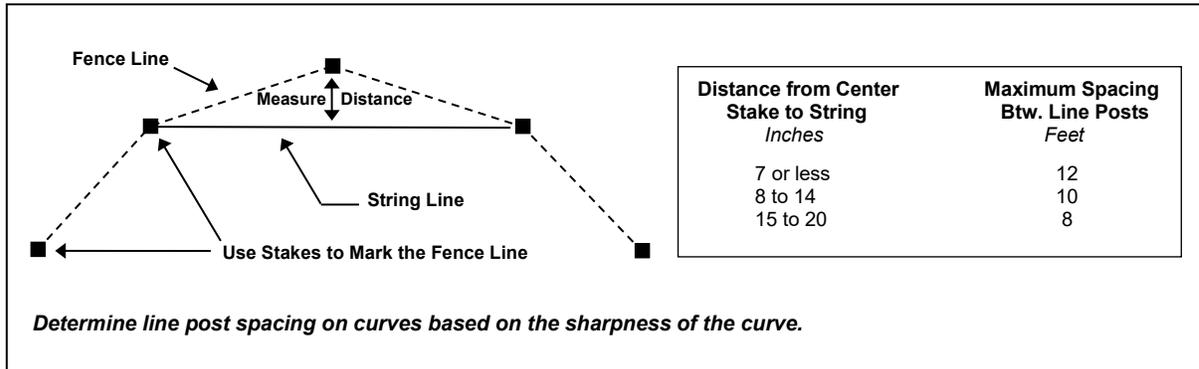
Where extra strength and support for the fence is needed, use a wooden post instead of steel for every third or fourth line post.

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 and to maintain spacing of the bottom wire above the ground.

TABLE 6: High Tensile Smooth Wire for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Line posts must be placed closer together on curves to prevent wire tension from moving the posts. Mark the location of the fence line by placing small stakes every 16 feet around the curve. Determine where the curve is greatest, and then start figuring post spacing. The sharper the curve, the closer the posts need to be.

Select three stakes at the point of maximum curvature. String a line from the first to the third stake. Measure the distance from the center stake to the string and space the posts as shown below. Lean posts outward on the curve approximately 2 inches off vertical at the top. Posts will straighten as the wire is tightened.



Battens – If battens are used, distances between line posts can be increased by 30 feet. Battens shall be 1¼-inch x 1¼-inch x 3½ feet long, self-insulating pressure treated softwood, slotted hardwood, light duty fiberglass, or other NRCS approved material.

Spacing between battens will be 30 feet maximum.

For a one-strand fence, use 4-foot (minimum height) wood or insulated steel posts instead of battens.

Corner, End, Gate, and Brace Posts – Shall be 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 wood (e.g., red cedar, black locust, Osage orange) with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine. Treated lumber shall meet or exceed requirements for AWPA Use Category 4A (UC4A), Ground Contact, General Use.
- 2. Size** – 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 or 5 inches square.

Posts shall be of sufficient length to hold the fence wires while allowing the post to be set in the ground to a minimum depth of 3½ feet for corner, end, and gate brace assemblies, and a minimum depth of 2½ feet for line brace assemblies. 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.) 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.

- 3. Spacing** – Brace posts shall be set a minimum of 7 and a maximum of 10 feet from each corner, end, or gate post. The total length of each brace must be double the height of the fence; a double span (“double H”) brace can be used to add length. Brace assemblies shall be installed as described in the next section of this table.

TABLE 6: High Tensile Smooth Wire for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Brace Assemblies – For fences with 3 or more strands of high tensile wire, **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 (see diagram, next page). **Line brace assemblies** shall also be installed at appropriate intervals in a run of fence and at 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 shall be as shown below. For fences with fewer than 3 strands, braces are not required if alternatives to braces (such as closer line post spacing and angled end posts) will provide sufficient support for the fence.

Type of Fence	Run of Fence between Corner, End, and/or Gate Posts	Type of Brace Assembly Needed at Corner, End, and/or Gate Posts	Line Brace Assembly Interval in the Run of Fence
High-tensile, 5 or more strands.	Less than 1,300 feet.	The total length of each brace must be double the height of the fence; a double span (“double H”) brace can be used to add length. Use double span braces if fence has 6 or more strands.	Line braces are not required at fixed intervals for this run of fence. Use as needed at bottom of hills.
	More than 1,300 feet.		At least one every 1,300 feet in the run of the fence and as needed on the bottoms of hills.
High-tensile, 3 or 4 strands.	Less than 1,700 feet.	The total length of each brace must be double the height of the fence; a double span (“double H”) brace can be used to add length.	Line braces are not required at fixed intervals for this run of fence. Use as needed at bottom of hills.
	More than 1,700 feet.		At least one every 1,700 feet in the run of the fence and as needed on the bottoms of hills.

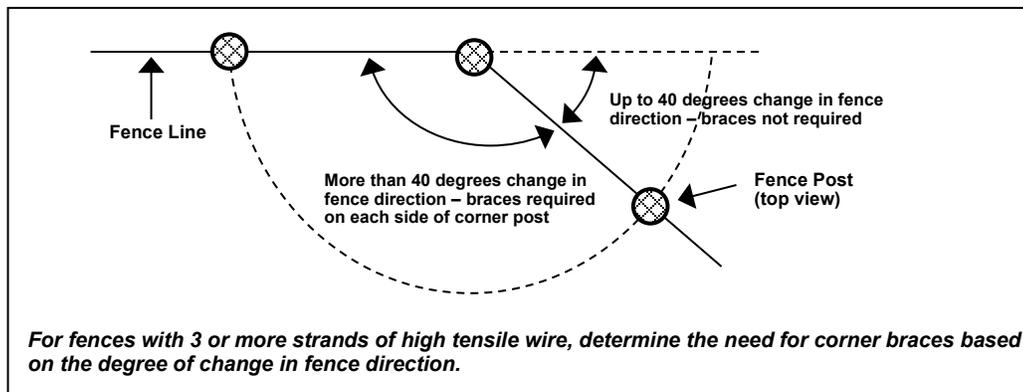


TABLE 6: High Tensile Smooth Wire for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Horizontal brace rails shall be installed roughly $\frac{3}{4}$ of the way up the vertical posts and shall consist of one of the following materials:

1. **Galvanized steel pipe** – Minimum 7 feet long, 2-inch diameter, with minimum wall thickness as specified for a water supply pipe;
2. **Wooden post** – Minimum 7 feet long, 4-inch square or 4-inch diameter round.

Brace post pins shall be galvanized steel rods a minimum of 5/16-inch x 9-inch and 5/16-inch x 4-inch.

Brace wires shall consist of 12½ gauge or stronger, galvanized, high tensile wire, double wrapped in a figure 8 pattern, with an in-line strainer. Brace wires shall be tightened to secure the brace assemblies.

If a wide stream or gully (i.e. greater than 16 feet) 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.

Fasteners – For wood posts, use minimum 9-gauge galvanized wire staples to attach wire to the posts. Staples shall be a minimum of 1¼ 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 12½ 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 – An electric fence charger (energizer) must have adequate voltage to effectively electrify the system and maintain output to control the type of animals, based on the manufacturer's recommendations. A minimum of two kilovolts on each electrified strand is acceptable for most classes of livestock.

The charger shall be low impedance, UL approved or equivalent, and shall include all of the safety features that are required by the manufacturer.

Insulators – If needed, these shall be UV stabilized (plastic) high density polypropylene Type W or type S, high strain end and corner tube insulator, or high strain porcelain corner Type O. 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. Do not use aluminum nails or screws on pressure treated posts

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.

TABLE 7: Electroplastic Twine (Polywire), Electrified Ribbon, and Galvanized Steel Braided Wire for Non-Critical Confinement/Exclusion (or Divisional) Fences

Electrified twine, ribbon type fencing, and/or galvanized steel braided wire may be used as interior (cross) fencing to divide large pasture acreage into manageable units, to divide the paddocks of intensive grazing systems, swath or bale grazing, or similar applications. Electric net fencing, which includes built-in portable posts, may also be suitable for some livestock and poultry applications. Lightweight type fencing shall not be used alone 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 seven stainless steel strands running through the fabric.

The number of wires and spacing is based on the type of animal to be confined. See Table 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 and set deep enough in the ground to withstand livestock. "Step-in" posts designed for this purpose may be used for portable fencing. These posts include a flange or stirrup near the bottom of the post for pressing the post into the ground.

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 (e.g., red cedar, black locust, Osage orange), or non-durable wood that is preservative pressure treated. Do not use red pine. Treated lumber shall meet or exceed requirements for AWWPA Use Category 4A (UC4A), Ground Contact, General Use. Posts must have a diameter sufficient to anchor the wire and be long enough to allow them to be set at least 1½ 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 – An electric fence charger (energizer) must have adequate voltage to effectively electrify the system and maintain output to control the type of animals, based on the manufacturer's recommendations. A minimum of two kilovolts on each electrified strand is acceptable for most classes of livestock.

The charger shall be low impedance, UL approved or equivalent, and shall include all of the safety features that are required by the manufacturer.

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.

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

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Additional Brace Requirements
Woven Wire	ASTM Class 3 galvanized, min. 12½-gauge horizontal wires with min. 14-gauge vertical wire.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use), 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 2½ feet. (See Note 2 at the end of this table.) <u>Steel posts</u> : min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 10 feet apart, on center, for standard wire. Max 20 feet apart, on center, if high tensile wire.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use).	Min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Min. 5 inches diameter or 5 inches square. Set in ground to min. depth of 3½ feet with corner, end, and gate brace assemblies, and a min. depth of 2½ feet with line brace assemblies. (See Note 2 at the end of this table.)	Length of braces must be double the height of the fence; use double span braces as needed to add length. Use line braces at bottom of hills and to divide fence lengths where runs of fence are more than 700 feet long.
Barbed Wire	ASTM Class 3 galvanized, double-strand, min. 12½-gauge with 4-point barbs spaced no more than 6 inches apart, or 15½-gauge for high tensile.	Same as above.	Same as above.	Max. 16 feet apart, on center.	Same as above.	Same as above.	Same as above.	Same as above.

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

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Additional Brace Requirements
Wooden Board	Wood rails (boards) – untreated durable wood, (e.g., red cedar, black locust, Osage orange), well-seasoned or kiln-dried. Min. 1 inch thick x 6 inches wide, and at least 8 feet long. Non-durable wood must be preservative pressure treated (UC3B, Above Ground, Exposed Use).	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use).	Wooden posts min. 4 inches diameter or 4 inches square. Length sufficient to support desired height of fence and be set in the ground a min. of 2½ feet deep. (See Note 2 at the end of this table.)	Max. 8 feet apart, on center.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use).	Wooden posts min. 6 inches diameter or 6 inches square. Length sufficient to support desired height of fence and be set in ground to min. depth of 3 feet. (See Note 2 at the end of this table.)	Not applicable.	Not applicable.
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.	Minimum 1.90 inches Outside Diameter standard round (Schedule 40) steel pipe. Posts shall be of sufficient length to support the height of the fence and be set in concrete to a minimum depth of 2 feet.	Max. 10 feet apart, on center.	Steel post, galvanized with 2 ounces of zinc coating per sq. ft., or painted.	<u>End (terminal) posts</u> – Minimum 2.375 Outside Diameter standard round (Schedule 40) steel pipe. <u>Gate posts</u> – Minimum 2.875 Outside Diameter standard round (Schedule 40) steel pipe. Posts shall be of sufficient length to support the height of the fence and be set in concrete to a minimum depth of 2 feet.	Not applicable.	Not applicable.

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

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Additional Brace Requirements
High Tensile Smooth Wire (5 strands or more)	ASTM Class 3 galvanized, min. 12½-gauge 200,000 PSI, 1,000 lbs. breaking strength.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use), 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 2½ feet. (See Note 2, below.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 60 feet apart, on center, or Max. 90 feet apart, on center, with battens installed at 30 and 60 feet.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use).	Min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Min. 5 inches diameter or 5 inches square. Set in ground to min. depth of 3½ feet with corner, end, and gate brace assemblies, and a min. depth of 2½ feet with line brace assemblies. (See Note 2 at the end of this table.)	Length of braces must be double the height of the fence; use double span braces as needed to add length. Use double span braces if 6 or more strands. Use line braces at bottom of hills and to divide fence lengths where runs of fence are more than 1,300 feet long.
High Tensile Smooth Wire (4 strands or fewer)	ASTM Class 3 galvanized, min. 12½-gauge 200,000 PSI, 1,000 lbs. breaking strength.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use), 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 2½ feet. (See Note 2, below.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 60 feet apart, on center, or Max. 90 feet apart, on center, with battens installed at 30 and 60 feet.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use).	Min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Min. 5 inches diameter or 5 inches square. Set in ground to min. depth of 3½ feet with corner, end, and gate brace assemblies, and a min. depth of 2½ feet with line brace assemblies. (See Note 2 at the end of this table.)	Length of braces must be double the height of the fence; use double span braces as needed to add length. For 3-4 strand fences, use line braces at bottom of hills and to divide fence lengths where runs of fence are more than 1,700 feet long.

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

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Additional Brace Requirements
Electroplastic Twine (Polywire), Electrified Ribbon, and Galvanized Steel Braided Wire	Polywire: min. 7 stainless steel strands running through the fabric.	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 for portable fencing.	Use spacing specified by the manufacturer to control livestock.	Untreated durable wood (e.g., red cedar, black locust, Osage orange) with bark removed, or Non-durable wood that is preservative pressure treated (UC4A, Ground Contact, General Use).	Diameter sufficient to anchor the wire. Posts must be long enough to allow them to be set at least 1½ feet in the ground. (See Note 2, below.)	Not applicable.	Not applicable.

TABLE 8 NOTES:

^{1/} This table briefly summarizes some of the major components (primarily wood and steel) and installation requirements for each fence type. Refer to Tables 1 – 7 for more detailed criteria. Other materials may also be used if approved in advance by NRCS.

^{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.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post.



Natural Resources Conservation Service Practice Specification Heavy Use Area Protection (Code 561)

1. SCOPE

The work shall consist of furnishing materials and installing all components of the paved surface treatment areas for heavy use area protection as outlined in this specification and the drawings.

2. MATERIALS

All materials used shall conform to the quality and grade noted on the plans, set forth in Section 6, 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 6. 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.

COAL COMBUSTION BYPRODUCTS (CCB) shall have a chemical analysis that provides adequate cementing and safety (toxicity) for the purpose intended.

CURING COMPOUND shall meet the requirements of ASTM-C309, Type 2, Class A or B, or as otherwise required in Section 6.

MASONRY COMPONENTS shall meet the requirements of ASTM-C90 & C270 and be 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.

AGGREGATES. Aggregates shall meet the requirements of Pennsylvania Dirt and Gravel Road Program(DSA), PennDOT Pub. 408, Section 703, for the gradations specified in the drawings or Section 6, or as otherwise set forth in Section 6.

BITUMINOUS CONCRETE. Bituminous concrete shall meet the requirements of PennDOT Pub. 408, Sections 401, 420 and 421, for the course(s) specified in the drawing or Section 6, or as otherwise set forth in Section 6.

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.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 6. 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 roofs and covers shall be stainless steel and/or galvanized in accordance with ASTM A153, and/or A653 Class G185, and Type 304 or 316, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses. All fasteners, connectors, and any other metal contacting ACZA, ACQ or CA treated wood shall be stainless steel, in accordance with Supplement A below.

GEOTEXTILES. Geotextiles shall meet the requirements of PennDOT Pub. 408, Sections 212 and 735, for the Type and Class specified in the drawings or Section 6, or as otherwise set forth in Section 6.

ORGANIC SURFACES. Materials such as tanbark and saw dust shall be free of contaminants and rot.

3. FOUNDATION PREPARATION

Clear all trees, brush, fences, manure, and rubbish within the area to be protected, 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 is to be stockpiled in a convenient location for use on disturbed areas to facilitate seeding.

Set all base course material on undisturbed soil or non-yielding compacted material. Geosynthetics may be used, if approved by the Engineer, to further separate and/or stabilize the foundation. Over-excavation must be corrected as noted on the drawings or as directed by the Engineer or his/her designated Representative. Surface and subsurface drainage systems shall be installed and operating adequately to remove water from the foundation to allow for proper placement of base and surface materials.

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

4. BASE COURSE

The base course shall be placed on the area to the grades and thicknesses shown on the plans. The base material shall be as set forth in Section 6 and/or as shown on the drawings. The material shall be wetted and compacted by rollers or other construction equipment approved by the Engineer.

5. SURFACE TREATMENTS

A. Portland Cement Concrete

CONCRETE MIX

Unless otherwise specified in Section 6, concrete shall be proportioned to provide a minimum compressive strength at 28 days of 4,000 psi. The Contractor shall be responsible for the design of the mix and certification of the necessary strength, in accordance with ACI 301. Acceptance and certification of design mixes by PennDOT within the past year may be accepted in lieu of additional testing.

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. Steel shall be supported by precast concrete bricks (not clay bricks), metal or plastic chairs, or hard fieldstone. 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 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.

MIXING AND HANDLING CONCRETE

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

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 as rapidly as practical by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall be placed 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.

For each load of concrete delivered to the site, a batch ticket shall be provided to the Owner or Technician by the Supplier. As a minimum, this ticket shall show the design strength, time out, admixtures (if any), and amount of water that may be added (if any) on site and still be within the design mix limits.

The Contractor shall test slump and air entrainment as necessary to ensure that the concrete meets the requirements of this specification. The slump shall be three to six inches (without superplasticizers) and the air content 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 95o F. The slump shall not exceed 7½ inches with the addition of superplasticizer.

Concrete shall be uniform and thoroughly mixed when delivered to the job site. 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.

Immediately after placement, concrete shall be consolidated by spading and vibrating, or spading and hand tamping. It shall be worked into corners and around all reinforcement and embedded items in a manner which prevents segregation. Excessive vibration which 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 no depressions that would result in surface water ponding. Careful screeding (striking-off) and/or wood float finishing shall be required. Any additional desired finishing of the surface (such as roughening for improved traction) shall be accomplished after an initial stiffening of the concrete has taken place. These requirements will be stated in Section 6 or on the drawings. Exposed edges should 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. If concrete placing is discontinued prior to completion of the entire structure, the unfinished end of the concrete shall be formed to create a proper construction or expansion/contraction joint.

EXPANSION/CONTRACTION JOINTS

When required in Section 6 or on the drawings, expansion/contraction joints shall contain a six-inch, Type B, vinyl waterstop with a minimum web thickness of 1/8-inch, or an approved joint sealer.

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.

Concrete that is damaged or otherwise defective shall be removed and replaced, or where feasible, repaired. The Engineer will determine the required extent of

removal, replacement, or repair. The plan for accomplishing the repair must be approved by the Engineer prior to beginning the repair work. Where minor areas of the concrete surface are “honeycombed,” damaged or otherwise defective, the area maybe 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.

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.

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.

CURING

In general, concrete shall be cured in accordance with ACI-308. Specifically, it 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.

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. 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. If the curing material is subsequently disturbed, it shall be reapplied immediately.

B. Bituminous Concrete

Bituminous concrete shall be installed in accordance with PennDOT Pub. 408, Sections 305, 320, & 400, as appropriate, and/or as otherwise set forth in Section 6.

C. Compacted Stone Aggregate

Compacted stone aggregate surfaces shall consist of the material specified in the drawing or Section 6. The material shall be moist and uniformly placed on the prepared base. The loose material shall be placed to an adequate thickness so that when compacted the finished thickness is as specified. The stone aggregate shall be compacted with a vibratory smooth wheeled roller or other approved equipment to form a dense, smooth surface.

D. Other Materials and Structures

Surface treatments, such as saw dust, coal combustion byproducts, soil cement, etc., shall be placed as set forth in Section 6, and to the grades and thicknesses shown on the drawings.

6. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

**Natural Resources Conservation Service
PRACTICE SPECIFICATION
SUBSURFACE DRAIN
(Code 606)**

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.

Table 1 – Drain Pipe Requirements

Type	Specification
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
	Federal Specification
Pipe, bituminized fiber & fitting	SS-P-1540
Styrene rubber (SR) plastic drain pipe & fitting	ASTM-D-2852
Polyvinyl chloride (PVC) sewer pipe & fitting	ASTM-D-2729
	ASTM-D-3034
Polyvinyl chloride (PVC) pipe	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-76

- 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. Provide UV protection for pipe stored and exposed to sunlight for extended periods of time exceeding 6 months or exceeding the pipe manufacturer's limit for UV exposure. At the time of installation, it should be kept as cool as possible to minimize elongation of the pipe during installation.

GEOTEXTILE shall meet the requirements as outlined in NRCS Design Note 24 and NRCS Material Specification 592

3. SITE PREPARATION

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 "design" responses from the Pennsylvania One Call System are noted on the plans. It is the Contractor's or Landowner's responsibility to notify One Call of pending construction and 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.

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. FITTING 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 ¼ inch long for 3-, 4- and 5-inch diameter pipe, or 1 ½ inch for 6- and 8-inch diameter pipe, or 1 ¾ 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:

**Practice Specification
Underground Outlet (Code 620)**

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 9.

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.

Table 1 – Drain pipe requirements

Type	Specification
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	Fed Spec SS-P-1540
Styrene rubber (SR) plastic drain pipe & fitting	ASTM-D-2852
Polyvinyl chloride (PVC), SHD 40, 80, 120	ASTM-D-1785
Polyvinyl chloride (PVC) sewer pipe & fitting	ASTM-D-2729
Polyvinyl chloride (PVC), SDR 35, 26	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
Corrugated polyethylene tubing	ASTM F2648
Corrugated polyethylene tubing (3-10")	AASHTO M252
Corrugated polyethylene tubing (12-60")	AASHTO M294
Pipe, corrugated (steel, polymer coated)	ASTM-A-762
Pipe, corrugated (steel, zinc coated)	ASTM-A-760

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 NRCS Design Note 24 and NRCS Material Specification 592.

d. CONCRETE and related materials shall meet the requirements set forth in Construction Specification PA313S, Waste Storage Facility (Structure), and/or as set forth in Section 9.

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. 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 underground outlets 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 "design" responses from the Pennsylvania One Call System shall be noted on the plans. It is the Contractor's or Landowner's responsibility to notify One Call of pending construction and 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. EXCAVATION

Construction operations shall follow the erosion and sediment control plan.

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.

7. INSTALLATION

BEDDING. In stable soils, the conduit shall be firmly and uniformly bedded throughout its entire length as required on the drawings or Section 9. 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, and in very hot climates no more than five percent stretch is allowed. Special precautions must be taken in hot weather to observe this stretch limit.

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."

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.

8. 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 9.

9. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:



NATURAL RESOURCES CONSERVATION SERVICE PRACTICE SPECIFICATION LINED WATERWAY OR CONVEYANCE CHANNEL (Code 468)

1. SCOPE

The work shall consist of furnishing materials and installing all components of the lined waterway or conveyance channel, 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 construction methods to be used have been reviewed and approved by the Engineer.

2. MATERIALS

All materials used shall conform to the quality and grade noted on the drawings, set forth in Section 6, or as otherwise listed below:

a. ROCK shall be durable and obtained from sources listed in Penn DOT Bulletin 14 or as otherwise approved by the designer. Gradation shall be as specified in Section 6 or on the drawings. The nominal size of a rock is that dimension (middle) which passes through a square opening with the same dimension; i.e., it is not the greatest dimension. The rock shall be free from soil and trash. Rocks shall be angular or sub- angular in shape. However, the least dimension of any individual rock shall be greater than one-third the greatest dimension. Unless specified in Section 6, a gradation quality control check shall be made of the in-place riprap by the Contractor. Any dispute on the acceptability of the gradation shall be resolved by physically testing the riprap in question. The Contractor is to provide the equipment and labor necessary to perform the testing at no additional cost.

b. EARTH FILL material used in constructing the waterway shall be obtained from the waterway area or other approved sources. Fill shall contain no frozen material, rocks greater than 6 inches in diameter, roots or wood greater than 2 inches in diameter or 4 inches in length, sod, brush, or other objectionable material.

c. DRAINFILL AGGREGATE shall meet the requirements of Penn DOT Specifications, Section 703.2, Type A, Coarse Aggregate. The size and gradation shall be as specified in Section 6 or on the drawings.

d. CONCRETE, masonry, or pre-cast concrete shall be made in conformance with the requirements of Penn DOT Specifications, Sections 704, 713, and 714, as appropriate.

e. GEOTEXTILE shall meet the requirements as outlined in NRCS Design Note 24 and NRCS Material Specification 592 or as otherwise stated in the design and specifications. Certification from the manufacturer shall be provided by the Contractor that the geotextile meets these requirements.

f. SYNTHETIC TURF REINFORCEMENT FABRICS shall meet the requirements of Penn DOT Specifications, Section 806.2(b) and (c), unless otherwise set forth in Section 6.

g. GRID PAVERS shall meet the requirements of Penn DOT Specifications, Section 857.

3. SITE PREPARATION

The foundation area shall be cleared of trees, stumps, roots, sod, loose rock, and other material. The waterway cross section shall be excavated to the neat lines and grades as shown on the drawings. The sub-grade surface on which the lining is to be installed shall be excavated or filled as needed. Fill shall be compacted to approximately the same density as the adjacent undisturbed material. No abrupt deviations from the design grade or horizontal alignment shall be permitted.

All material removed by the clearing and grubbing operation shall be disposed of as directed by the Owner or his/her Representative, or as set forth in Section 6.

Areas adjacent to the waterway shall be graded to allow water to drain directly into the waterway.

4. FILTER OR BEDDING

Where a geotextile fabric is required under the lining, it shall be unrolled in a direction parallel to the waterway in a loose manner permitting it to conform to the surface, without damage, when the lining is placed. The fabric shall be secured and overlapped as per the manufacturer's recommendations for waterway applications. Fabric ends shall be trenched, as necessary, to ensure that drainage from adjacent areas does not get under the fabric. Placement of fabric on mud, un-compacted fill or frozen material will not be permitted.

Prior to the placement of the lining material, the fabric shall be inspected and approved by the designated inspector. Notification shall be given far enough in advance to provide time to schedule the inspection. Any fabric which is damaged during placement of the lining material shall be replaced.

Aggregate bedding shall be placed to the thickness shown on the drawings, or as set forth in Section 6. Compaction of the bedding material is not required; however, the surface of the material shall be reasonably smooth and free of mounds or windrows.

5. LINING PLACEMENT

Rock linings shall be placed by equipment to the thickness specified. The rock shall be installed to the full thickness in one operation, and in such a manner as to avoid serious displacement or damage to the underlying materials or adjacent structures. In no case shall rock be dropped from a height greater than 3 feet.

The rock shall be delivered and placed in such a manner that will ensure that the in-place lining is homogeneous with no one size dominating an area. Some hand placing may be necessary to provide a neat and uniform surface on grade. Rock shall be placed so as not to obstruct or divert drainage from areas adjacent to the waterway sides.

Concrete linings shall be placed to the thickness shown on the drawings. The surface shall be smooth and even with concrete paste worked to the surface to fill all voids.

Careful screeding (striking-off) and/or wood float finishing shall be required, unless otherwise shown on the drawings, or as set forth in Section 6. Adequate precautions shall be taken to protect freshly placed concrete from freezing or extremely high temperatures, to insure proper curing.

Other pavement or linings, such as synthetic turf reinforcement fabrics, grid pavers, etc., shall be installed in accordance with Penn DOT Specifications, Sections 806 and 857, as appropriate, and/or as otherwise set forth in Section 6.

6. ADDITIONAL CONDITIONS WHICH APPLY TO THE PROJECT ARE:

Natural Resources Conservation Service Practice Specification Access Road (Code 560)

1. SCOPE

The work shall consist of construction of the Access Road at the location, and to the dimensions and grades, shown on the drawings and as staked in the field.

2. SITE PREPARATION

All trees, stumps, roots, brush, weeds, and other objectionable material shall be removed from the work area and disposed of as directed.

All unsuitable material shall be removed from the roadbed area prior to placing fill or surfacing materials.

The roadbed shall be graded to the required elevations. All areas which require filling will be scarified prior to placement of fill. All fill shall be compacted according to the specified method with the appropriate equipment or to the specified density.

3. SURFACING

Aggregate for the subbase shall be clean and free from deleterious substances.

GEOTEXTILE shall meet the requirements as outlined in NRCS Design Note 24 and NRCS Material Specification 592 or as otherwise stated in Section 6.

Gradation shall be such that a stable base will be formed. Placement of the surface course shall be in accordance with sound highway construction practices.

4. SEEDING

All disturbed areas shall be revegetated as designated on the drawings.

5. EROSION CONTROL

Construction operations shall be carried out in such a manner that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement must be followed.

6. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

Natural Resources Conservation Service Practice Specification Trails and Walkways (Code 575)

1. SCOPE

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

2. MATERIALS

All materials used shall conform to the quality and grade noted on the plans, set forth in Section 8, or as otherwise listed below:

WEARING SURFACE, BINDER COURSE, and BASE COARSE aggregate shall meet the requirements and gradation specified in Section 8 or on the drawings.

GEOTEXTILE shall meet the requirements as outlined in NRCS Design Note 24 and NRCS Material Specification 592.

PIPE shall meet the requirements specified in Section 8 or on the drawings.

PRESSURE TREATED WOOD PRODUCTS shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 8. 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 and soil.

3. FOUNDATION PREPARATION

All trees, brush, fences, manure, and rubbish shall be cleared within the trail or walkway area, including any associated drainage control features and borrow areas. All stumps and roots larger than two-inch diameter shall be removed down to the subgrade elevation. All material removed by clearing operations shall be disposed of as directed by the Owner or his/her Representative.

Topsoil shall be stripped and stockpiled in a convenient location for use on disturbed areas to facilitate seeding.

Soil shall be excavated and if suitable can be used as fill as shown on the drawings to establish a uniform, stable subgrade. Wet soil, mud, and topsoil shall not be used as fill. The fill material shall be compacted as specified in Section 8 or on the drawings.

Borrow material shall be taken from the designated borrow area as needed after excavation of the trail or walkway is complete. The borrow area shall be final graded to drain freely and blend into the surrounding undisturbed area.

Excess excavated material shall be disposed of in the designated spoil area, which shall be graded to blend into the surrounding undisturbed area. Geotextile or base course material shall be installed 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.

4. DRAINAGE STRUCTURES

Culverts, subsurface drains, and swales shall be installed as shown on the drawings. Surface and subsurface drainage structures shall be adequately removing water from the foundation to allow for proper placement of base and surface materials.

5. GEOTEXTILE

Where specified in Section 8 or on the drawings, geotextile shall be installed on the prepared subgrade. The geotextile shall be placed, overlapped and anchored as recommended by the manufacturer, unless otherwise specified in Section 8 or on the drawings.

Vehicles and heavy equipment shall not be operated directly on top of the geotextile. Base course or surface material shall be placed on the geotextile ahead of the construction equipment.

6. E&S CONTROL

E&S control measures shall be as set forth in the E&S Plan, and as otherwise detailed in the drawings.

Vegetation shall be established as set forth in Construction Specification PA 342, and/or as set forth in Section 8 and the drawings.

7. SURFACING

Where specified in Section 8 or on the drawings, the base and binder course shall be placed on the trail or walkway to the specified grades and thickness. The material shall be wetted and compacted by rollers or other construction equipment approved by the Engineer.

Surface material shall be placed to the grades and thicknesses set forth in Section 8 or on the drawings. The material shall be compacted by rollers or other construction equipment approved by the Engineer. The finished surface shall be smooth and free of projecting stones.

Vegetation shall be established in accordance with Construction Specification PA342.

The surface material within 3' of surface water control devices and other structures (pipes, drop inlets, etc.) shall be compacted using manually directed tamping equipment.

8. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

Practice Specification Critical Area Planting (Code 342)

1. SCOPE

The work shall consist of furnishing and planting the plant materials as set forth in the drawings and/or Section 7.

Critical area planting specifications are divided into four subsections based on the type of vegetation to be established:

Temporary cover

Permanent cover – seeding grasses and legumes

Permanent cover – sod establishment

Permanent cover – trees & shrubs

2. TEMPORARY COVER

A. **MULCHING** – Unless otherwise set forth in Section 7, use if the period of soil exposure without permanent vegetation will be less than two months, temporary vegetation is not feasible, or where seeding is delayed because of weather conditions. Follow the specification for Mulching (PA484).

B. **ANNUAL GRASS or CERAEL GRAIN** – Unless otherwise set forth in Section 7, use on all sediment producing areas where the period of soil exposure will be more than two months, but less than 12 months.

1. Site Preparation

- a. Install all required water control measures (temporary and permanent) prior to cover application.
- b. Perform all cultural operations at right angles to the slope on slopes 3:1 or flatter.
- c. Apply agricultural lime according to the soil test. If no test results are available when ready to seed, apply at the rate of 8000 pounds per acre (200 pounds per 1000 square feet) on a 100 percent calcium carbonate equivalent basis as a preliminary application. Apply the balance recommended by the test when the results are received. If lime is to be worked into a depth of five inches or deeper, use the amount full recommended in the soil test report. Apply no more than 8000 pounds per acre at one time if the limestone is to be worked into less than five inches. Apply the balance of the recommendation as the lime dissolves and infiltrates into the soil.

Where pH levels are extremely low, it may not be feasible or practical to apply the lime all at once. In these cases, apply 6,000 pounds per acre (150 pounds per 1,000 square feet) on a 100 percent calcium carbonate equivalent basis for the temporary cover, and the balance of the test recommendation with the permanent cover.

- d. Apply fertilizer according to the soil test. If the test results are not available prior to seeding, apply 40 pounds each of actual N, P₂O₅, and K₂O per acre (1 pound each per 1000 square feet) as a preliminary application. Apply any balance recommended by the test when the results are received.

2. Materials

- a. Seed using the species or mixtures for the appropriate site type in **Table 1 Temporary Cover or Nurse Crop** unless otherwise set forth in Sections 7.
- b. All seed shall conform to the certifications of the PA Dept. of Agriculture and in addition, be labeled in accordance with the USDA Federal Seed Act in effect at the time of planting.
- c. No seed will be accepted with a test date more than 9 months before delivery to the site. Seed that is moldy or otherwise damaged will not be accepted.

3. Establishment

- a. Seeding rates shall be at the rates set forth in **Table 1 Temporary Cover or Nurse Crop**, unless otherwise set forth in Section 7.
- b. Cover grass seeds with ¼-inch, and small grains with 1½-inches of soil by drilling, cultipacking, harrowing, or other suitable method when the site conditions permit; cultipack or track hydroseeded area where slopes will allow safe equipment operation.
- c. Mulch all seeded areas according to the construction specification for Mulching (PA484).

3. PERMANENT COVER – SEEDING GRASSES AND LEGUMES

A. SITE PREPARATION

1. Install all required water control measures (temporary and permanent) prior to cover application.
2. Perform all cultural operations at right angles to the slope on slopes 3:1 or flatter.
3. Where site conditions permit, prepare a seedbed by loosening the soil to a depth of 2 to 6 inches with suitable equipment. Where site conditions do not permit such normal seedbed preparation, loosen the soil surface by dragging a heavy chain or other suitable devices over the area to be seeded. Where possible on mined land, the surface should be left furrowed (as typically left by ripper teeth spaced 12 to 18 inches apart) when seeding herbaceous plants.
4. Apply agricultural lime according to the soil test. If no test results are available when ready to seed, apply at the rate of 8000 pounds per acre (200 pounds per 1000 square feet) on a 100 percent calcium carbonate equivalent basis as a preliminary application. Apply the balance recommended by the test when the results are received. If lime is to be worked into a depth of five inches or deeper, use the amount full recommended in the soil test report. Apply no more than 8000 pounds per acre at one time if the limestone is to be worked into less than five inches. Apply the balance of the recommendation as the lime dissolves and infiltrates into the soil.
Where pH levels are extremely low, it may not be feasible or practical to apply the lime all at once. In these cases, apply the lime in increments of 6,000 pounds per acre (150 pounds per 1,000 square feet) on a 100 percent calcium carbonate equivalent basis and incorporate it before the next increment.
5. Apply nitrogen only when the plants will be actively growing during the period immediately following the application (March to May and August to October for cool- season grasses, June to August for warm- season grasses). On remote sites with poor access for standard fertilization (e.g., mine reclamation), apply all nitrogen as slow release compounds (e.g. ureaformaldehyde, sulfur-coated urea, other slow release formulation, animal manure, or sewage sludge), and at a rate of not greater than 80 pounds of actual nitrogen per acre (2 pounds per 1000 square feet) in any one application. On sites with good access (e.g. agricultural fields), apply 40% of the required nitrogen as slow release compounds, and no more than 40 pounds of actual nitrogen per acre (1 pound per 1000 square feet) in any one application.
6. Apply fertilizer according to a soil test. If test results are not available prior to seeding, apply as follows:
 - a. Where a seedbed can be, prepared, apply 100 pounds each of actual P₂O₅ and K₂O per acre (2.5 pounds each per 1000 square feet) during seedbed preparation and at time of seeding. Apply 100 pounds of actual P₂O₅ and 100 pounds actual K₂O per acre (2.5 pounds of actual P₂O₅ and 2.5 pounds of actual K₂O per 1,000 square feet) as a preliminary application. Apply 40 pounds of actual N per acre (1 pound per 1,000) square feet) during the first period of active growth following the seeding. (Cattle manure or sewage sludge can be used to meet the nutrient requirements and will add needed organic matter when they can be incorporated into the soil. Heavy metal content of sewage sludge should not exceed that allowed on agricultural lands.) Test the soil before application and apply any balance recommended by the test when the results are received. Apply maintenance fertilizer the following growing season according to a soil test.

- b. Where seedbed cannot be prepared, 80 pounds of actual P₂O₅ and K₂O per acre (2 pounds of actual P₂O₅ and 2 pounds of actual K₂O per 1,000 square feet) at time of seeding. Apply 40 pounds of actual N per acre (1 pound per 1,000 square feet) during the first period of active growth following the seeding.
- c. If legumes are hydroseeded alone or in a mixture, use four times the normally recommended amount of inoculants to the slurry just before seeding, and apply lime and fertilizer by any method that will provide a uniform distribution.

B. MATERIALS

- 1. Apply seed species or mixtures as set forth in Section 7 and at the rates in **Table 2 Permanent Cover Grass and Legume Seeding Rates** for the permanent cover. Also apply a nurse crop seed mixture at the rates in **Table 1 Temporary Cover or Nurse Crop** unless otherwise set forth in Section 7.
- 2. All seed shall conform to the certifications of the PA Dept. of Agriculture and in addition be labeled in accordance with the USDA Federal Seed Act in effect at the time of planting. No seed will be accepted with a test date more than 9 months before delivery to the site. Seed that is moldy or otherwise damaged will not be accepted.

C. ESTABLISHMENT

- 1. Where the seedbed is prepared:
 - a. Smooth and firm the seedbed with a cultipacker or other similar equipment prior to seeding.
 - b. Apply seeds uniformly by drilling, broadcasting, or hydroseeding. When broadcast or drilled, cover grass and legume seeds with ¼-inch of soil. Cultipack or track with a tracked- vehicle where slopes allow.
 - c. Cultipack or track with a tracked- vehicle where slopes allow.
 - d. Mulch all areas according to construction specification for Mulching (PA484).
- 2. Where seedbed is not prepared:
 - a. Apply seed species or mixtures as set forth in Section 7 and at the rates in **Table 2 Permanent Cover Grass and Legume Seeding Rates** for the permanent cover. Also apply a nursery crop seed mixture at the rates in **Table 1 Temporary Cover and Nurse Crop**, unless otherwise set forth in Section 7.
 - b. All seed shall conform to the certifications of the PA Dept. of Agriculture and in addition be labeled in accordance with the USDA Federal Seed Act in effect at the time of planting. No seed will be accepted with a test date more than 9 months before delivery to the site. Seed that is moldy or otherwise damaged will not be accepted.
 - c. Apply seeds uniformly by drilling, broadcasting, or hydroseeding.
 - d. Cultipack or track with a tracked- vehicle where slopes allow.
 - e. Mulch all areas according to construction specification for Mulching (PA484).

4. PERMANENT COVER – ESTABLISHING SOD

A. SITE PREPARATION

- 1. Prepare the area, including lime and fertilizer, as set forth for Permanent Cover- Seeding in Section 3.A.
- 2. Till the soil surface to a depth of three inches and dampen immediately prior to laying sod.

B. MATERIALS

- 1. Sod shall be of the species set forth in Section 7.
- 2. Sod shall be grown from certified seed of adapted varieties, tested and approved by the PA Experiment Station, and under the cultural practices conducive to high quality sod that is free of any significant thatch, weeds, insects, and disease.
- 3. Sod shall be at least one-year old and no older than three years. Cultivated turfgrass shall be

considered ready for harvest when a cut portion of sod three feet in length and about 1-1/2 feet wide will support its own weight.

4. Cut sod of a width and length suited to the equipment and site, or as otherwise set forth in Section 7. Sod shall be cut, folded in the middle or rolled, and stacked on pallets. Folded sod shall be between 3 and 4 feet in length, unless otherwise allowed in Section 7. Sod shall be cut with a 1/2- to 1-inch layer of soil.
5. Have sod delivered to the site as soon as possible after harvesting. During hot weather, delivery shall be made within six hours. During cooler weather, when allowed in Section 7, delivery time may be extended up to 48 hours. Unless allowed in Section 7, sod shall not be planted during July and August, and when allowed shall be cut with at least 1-1/4 inch of soil and irrigated as necessary to ensure survival.

C. ESTABLISHMENT

1. Lay sod strips at right angles to the direction of water flow (slope), starting at the lowest elevation. Wedge the edges and ends of the sod strips together and tamp or roll. Stagger all end joints. Score the adjacent undisturbed ground so that the sod edges are flush and embedded (i.e. do not allow feathered edges).
2. On steep slopes or where required by Section 7, use wire or starch staples, fine mesh, or wooden pins and baler twine to secure the sod in place. When required in Section 7, remove wire and wooden stakes after the sod has rooted sufficiently to be secure.
3. Irrigate sod when dry conditions prevail to ensure survival. If required in Section 7, irrigate the sod to be lifted prior to harvesting.

5. PERMANENT COVER – TREES & SHRUBS ON HIGHLY DISTURBED AREAS

A. SITE PREPARATION

1. For seedings:
 - a. Site preparation shall be the same as set forth in Sections 3.A. (1 through 3).
 - b. Apply lime at the rate of 4000 pounds per acre on a 100-percent calcium carbonate basis over the area to be planted.
 - c. Apply fertilizer at the rate of 40 pounds of actual P₂O₅ and 40 pounds of actual K₂O per acre (1 pound per 1000 square feet) at the time of seeding. Apply 40 pounds of actual N per acre (1 pound per 1000 square feet) during the first period of active growth following the seeding. When strip-seeding, apply all of the fertilizer in the herbaceous strips.
2. For individual plantings:
 - a. Prepare the area by clearing and mowing to allow access for planting and plant growth, or as otherwise set forth in Section 7.
 - b. Planting pits in confined spaces or other harsh environments shall be excavated as recommended in *A guide to: Conservation Plantings in Critical Areas for the Northeast* (<http://plant-materials.nrcs.usda.gov//nypmc/>) unless otherwise set forth in Section 7.

B. MATERIALS

1. Plant species shall be as set forth in Section 7. Plant names required under this contract shall conform to those set forth in Standardized Plant Names, 1942 Edition, prepared by the American Joint Committee on Horticulture Nomenclature. Names not included therein shall conform to names generally accepted in the nursery trade.
2. All seed shall conform to the certifications of the PA Dept. of Agriculture and in addition be labeled in accordance with the USDA Federal Seed Act in effect at the time of planting. No seed will be accepted with a test date more than 9 months before delivery to the site. Seed that is moldy or otherwise damaged will not be accepted.
3. Plant materials shall be of the size and quality set forth in the rules adapted by the American Association of Nurserymen, Inc. and conform to the "American Standard for Nursery Stock". All

TABLE 1: Temporary Cover or Nurse Crop

SPECIES OR MIXTURE	SEEDING RATE		RECOMMENDED SEEDING DATES		ADAPTATION		
	(LBS/ACRE)		PLANT HARDINESS ZONE		DROUGHTY	POORLY DRAINED	ACIDITY pH
	TEMPORARY COVER	NURSE	4 & 5	6 & 7			
Redtop	5	3	3/15 – 7/01	3/01 – 6/15	X	X	4.0 – 7.5
			8/01 – 9/01	8/15 – 9/15			
Annual Ryegrass	40	20	3/15 – 7/01	3/01 – 6/15	X	X	5.5 – 7.5
			8/01 – 9/01	8/15 – 9/15			
Spring Oats	96	48	3/15 – 7/01	3/01 – 6/15	X		5.5 – 7.0
Sudangrass	40	20	7/01 – 8/01	6/15 – 8/15	X		5.5 – 7.5
Japanese Millet <i>(Echinochloa frumentacea)</i>	30	15	7/01 – 8/01	6/15 – 8/15	X		4.5 – 7.0
Winter Rye Grain	168	56	8/01 – 11/01	8/15 – 11/15	X		5.5 – 7.5
Winter Wheat	180	90	8/01 – 11/01	8/15 – 11/15	X		5.0 – 7.0

TABLE 2 - Permanent Cover Grasses and Legumes Seeding Rates
(Use a nurse crop from Table 1 selected for the site conditions)

SPECIES OR MIXTURE ¹	SEEDING RATE (LBS/ACRE)		ADAPTATION		
	PREPARED DRILLED CULTIPACKED	UNPREPARED ADVERSE SITE HYDROSEEDDED	DROUGHTY	POORLY DRAINED	ACIDITY pH
1. Tall Fescue	60	75	X	X	4.0 - 8.0
2. Tall Fescue and Red Fescue or Hard Fescue	40	60	X		5.0 - 7.5
	10	15			
3. Tall Fescue and Birdsfoot Trefoil ^{2/3}	20	30	X	X	5.0 - 7.5
	6	10			
4. Birdsfoot Trefoil ^{2/3} and Hard Fescue or Red Fescue	6	10	X		5.0 - 7.5
	20	30			
5. Crownvetch ² and Tall Fescue or Red Fescue or Hard Fescue or Perennial Ryegrass ⁴	10	15		X	6.0 - 7.5
	20	30			
6. Crownvetch ² and Birdsfoot Trefoil ^{2/3} and Tall Fescue	10	15	X		6.0 - 7.5
	6	10			

TABLE 2 - Permanent Cover Grasses and Legumes Seeding Rates cont.
 (Use a nurse crop from Table 1 selected for the site conditions)

SPECIES OR MIXTURE ¹	SEEDING RATE (LBS/ACRE)		ADAPTATION		
	PREPARED DRILLED CULTIPACKED	UNPREPARED ADVERSE SITE HYDROSEEDDED	DROUGHTY	POORLY DRAINED	ACIDITY pH
7. Flatpea ^{2/6} and	20	30	X		5.0-7.5
Tall Fescue or	20	30			
Red Fescue or					
Hard Fescue or					
Perennial Ryegrass ⁴					
8. Perennial Pea ^{2/6} and	40	60			5.0-7.5
Tall Fescue or	20	30			
Red Fescue or					
Hard Fescue or					
Perennial Ryegrass ⁴					
9. Alfalfa and ^{2/5}	10	15			6.5 - 7.5
Tall Fescue or	10	15			
Orchardgrass or	3	5			
Timothy ⁸	4	6			

SPECIES OR MIXTURE ¹	SEEDING RATE (LBS/ACRE)		ADAPTATION		
	PREPARED DRILLED CULTIPACKED	UNPREPARED ADVERSE SITE HYDROSEEDING	DROUGHTY	POORLY DRAINED	ACIDITY pH
10. Birdsfoot Trefoil ^{2/3/5} and	6	10			
Tall Fescue or	6	10	X	X	5.0- 7.5
Orchardgrass or	3	5	X		
Timothy	2	3			
11. Perennial Ryegrass ⁴ and	25	30	X	X	5.0 - 8.0
Tall Fescue or	25	35			5.5 - 7.0
Kentucky Bluegrass	15	20			5.5 - 7.5
12. Switchgrass ⁵	10	15	X	X	5.0- 7.5
13. Switchgrass and	10	15			
Birdsfoot Trefoil ^{2/3}	6	10	X	X	5.0 -7.5
14. Deertongue ⁵	15	25	X		3.5 - 7.5
15. Deertongue ⁵ and	15	25			
Birdsfoot Trefoil ^{2/3}	6	10	X		5.0 -7.5

Footnotes for Table 2

¹Consult the Agronomy Guide for cultivar recommendations of forage and turf species. Other species:

- Crownvetch ‘Penn gift’
- Flatpea ‘Lathco’
- Perennial Pea ‘Lancer’
- Switchgrass ‘Blackwell’ - Erosion control
 - ‘Cave-in-Rock’ - Forage
 - ‘Shelter’ - Wildlife
- Deertongue ‘Tioga’

²Inoculate legume seeds, use four times the normal rate of inoculate when hydroseeding.

³Birdsfoot Trefoil is not recommended in MLRA 148 and 149, where crown and root rots may injure the stand.

⁴Use only the “turf-type” fine-leaved perennial ryegrass varieties

⁵Use these mixtures on gentle, less erosive slopes; must be drilled or broadcast and cultipacked.

⁶Drill ½-inch deep or broadcast flatpea and perennial pea then cultipack.

Table 2a – Grass and Legume Seed Mixtures in Table 2 suitable for various areas or purposes.

Area/Purpose	Suitable Mixtures (Select One)
Slopes and Banks – non-mowed	
Well drainage	3, 4, 5, 6, 7, 8
Variable drainage	3, 6
Slopes and Banks (mowed)	
	1, 2, 11
Gullies and eroded areas	3, 4, 5, 6, 7, 8
Conservation Structures	
Sod waterways, spillways, and other frequent waterflow areas	1, 2, 3
Drainage ditches	
Shallow, less than 3 feet	1, 2, 3
Deep, non-mowed	5, 6, 7, 8
Pond banks, dikes, levees, dams, diversion channels, and occasional waterflow areas	
Mowed areas	1, 2, 3, 4, 11
Non-mowed areas	5, 6, 7, 8
Hay or silage on diversion channels and occasional waterflow areas	use adapted hay mixtures or 9, 10
Sanitary landfill areas	3, 4, 5, 6, 12, 13, 14, 15
Strip-mined spoils, mine wastes, fly ash, slag, settling-basin residues, and other severely disturbed areas (lime to soil test)	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Wildlife habitat	9, 10, 12, 13, 14, 15
Effluent Disposal Areas	10, 12, 13
Sand and Gravel Pits	12, 13, 14, 15

Table 2b – SEEDING DATES for species and mixes in Table 2 Permanent Cover Grasses and Legumes		
COOL SEASON PLANTS (MIXES 1 - 12)		
	Hardiness Zone 6 & 7	Hardiness Zone 4 & 5
Optimum	03/01- 04/15	03/15 - 05/01
Normal Range	11/15 - 06/15	11/01 - 07/01
	08/15 - 09/15	08/01 - 09/01
Project	11/15 - 09/15	01/01 - 09/01
WARM SEASON PLANTS (MIXES 12 - 15)		
	Hardiness Zone 6 & 7	Hardiness Zone 4 & 5
Optimal	03/01- 04/15	03/15 - 05/01
Normal Range	12/01 - 04/15	01/15 - 05/01

Table 3 – Trees suitable for highly disturbed areas				
SPECIES	LOWER LIMIT pH TOLERANCE	TOLERANCE TO SHADE ¹	DRAINAGE ADAPTATION	ELEVATION ²
CONIFERS				
Larch, Japanese	4.0	intermediate	Excessive – poor	
Pine, Austrian	4.0	intermediate	Well	
Pine, Pitch	4.0	intolerant	Excessive – well	Below 3000 feet
Pine, Red	4.0 – 4.5	intolerant	Excessive – well	Above 2000 feet
Pine, Scotch	4.0	intolerant	Well	
Pine, Virginia	4.0	intolerant	Excessive – well	Below 2500 feet
Pine, White	4.5	intermediate	Well – poor	
Spruce, Norway	4.5 – 5.0	tolerant	Well	
Spruce, White	4.5 – 5.0	tolerant	Well - poor	
HARDWOODS				
Alter, European Black	3.5	intolerant	Well-poor	Below 2500 feet
Aspen, Bigtooth	4.0	intolerant	Excessive-well	
Aspen, Quaking	4.0	intolerant	Excessive-well	
Birch, Gray	3.5	intolerant	Excessive-well	
Birch, Sweet	4.0	intermediate	Excessive-well	
Chestnut, Chinese	5.0	intermediate	Well	
Locust, Black ³ 'Steiner'	4.0	intolerant	Excessive-well	Below 3000 feet
Oak, Red	4.0	intermediate	Well	
Oak, Sawtooth 'Gobbler'	5.0	intolerant	Excessive-well	
Poplar, Hybrid	4.0 – 4.5	intolerant	Well	
Poplar, Yellow	4.5	intolerant	Well	Below 3000 feet
Sycamore	4.0 – 4.5	intolerant	Poor	Below 2500 feet

¹Shade tolerance of species defined as follows: **Tolerant** – can withstand completely shaded conditions; **Intermediate** – partial shade is tolerated; plant requires some sunlight; **Intolerant** – plant requires full sunlight

²Blank spaces indicates no restriction: “Below” means that species are to be planted below this elevation

TREE PLANTING DATES: Plant as soon as frost is out of the ground but no later than April 15 in hardiness zones 6 & 7; May 1 in hardiness zones 4 & 5.

SPECIES¹	LOWER LIMIT pH TOLERANCE	TOLERANCE TO SHADE²	DRAINAGE ADAPTATION	YEARS TO FRUIT MATURITY	MONTHS OF FRUIT MATURITY
Coral berry	5.0	tolerant	excessive-well	3	September – October
Crabapple	4.5 – 5.0	intolerant	well	3	September – October
Dogwood, Gray	5.0	intermediate	excessive-well	5	September – October
Dogwood, Silky	4.0	tolerant	well-poor	4 – 5	August – September
Honeysuckle, Amur	4.5 – 5.0	intermediate	excessive-well	3 – 4	September – October
<u>Indigobush</u>	4.0	intermediate	excessive-well	3	August
Locust, Bristly	3.5	intolerant	excessive-well	3 – 5	September
Privet, Amur	4.5 – 5.0	tolerant	well	4	September
Sumac, Aromatic	4.5	tolerant	excessive-well	5	July – August
Sumac, Shining	4.0	intermediate	excessive-well	4	September – October
Sumac, Smooth	4.5	intermediate	excessive-well	4	September – October
<u>Viburnum Arrowwood</u>	4.5	tolerant	well-poor	3 – 5	September – October
<u>Viburnum Cranberrybush</u>	4.5	intermediate	well-poor	3 – 5	August – September

¹Recommended varieties are:

- Crabapple - 'Midwest', 'Roselow'
- Dogwood, Silky - 'Indigo'
- Honeysuckle, Amur - 'Rem Red'
- Locust, Bristly - 'Arnot'
- Sumac, Aromatic - 'Konza'

²Shade tolerance of species defined as follows;

- Intermediate - partial shade is tolerated; plant requires some sunlight
- Intolerant - plant requires full sunlight
- Tolerant - can withstand completely shaded conditions

PLANTING DATES: Plant as soon as frost is out of the ground but no later than:	
HARDINESS ZONE	DATE
6 & 7	04/15
4 & 5	05/01

ATTACHMENT B RFP Scoring Sheet

Landowner/Job Name:

BMP #:

Project Location:

RFP Due Date:

Evaluation Criteria / Points	%	Bidder Name		Bidder Name		Bidder Name		Bidder Name	
		Score (1-10)	Result						
Adherence to RFP Instructions 1 (some documents filled out completely) - 10 (all documents filled out completely)	10		0		0		0		0
Bid Price 1 (highest price) - 10 (lowest price)	35		0		0		0		0
Safety Record 1 (did not provide record) - 10 (no reportables/good record)	10		0		0		0		0
Confidence in Quality of Work <i>(Conservancy may also check with other partners for feedback)</i> 1 (no references provided and unknown) - 10 (references provided and has done great work)	30		0		0		0		0
Small, Small Diverse Business 1 (no information provided) - 10 (federal and state small and small diverse business)	5		0		0		0		0
Construction Schedule Adherence 1 (no dates or schedule provided) - 10 (schedule completed within preferred timeframe)	10		0		0		0		0
Total -- All Evaluation Points	100	0	0	0	0	0	0	0	0