

# HEARTLAND CO-OP / IOWA SEED ASSOCIATION BATCH & BUILD 2025-2026

~~CEDAR~~, MARSHALL, ~~MUSCATINE~~, POWESHIEK + TAMA COUNTIES, IOWA

## TECHNICAL PLANS AND SPECIFICATIONS

December 2025  
PROJECT NO. 25-32609



Architecture  
Engineering  
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Planning  
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**TECHNICAL SPECIFICATIONS FOR:**

**HEARTLAND CO-OP / IOWA SEED ASSOCIATION BATCH & BUILD 2025-2026  
MARSHALL, ~~MUSCATINE~~, POWESHIEK, AND TAMA COUNTIES, IOWA**

**DECEMBER 2025**

**PROJECT NO. 25-32609**

	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p>
	<p><i>Spencer D Pech</i></p> <p>12/29/2025</p> <hr/> <p>Spencer Dean Pech, P.E. <span style="float: right;">Date</span></p> <p>License No.: P28161</p> <p>My License Renewal Date is December 31, 2026</p> <p><u>Sections covered by this seal:</u></p> <p>All sections Listed in Table of Contents</p>

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**END OF CERTIFICATIONS PAGE**

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BATCH & BUILD 2025 - 2026  
MARSHALL, MUSCATINE, POWESHIEK + TAMA COUNTIES, IOWA**

## TABLE OF CONTENTS

### CONSTRUCTION SPECIFICATIONS & STANDARDS

IA-1	Site Preparation	CS-001 (2013)
IA-3	Structure Removal	CS-003 (2011)
IA-5	Pollution Control	CS-005 (2011)
IA-6	Seeding and Mulching for Protective Cover	CS-006 (2011)
IA-342	Critical Area Planting	IR-342 (2022)
NRCS-8	Mobilization and Demobilization	CS-008 (2001)
IA-9	Subsurface Drain Investigation, Removal, and Repair	CS-009 (2014)
IA-11	Removal of Water	CS-011 (2011)
<del>IA-21</del>	<del>Excavation</del>	<del>CS-021 (2013)</del>
<del>IA-23</del>	<del>Earthfill</del>	<del>CS-023 (2015)</del>
<del>IA-24</del>	<del>Drainfill</del>	<del>CS-024 (2015)</del>
<del>IA-26</del>	<del>Topsoiling</del>	<del>CS-026 (2011)</del>
<del>IA-31</del>	<del>Concrete</del>	<del>CS-031 (2013)</del>
IA-45	Plastic (PVC, PE) Pipe	CS-045 (2011)
IA-46	Tile Drains for Land Drainage	CS-046 (2013)
IA-51	Corrugated Metal Pipe Conduits	CS-051 (2011)
<del>IA-61</del>	<del>Loose Rock Riprap</del>	<del>CS-061 (2015)</del>
<del>IA-95</del>	<del>Geotextile</del>	<del>CS-095 (2010)</del>
<del>IA-302</del>	<del>Fence</del>	<del>PS-302 (2023)</del>
IA-604	Saturated Buffer	PS-604 (2022)
<del>IA-605</del>	<del>Denitrifying Bioreactor</del>	<del>PS-605 (2023)</del>
IA-620	Underground Outlet	PS-620 (2024)

### CONSTRUCTION INSPECTION PLAN

## CONSTRUCTION SPECIFICATIONS & STANDARDS

## Construction Specification 000 IA CS-00-1 Site Preparation

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### 1. SCOPE

Site preparation work shall consist of clearing, grubbing, stripping, refuse removal, bank sloping and structure removal on the site as necessary to rid the site of all undesirable materials on or near the surface and prepare the site for the structure. All woody growth within the construction area shall be cleared and all stumps and roots one inch in diameter or larger shall be grubbed from the site. In addition, all areas within 25 feet of the footprint of the structure shall be cleared and grubbed except as directed by NRCS. The work shall also consist of the removal and disposal of structures (including fences) that must be removed to perform other items of work.

For wetland restoration, enhancement, or creation projects, the wetland area shall be disturbed as little as possible and existing naturally vegetated spillway areas shall not be disturbed.

### 2. FOUNDATION PREPARATION

The construction areas shall be stripped a minimum of 6 inches to remove all unsuitable materials such as organic matter, grasses, weeds, sod, debris, and stones larger than 6 inches in diameter.

In an earth embankment foundation area, all channel banks and sharp breaks shall be sloped to no steeper than 1.5 horizontal to 1 vertical.

The foundation area shall be thoroughly scarified before placement of fill material. The surface shall have moisture added or shall be compacted if necessary so that the first layer of fill material can be compacted and bonded to the foundation.

### 3. STRIPPED MATERIAL DISPOSAL

Suitable soil material shall be stockpiled for use as topsoil. The other stripped materials shall be buried, removed from the site, or disposed of as directed by the owner or NRCS. Whenever possible, material shall not be disposed of in the pool area created by the structure.

Stockpiled materials around a construction site should be placed so as not to hinder subsequent construction operations.

### 4. DISPOSAL OF REFUSE MATERIALS

Waste materials from clearing and structure removal shall be burned or buried at locations approved by the owner. Buried materials shall be covered with a minimum of 2 feet of earthfill. Whenever possible, material shall not be disposed of in any pool area created by the structure.

All refuse shall be disposed of in a manner which complies with all local and state regulations.

### 5. SALVAGE

Items to be salvaged shall be as shown on the drawings. Structures and fencing materials that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas.

## 6. SPECIFIC SITE REQUIREMENTS

### A. Measurement and Payment

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

### B. Items of Work and Construction Details

#### **“Site Preparation”:**

##### 1. Bid Item No. 1

This item will consist of work to remove and dispose of existing material to remove vegetation on areas to be excavated or filled. Total depth of vegetative stripping and topsoil stripping shall equal a combined depth of 12", with the estimated cubic yards of topsoil removal as shown in the plans. The topsoil replacement quantity shall be paid separately.

This item will also include any tree and brush removal along with any fences. These shall be considered incidental to site stripping.

This item will be paid out as a lump sum.



## Construction Specification 000 IA-3 Structure Removal

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### 1. SCOPE

The work shall consist of the removal, salvage and/or disposal of structures (including fences) from the designated areas and as indicated on the drawings.

### 2. MARKING

Each structure or item to be removed will be marked by means of stakes, flags, painted markers or other suitable methods.

### 3. REMOVAL

All structures designated for removal shall be removed to the specified extent and depth.

### 4. SALVAGE

Structures that are designated to be salvaged shall be carefully removed and neatly placed in the specified storage areas. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly match marked with paint prior to disassembly. All pins, nuts, bolts, washers, plates and other loose parts shall be marked or tagged to indicate their proper location in the structure and shall be fastened to the appropriate structural member or packed in suitable containers. Materials from fences designated to be salvaged shall be placed outside the work area on the property from which they are removed. Wire shall be rolled into uniform rolls of convenient size. Posts and rails shall be neatly piled.

### 5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be burned or buried at locations shown on the drawings. Buried materials shall be covered with a minimum of 2 feet of earthfill. Whenever possible, material shall not be disposed of in the pool area created by the structure.

All refuse shall be disposed of in a manner which complies with all local and state regulations.

## Specific Site Requirements

## Construction Specification 000 IA CS-005 Pollution Control 2011

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### 1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air during construction operations.

### 2. MATERIALS

All materials furnished shall meet the requirements shown on the drawings or in the specifications.

### 3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The measures and works shall include, but are not limited to, the following:

**Staging of Earthwork Activities:** The excavation and moving of soil materials shall be scheduled so that areas unprotected from erosion will be minimized. These areas will be unprotected for the shortest time feasible.

**Seeding:** Structures and disturbed areas shall be seeded as soon as possible after construction is completed.

Temporary seedings may be used as an alternative to other stabilization measures as approved by NRCS.

**Mulching:** Construction areas that have been disturbed but have no construction activity scheduled for 21 days or more shall have erosion protection measures applied by the 14th day. This erosion protection may be mulching or other approved temporary measures. Construction areas shall not be left open during a winter shutdown period and shall be protected by mulching.

All seeding and mulching shall be completed in accordance with the seeding plan and Iowa Construction Specification IA-6, Seeding and Mulching for Protective Cover.

The following works may be temporary. If they are installed as a temporary measure, they shall be removed and the area restored to its original state when they are no longer needed or when permanent measures are installed.

**Diversions:** Diversions may be required to divert clean runoff water away from work areas and to collect runoff from work areas for treatment and safe disposition.

**Stream Crossings:** Culverts or bridges may be required where construction equipment must cross streams.

**Sediment Basins:** Sediment basins may be required to settle and filter out sediment from eroding areas to protect properties and streams below the construction site.

**Sediment Filters:** Straw bale filters, geotextile sediment fences, or other equivalent methods may be used to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under them.

**Waterways:** Waterways may be required for the safe removal of runoff from fields, diversions, and other structures or measures

#### **4. CHEMICAL POLLUTION**

The Contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to be used to dispose of chemical pollutants, such as drained lubricating or transmission oils, greases, soaps, concrete mixer wash water, asphalt, etc., produced as a by-product of the construction work.

At the completion of the construction work, sumps shall be removed and the area restored without causing pollution.

Sanitary facilities such as chemical toilets or septic tanks shall not be placed adjacent to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water sources. At the completion of construction work, facilities shall be disposed of without causing pollution.

#### **5. AIR POLLUTION**

The burning of brush or trash or disposal of other materials shall adhere to local and state regulations.

Fire prevention measures shall be taken to prevent the start or the spreading of wild fires, which result from project work. Fire breaks or guards shall be constructed at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall insure safe operations at all times. If chemical dust suppressants are used, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the Engineer five working days before use.

#### **6. MAINTENANCE, REMOVAL, AND RESTORATION**

All pollution control measures and works shall be adequately maintained in a functional condition as long as needed during the construction operation. All temporary measures shall be removed and the site restored to as near original conditions as practical.

#### **7. SPECIFIC SITE REQUIREMENTS**

##### **A. Measurement and Payment**

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

##### **B. Items of Work and Construction Details**

###### **1. Subsidiary Item - Pollution Control**

This item shall consist of applying and performing all construction activities in a manner that will minimize water pollution, air pollution and soil erosion.

No separate payment will be made for Pollution Control. Compensation for this item will be other items as appropriate.

## Construction Specification 000 IA-6 Seeding and Mulching for Protective Cover

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### 1. SCOPE

The work shall consist of seeding, mulching, and fertilizing all disturbed areas and other areas as indicated on the drawings or otherwise designated.

### 2. SEEDBED PREPARATION AND APPLICATION

The entire area to be seeded shall be reasonably smooth and all washes and gullies shall be filled to conform to the desired cross-section before actual seedbed preparation is begun. At this stage of the operation, the required fertilizer and lime shall be applied uniformly and incorporated into the top 3 inches of the soil with suitable tillage equipment. The seedbed preparation operation shall be suspended when the soil is too wet or too dry. The seedbed shall be loosened to a depth of at least three inches.

On side slopes steeper than 2-1/2 horizontal to 1 vertical, the 3 inch minimum depth of seedbed preparation is not required, but the soil shall be worked enough to insure sufficient loose soil to provide adequate seed cover.

Unless otherwise specified, the seeding operation shall be performed immediately after preparation of the seedbed. The seed shall be drilled or broadcast by equipment that will insure uniform distribution of the seed.

### 3. MATERIALS

The seeding, fertilizing, and mulching requirements are as specified in Section 5 of this specification.

Straw from cereal grains or hay will be used as mulching material. It shall be relatively free of weeds.

### 4. MULCH APPLICATION

The required mulching shall be performed as soon as possible after seeding unless otherwise specified. The mulch shall be applied uniformly over the area. The type and rate shall be as specified. When mulching is required, all areas seeded during any one day shall be mulched within 24 hours. The mulch may be spread by any means that results in a uniform cover.

The mulch shall be anchored. Anchoring of the mulch may be performed by a mulch anchoring tool or regular farm disk weighted and set nearly straight, by installation of mulch netting, or by other methods approved by NRCS.

## 5. SPECIFIC SITE REQUIREMENTS

### 5.1 Site-Specific Seed Mix List

County	Site	Seed Mix
	15a. [REDACTED]	IA CP25 30-10 Standard
Marshall	15b. [REDACTED]	IA CP25 30-10 Standard
	18. [REDACTED]	IA CP25 30-10 Standard
	2. [REDACTED]	IA CP25 30-10 Standard
Tama	4. [REDACTED]	IA CP25 30-10 Standard
	1. [REDACTED]	SUDAS 9010 Native Grass and Forbs (Wildflower) Mix
Poweshiek	9. [REDACTED]	SUDAS 9010 Native Grass and Forbs (Wildflower) Mix
	10. [REDACTED]	SUDAS 9010 Native Grass and Forbs (Wildflower) Mix

5.2 IA CP25 30-10 Standard Requirements

Grasses	Scientific Name	Common Name	Seeds/Ft <sup>2</sup>	PLS Lbs/Acre	PLS Lbs Total
1	<i>Andropogon gerardii</i>	Big Bluestem	7.346	2.000	2.00
2	<i>Sporobolus compositus</i>	Rough Dropseed	2.755	0.250	0.25
3	<i>Elymus canadensis</i>	Canada Wildrye	0.669	0.350	0.35
4	<i>Sorghastrum nutans</i>	Indiangrass	7.713	1.750	1.75
5	<i>Schizachyrium scoparium</i>	Little Bluestem	2.204	0.400	0.40
6	<i>Elymus virginicus</i>	Virginia Wildrye	1.157	0.750	0.75
7	<i>Bouteloua curtipendula</i>	Sideoats Grama	0.551	0.250	0.25
8	<i>Panicum virgatum</i>	Switchgrass	3.960	0.770	0.77
9	<i>Koeleria macrantha</i>	Junegrass	3.673	0.050	0.050
<b>SUBTOTAL GRASSES</b>			<b>30.028</b>	<b>6.570</b>	<b>6.570</b>
Forbs/Legumes	Scientific Name	Common Name	Seeds/Ft <sup>2</sup>	PLS Lbs/Acre	PLS Lbs Total
1	<i>Rudbeckia hirta</i>	Black-eyed Susan	1.014	0.030	0.030
2	<i>Helianthus helianthoides</i>	Oxeye, False Sunflower	0.046	0.020	0.020
3	<i>Oenothera biennis</i>	Common Evening Primrose	0.132	0.004	0.0040
4	<i>Ratibida columnifera</i>	Long-headed Coneflower	0.771	0.050	0.050
5	<i>Oligoneuron rigidum</i>	Stiff Goldenrod	0.060	0.004	0.0040
6	<i>Achillea millefolium</i>	Common Yarrow	2.684	0.041	0.041
7	<i>Potentilla arguta</i>	Prairie Cinquefoil	0.845	0.010	0.010
8	<i>Monarda fistulosa</i>	Wild Bergamot	1.543	0.060	0.060
9	<i>Verbena stricta</i>	Hoary Vervain	0.103	0.010	0.010
10	<i>Symphotrichum novae-angliae</i>	New England Aster	0.097	0.004	0.0040
11	<i>Desmanthus illinoensis</i>	Illinois Bundle Flower	0.309	0.200	0.20
12	<i>Helianthus maximiliani</i>	Maximilian's Sunflower	0.096	0.020	0.020
13	<i>Dalea purpurea</i>	Purple Prairie Clover	1.190	0.180	0.18
14	<i>Ratibida pinnata</i>	Gray-headed Coneflower	0.110	0.010	0.010
15	<i>Solidago nemoralis</i>	Old Field Goldenrod	0.220	0.002	0.0020
16	<i>Penstemon digitalis</i>	Foxglove Beardtongue	0.191	0.004	0.0040
17	<i>Pycnanthemum tenuifolium</i>	Slender Mountain Mint	0.555	0.004	0.0040
18	<i>Asclepias syriaca</i>	Common Milkweed	0.008	0.005	0.0050
19	<i>Dalea candida</i>	White Prairie Clover	0.070	0.010	0.010
<b>SUBTOTAL FORBS</b>			<b>10.044</b>	<b>0.668</b>	<b>0.668</b>
Woody	Scientific Name	Common Name	Seeds/Ft <sup>2</sup>	PLS Lbs/Acre	PLS Lbs Total
<b>SUBTOTAL VINES/WOODY</b>			<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>TOTAL</b>			<b>40.072</b>	<b>7.238</b>	<b>7.238</b>

## 5.2 SUDAS 9010 Native Grass and Forbs (Wildflower) Requirements

**Native Grass and Forbs (Wildflower) Seeding:** Between April 1 and June 30, use the following seed mixture for areas designated for native grass and wildflower seeding.

**Table 9010.13: Native Grass and Forbs (Wildflower) Seeding Mixture**

Common Name	Scientific Name	Application Rate**
<b>GRASSES</b>		<b>lb/acre</b>
Big bluestem*	<i>Andropogon gerardii</i>	1.0
Canada wild rye	<i>Elymus Canadensis</i>	1.5
Indiangrass*	<i>Sorghastrum nutans</i>	1.0
Little bluestem*	<i>Schizachyrium scorparium</i>	2.0
Sideoats grama*	<i>Boutelouea curtipendula</i>	2.5
Switchgrass*	<i>Panicum virgatum</i>	0.5
<b>FORBS (WILDFLOWERS)</b>		<b>oz/acre</b>
Black-eyed Susan	<i>Rudbeckia hirta</i>	3.0
Butterfly milkweed	<i>Asclepias tuberosa</i>	4.0
Canadian anemone	<i>Anemone canadensis</i>	0.5
Common mountainmint	<i>Pycnanthemum virginianum</i>	0.25
Golden Alexanders	<i>Zizia aurea</i>	8.0
Grey-headed coneflower	<i>Ratibida pinnata</i>	2.75
Heath aster	<i>Symphyotrichum ericoides</i>	0.25
Ironweed	<i>Veronia fasciculata</i>	3.0
New England aster	<i>Symphyotrichum novae-angliae</i>	1.25
Ohio spiderwort	<i>Tradescantia ohiensis</i>	7.0
Oxeye sunflower	<i>Heliopsis helianthoides</i>	12.0
Pale purple coneflower	<i>Echinacea pallida</i>	15.0
Partridge pea	<i>Chamaecrista fasciculata</i>	32.0
Prairie blazing star	<i>Liatris pycnostachya</i>	4.5
Purple prairie clover	<i>Dalea purpurea</i>	2.5
Rattlesnake master	<i>Eryngium yuccifolium</i>	1.75
Showy goldenrod	<i>Solidago speciosa</i>	0.50
Stiff goldenrod	<i>Solidago rigida</i>	1.0
Swamp milkweed	<i>Asclepias incarnata</i>	4.0
White wild indigo	<i>Baptisia alba</i>	2.0
Wild bergamot	<i>Monarda fistulosa</i>	1.25
<b>NURSE CROP</b>		<b>lb/acre</b>
Oats (spring seeding - April 1 to June 30)		32
Winter wheat (dormant/frost seeding - November 1 to March 31)		25

\* Furnish seed certified as Source Identified Class (Yellow Tag) Source G0-Iowa.

\*\* Seeding rates for native grass and forb species are given as PLS. Either the germination test or Tetrazolium (TZ) test is acceptable to determine PLS for native species.

5.3 SUDAS 9010 Type 2 (Permanent Cool Season Mixture for Slopes and Ditches) Requirements

**Type 2 (Permanent Cool Season Mixture for Slopes and Ditches):** Not typically mowed. Reaches a maximum height of 2 to 3 feet, low fertility requirements, grows in the spring and fall, and can go dormant in the summer. Use between March 1 and May 31 and between August 10 and September 30.

**Table 9010.07: Type 2 Seed Mixture**

Common Name	Application Rate lb/acre
Tall fescue <sup>1</sup>	100
Kentucky bluegrass	20
Ryegrass, perennial <sup>2</sup>	75

<sup>1</sup> Use endophyte free cultivars including Fawn, K-31, or a combination.

<sup>2</sup> Use cultivars including Linn, Amazon, Noriea, or Nui, or a combination.

5.4 Pasture Mix: Smooth Bromegrass, Birdsfoot Trefoil & Chicory\*

Refer to Iowa Conservation Practice 342 Critical Area Planting for seeding rate for Smooth Bromegrass and Birdsfoot Trefoil. Mix should include Chicory. Mix shall not include any Alfalfa or Clover. Submit proposed seed mix to landowner, Watershed Coordinator and Engineer for approval.

5.5 Measure and Payment; Items of Work

A. Measurement and Payment

Measure and payment shall be to the nearest hundredth of an acre of seeded area. Item includes all labor, equipment, and fertilizer required to complete the work. Refer to the plans for further details.

B. Items of Work and Construction Details

**“Seeding”:**

1. Bid Item No. 2

This item will consist of seeding the areas as shown on the plans.

Some areas of the sites may have existing CRP vegetation or steep slopes with existing vegetation. Local NRCS personnel will determine if these areas will be included as part of the seeding areas for this project or will be left as is. Site-specific seed mixes are subject to change based on input from local NRCS personnel. This may affect the bid quantity and Contractor will verify with Engineer the seed mix and number of acres that will require seeding.

All seed must be clean and weed free. Seeding rates are expressed in pounds of pure live seed per acre. All native seed must be yellow-tagged Iowa ecotype unless approved otherwise by IDALS-DSCWQ.

Seeding mixture for each site shall be as specified in Section 5.1. Where seeding rate is not specified, number of seeds will be based on Iowa Conservation Practice 342 Critical Area Planting. Refer to Iowa Conservation Practice 342 Critical Area Planting

Implementation Requirements for seedbed preparation, fertilizer, mulching, and seeding date requirements. Contractor's proposed seed mix shall be submitted to Engineer and local NRCS office for approval at least 2 weeks before seed is to be applied.

Measurement and Payment will be based on the area successfully seeded and measured to the nearest 0.1 acre.

2. Weed Control (Not a Bid item)

Weed control may be needed depending upon the start date of the contract, the initiation of construction activities, and the seeding date requirements.

Weed control will be added to the contract with a change order to be negotiated between Contractor and Division based on conditions observed and the type of weed control used and will be paid only once. If delays require additional weed control, this will be paid for at Contractor's own expense.

Weed control may include placement of a cover crop such as oats or rye, spraying with appropriate chemicals, or disking. If thistles are present, only spraying is allowed for weed control and shall include appropriate chemicals designed to control thistles.



# Critical Area Planting

## Iowa Implementation Requirements

Natural Resources Conservation Service  
Des Moines, Iowa

Iowa Conservation Practice 342  
June 2017 revised October 2022

### Definition

Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices.

### Purpose

- Stabilize areas with existing or expected high rates of soil erosion by water and wind.
- Stabilize areas, such as sand dunes and other riparian areas.
- Stabilize stream and channel banks, ponds and other shorelines, and earthen features of structural conservation practices.



### Condition Where Practice Applies

This practice applies to highly disturbed areas, such as: active or abandoned mined lands; urban restoration sites; construction areas; conservation practice construction sites; eroded banks of natural and constructed channels and lake shorelines; areas needing stabilization before or after natural disasters, such as floods, hurricanes, tornadoes and wildfires; and other areas degraded by human activities or natural events.

### Criteria for Conservation Cover

#### A. Seeding Periods

Permanent, perennial vegetative cover and/or trees will be established during the first recommended seeding or planting period for the selected species or mixture. Planting dates are outlined on Table 1 of this implementation requirement. Planting immediately after construction of earthen structures such as terraces, grade stabilization, or ponds may be completed at the discretion of the Conservation Planner with Job Approval Authority.

#### B. Fertilizer and Lime Requirements

No fertilizer requirement for seedings that are predominantly native. Apply 50 lbs per acre of Nitrogen and follow Iowa State University PM-1688 to apply phosphorus, potassium and lime (lime to a minimum target pH of 6.0 at a 3 inch depth) based on a soil test.

When a current soil test is not available, apply 50 lbs P<sub>2</sub>O<sub>5</sub> per acre, 50 lbs K<sub>2</sub>O per acre and 1000 pounds per acre ECCE lime. Fertilizer requirements may be waived at the discretion of the Conservation Planner with Job Approval Authority on sites:

- Less than 1 acre in size.
- Where application equipment cannot access the site (i.e. steep sides of terraces, grade stabilization, ponds).
- Field practices, such as waterways, when soil tests for adjacent cropland is at optimum or higher.

**C. Companion Crop**

All critical area plantings will contain a companion crop of spring cereal rye or will be mulched. Mulching is recommended on slopes steeper than 4:1 where mowing of a companion crop may be difficult or dangerous. Mulch of small grain straw shall be used at the rate of 2 tons/ac.

For spring seedings of introduced species, oats or a spring cereal grain shall be seeded at a rate of 1 1/2 bushels/acre to reduce soil erosion and help control weed competition. The oats shall be clipped at the time of seed head emergence to promote growth of the new permanent cover. The use of the companion crop is not required when interseeding.

**D. Seedbed preparation and Seeding**

1. Conventional seeding for spring and late summer seeding periods where site conditions allow for safe operation of equipment.

- The seedbed shall be worked to a depth of 3", smooth, friable and firm before seeding.
- All tillage operations shall be performed across the general slope of the land.
- Grass and legume seed shall be drilled uniformly over the area at a 1/4-1/2 inch depth or broadcast uniformly over the area and rolled into the seedbed.
- Where erosion is a concern prepare a seedbed with tillage tool that will leave enough residue or provide mulch to provide adequate protection.

2. No-till seeding for spring, late summer and dormant seeding periods where site conditions allow for safe operation of equipment.

- Approved herbicides shall be applied to kill or suppress existing weed competition, as necessary. Herbicides will not be used in waterways or filter strips adjacent to wetlands or other waterbody.
- A drill designed for no-till planting shall be used to plant the seed at a depth of 1/4 - 1/2 inch.

3. Frost Seeding

- Broadcast seed for only those species approved for frost seeding as shown in table 2 and table 3.

4. Hydro-seeding

- Hydro-seeding can be used on all sites but especially on sites that are too steep for regular seeding equipment to operate. The prescribed procedure will be to apply the seed and fertilizer in a water slurry uniformly over the surface. A second trip will be needed to apply an asphalt emulsion to long fiber mulch as it is blown on.

5. Sodding

- All sod used shall be free of noxious weeds as listed in Iowa State Laws and shall be cut from stands giving not less than 90 percent ground cover.
- Only moist, fresh sod shall be used. Lay sod as soon as possible after delivery to the site. Wet soil to a depth of 2 inches or more prior to laying the sod. Lay the sod from the lower end of the slope. Sod strips shall be laid at right angles to the flow of water, stagger joints. Fill any open joints with loose soil. Tamp or roll laid sod to insure a solid contact of root mass to soil surface.
- On severely steep sites or when anticipating overland flow, sod shall be held in place by woven wire, wooden pegs, wire staples, or similar material. Pegs or staples will be a minimum of 10 inches long.

**E. Seeding Stand Improvement**

This includes any stand modification that maintains some vegetative component of the original stand.

1. Incorporation of grasses and/or legumes with light tillage.

- Weaken the existing stand in the fall or early winter by use of herbicides, grazing, mowing or a combination of these methods.

- Use a disk, cultivator, or similar tool to disturb 40- 50% of the existing stand.
  - Grass and legumes shall be drilled uniformly over the area at 1/4-1/2 inch depth, or broadcast uniformly over the area and rolled into the seedbed.
  - Remove early spring regrowth by mowing to reduce competition and allow the new seedlings to become established.
2. Incorporation of grasses and/or legumes with no- tillage (interseeding) for spring, late summer and dormant seeding periods.
    - When interseeding into existing sod, graze, burn, mow or apply herbicides to kill strips or suppress existing vegetation and to control weed competition. Herbicides will not be used in waterways or filter strips adjacent to wetlands or other waterbody.
    - Control broadleaf weeds by applying herbicide at least two weeks prior to applying contact herbicides and prior to seeding.
    - Grass and legumes shall be drilled uniformly over the area at 1/4-1/2 inch depth.
    - Remove early spring regrowth by mowing to reduce competition and allow the new seedlings to become established.
  3. Incorporation of grasses and/or legumes with frost seeding.
    - Broadcast seed only species approved for frost seeding as shown in table 2 and table 3. Small smooth (shiny) seeded species are best for incorporation into the soil during freezing and thawing.
    - Frost seeding is likely to be more successful if existing stand is weak and less than 50 percent of the ground is covered with live vegetation.

#### **F. Inoculation**

1. Legume seed shall be inoculated and the inoculant shall be specific to the legume seeded.
2. When more than one legume species is used, each species shall be inoculated separately.

#### **G. Seed Quality**

1. All seed shall be of high quality and comply with Iowa Seed and Weed Laws.
2. Cool season (introduced) grass and legume seeding rates are expressed in bulk pounds/acre. Seed quality shall not drop below 80% Pure Live Seed (PLS) where  $PLS = (\% \text{ germination} + \text{dormant seed}) \times \% \text{ purity}$ .
3. Native grass species seeding rates are expressed in PLS pounds/acre.

#### **H. Management during the Establishment Year**

Plant species and cultivars shall be selected based upon:

1. Climatic conditions such as annual rainfall, seasonal rainfall, growing season length, humidity levels, temperature extremes and the USDA Plant Hardiness Zones.
2. Soil condition and position attributes such as pH, percent slope, available water holding capacity, aspect, drainage class, inherent fertility, flooding and ponding, and levels of salinity and alkalinity.
3. Plant characteristics such as season of growth, vigor, ease of establishment, longevity of the species, growth habit, adaptation to soil conditions, and conservation value.
4. Resistance to diseases and insects common to the site or location.
5. Compatibility with other plant species and their selected cultivars in rate of establishment and growth habit when seeded together as a mixture.
6. Seeding Rates

The pure stand rates in table 2 of this standard are the minimum rates for planting a single species stand into well-prepared seedbed at the proper placement. The pure stand rates are decreased to a percentage of the desired stand when used to calculate a mixture of two or more species. Select combinations of plant species and cultivars best adapted to site conditions.

7. When frost seeding is used, the seeding rate shown in table 2 and table 3 shall be multiplied by 1.5.

#### 8. Introduced Species

- Approved introduced plant species, allowable mixture composition and the pure stand seeding rate are shown in Table 2.
- A designed seeding mixture shall meet criteria specified in table 2 as to species composition and seeding rate.
- For critical area seeding used for erosion control, at least 50% of mixture shall be composed of grasses.
- Tall Fescue shall not compose more than 10% of the mixture if the secondary purpose is for wildlife.
- Mixtures may include up to 20% native grasses. Use the criteria for the predominant species in the mixture for stand establishment.

#### 9. Native Species

- Approved native plant species, allowable mixture composition and a pure stand seeding rate are shown in Table 3.
- A designed seeding mixture shall meet criteria specified in table 3 as to species composition and seeding rate. At least 50% of the mixture shall be composed of grasses. For seeding mixtures with the secondary purpose of wildlife not more than 20% of the mixture will be composed of switchgrass.
- When developing seeding mixtures, except eastern gamma grass, use 60 seeds/sq. ft. for grass stands.
- Mixtures may include up to 20% introduced legumes. Use the criteria for the predominant species in the mixture for stand establishment.

**I. Weed Control During the Establishment Year** Weed control during the establishment year shall be provided to ensure survival of the new permanent seeding.

1. To manage severe weed competition, native species may be mowed no closer than 8 inches and introduced species no closer than 4 inches.
2. Approved herbicides may be used on both introduced and native plantings to control weed species.

#### **J. Establishment of Temporary Cover**

Temporary cover may be required to reduce potential weed and erosion problems where one of the following conditions exists.

1. Fields with herbicide carry over.
2. Where planting is delayed due to unavailability of seed.
3. The normal planting period has passed.
4. Temporary cover or mulching will be established on sites where construction delays or shutdowns occur if the delay or shutdown will last more than 30 days.
5. The temporary cover shall be seeded as specified in Table 4.

#### **K. Site Protection and Access Control**

Grazing animal access to planted areas will be controlled for a minimum of two growing seasons during the establishment period.

All areas to be grazed will have a grazing plan that meets the criteria in the Iowa Field Office Technical Guide. Grazing shall be permanently excluded on high hazard areas, such as cut banks, areas of seepage, or other potentially unstable areas.

**L. Re-vegetate Degraded Sites that Cannot Be Stabilized Through Normal Farming Practices**

If gullies or deep rills are present, they will be filled and leveled as necessary to allow equipment operation and ensure proper site and seedbed preparation.

Based on a soil test and other appropriate site evaluations, soil amendments will be added as necessary to improve or eliminate physical or chemical conditions that inhibit plant establishment and growth.

**Table 1. Seeding dates for introduced and native species**

Type of Seeding	Introduced Species <sup>2</sup> (Grasses and Legumes)	Native Species <sup>3</sup>
Spring	March 1 - May 15	April 1 - July 1
Late Summer	August 1 - September 15	Not Recommended
Dormant <sup>1</sup>	November 15 - Freeze	November 15 - Freeze
Frost <sup>1</sup>	February 1 - March 15	February 1 - March 15

1. Refer to Table 2 and 3 for applicable plant species.
2. Includes all species generally considered introduced.
3. Includes all warm and cool season natives planted in mixture.

**Table 2. Seeding chart for introduced plant species**

Plant Species	% of Mixture (Range Allowed)		Seeding Rate PLS/acre
	Critical Areas Grassland <sup>3/</sup>	Trees, Shrubs & Wildlife	
Smooth brome <sup>1</sup>	0-100	0-25	25
Kentucky bluegrass <sup>1</sup>	0-80	0-10	25
Orchardgrass <sup>2</sup>	0-25	0-100	10
Timothy <sup>2</sup>	0-25	0-100	10
Alfalfa <sup>2</sup>	0-50	0-50	20
Red clover <sup>2</sup>	0-50	0-50	16
Birdsfoot trefoil <sup>2</sup>	0-50	0-25	16
Reed Canarygrass <sup>5</sup>	0-25	0	16
Perennial rye	0-50	0-50	25
Ladino clover <sup>2</sup>	0-50	0-50	8
Red top	0-50	0-80	10
Alsike clover <sup>2</sup>	0-50	0-50	8
Tall Fescue <sup>1,7</sup>	0-50	0-10	16

Table 2. Seeding chart for introduced plant species cont...

Plant Species	% of Mixture (Range Allowed)		Seeding Rate PLS/acre
	Critical Areas Grassland <sup>3/</sup>	Trees, Shrubs & Wildlife	
Sweetclover <sup>2,4</sup>	0-20	0-20	10
Intermediate Wheatgrass <sup>1,6</sup>	0-75	0-75	30
Meadow Bromegrass	0-100	0-25	30
Meadow Fescue	0-75	0-25	16

1. For critical area seeding used for erosion control, at least 50% from the grassland or wildlife seeding mixture shall be composed of sod forming grasses.
2. Species suitable for frost seeding, increase seeding rate by a factor of 1.5.
3. Mixtures may include up to 20% native grasses. See Table 3 for seeding rates. Use the criteria for the predominate species in the mixture for establishment.
4. Sweet clover is to be used in mixtures only.
5. Reed Canary grass is to be used only for very wet sites with high nutrient load only if Reed Canary grass is already present downstream of the practice.
6. Suitable for well drained sites.
7. Tall Fescue will not consist of more than 10% of the mix if primary or secondary purpose is for wildlife.

Table 3. Seeding chart for native plant species

Grasses <sup>1</sup>	% of Mixture (Range Allowed)	Pure Stand Seeding Rate PLS lbs./acre	Seeds/sq. ft.	Approx. Seeds/ lb.
Big bluestem, <i>Andropogon gerardi</i>	0-100	16	60	165,000
Blue grama, <i>Bouteloua gracilis</i>	0-20	4	75	825,000
Buffalograss, <i>Buchloe dactyloides</i>	0-20	65	60	40,000
Canada wildrye, <i>Elymus canadensis</i>	0-20	22	61	121,000
Eastern gamagrass, <i>Tripsacum dactyloides</i>	0-100	20	4	7,500
Indiangrass, <i>Sorghastrum nutans</i>	0-100	15	60	175,000
Little bluestem, <i>Schizachyrium scoparium</i>	0-20	11	60	240,000
Sideoats gramma, <i>Bouteloua curtipendula</i>	0-20	14	61	191,000
Switchgrass, <i>Panicum virgatum</i> <sup>2</sup>	0-100	7	62	389,000
Virgina Wildrye, <i>Elymus virginicus</i>	0-20	27	60	96,000
Western wheatgrass, <i>Agropyroni smithi</i>	0-20	24	61	110,000

1. When developing seed mixtures, except eastern gamagrass, use 60 seeds/sq. ft. for grass stands. Grass and forb/legume mixtures are 40 seeds/sq. ft. for the grass component and minimum of 20 seeds/sq. ft. for forb/legume component.
2. Species suitable for frost seeding, multiply seeding rate by factor of 1.5.

Table 4. Temporary Seeding Recommendations

Fields with atrazine <sup>1</sup> carryover, lack of suitable seed or late planting date	
Sudangrass	20 lbs./acre
Sorghum-Sudangrass hybrid	20 lbs./acre
Corn	2 bushels/acre
Fields where planting is delayed, due to lack of suitable seeding or late planting date	
Oats	3 bushels/acre
Winter rye	2 bushels/acre
Spring or winter wheat	2 bushels/acre

1. For other herbicide carryover problems, check with the area office.

Table 5. Critical Area Seedbed Mixtures for Specific Site Conditions

Site Conditions	Seeding Mixture	Rate lbs./acre
Moderately to well drained, limed or non-acid, fertile soils	Alfalfa Red clover Smooth brome grass	3 2 15
	Alfalfa Timothy Smooth brome grass Or Orchardgrass	6 2 15 Or 8
Imperfectly drained soils	Red clover Ladino clover Orchardgrass	4 1 8
	Birdsfoot trefoil Smooth brome grass Timothy	5 12 3
	Big bluestem Switchgrass	14 2
Poorly drained soils	Birdsfoot trefoil Timothy Or Orchardgrass	4 8 Or 12
	Alsike clover Ladino clover Tall fescue Or Timothy	2 3 8 Or 5

Table 5. Critical Area Seedbed Mixtures for Specific Site Conditions cont...

Site Conditions	Seeding Mixture	Rate lbs./acre
Very wet sites with high nutrient loading (i.e. animal waste filter strips)	Reed canary grass	16
	Tall fescue	16
	Switchgrass	7
Medium acid to strongly acid (6.0-5.1) with well drained to poorly drained soil that has a high clay content	Birdsfoot trefoil	7
	Tall fescue	5
	Bromegrass	8
Medium to strongly acid (pH 6.0-5.1) shallow (20 in.) with poorly drained soils with low fertility and low level management	Birdsfoot trefoil	4
	Tall Fescue	4
	Red top	3
	Switchgrass	2
Deep or coarse sands, droughty, usually acid (pH 6.0)	Sand lovegrass	2
	Switchgrass	5
	Prairie sandreed grass	4
Reclaimed acid mine spoil (pH 4.0)	Birdsfoot trefoil	4
	Red clover	4
	Crown vetch	4
	Tall fescue	4
Reclaimed acid mine spoil, deep coarse sands, droughty, low fertility (pH 4.0)	Switchgrass	2
	Big bluestem	4
	Indiangrass	4
	Little bluestem	3
Alkaline mine spoil (pH 7.4)	Bromegrass	12
	Alfalfa	10
	Bromegrass	14
	Timothy	5

**Specific Site Requirements**

Refer to IA-CS-006 Seeding and Mulching for Protective Cover for site-specific seed mix.

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

**Construction Specification 8—Mobilization and Demobilization**

**1. SCOPE**

The work consists of the mobilization and demobilization of the contractor's forces and equipment necessary for performing the work required under the contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

**2. EQUIPMENT AND MATERIAL**

Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in section 4 of this specification.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal, and site cleanup of offices, buildings, and other facilities assembled on the site specifically for this contract.

This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

**3. PAYMENT**

Payment will be made as the work proceeds, after presentation of paid invoices or documentation of direct costs by the contractor showing specific mobilization and demobilization costs and supporting evidence of the charges of suppliers, subcontractors, and others. When the total of such payments is less than the lump sum contract price, the balance remaining will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for completion of the work.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

**4. ITEMS OF WORK AND CONSTRUCTION DETAILS**

A. Measurement and Payment

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

B. Items of Work and Construction Details

**“Mobilization”:**

1. Bid Item No. 3

This item shall consist of mobilizing and demobilizing personnel and equipment in preparation to perform the work within the scope of this contract.

Any work that is necessary to provide access to the site including, but not limited to, grading, temporary culverts, and clearing will be included in this item. When construction is completed access areas will be restored, as close as practical, to its original condition.

Any fence removed for access and /or to provide work area shall be replaced with same or like materials as approved by the engineer.

The Contractor shall exercise caution to minimize the amount of damage caused by the grading and clearing operations.

Portable toilets shall be provided at the construction site and used for the sanitary facilities.

This item shall not include transportation of personnel, equipment and operating supplies within the work limits areas of this contract.

Payment will constitute full compensation for related subsidiary item, Pollution Control.

Payment will be made as the work proceeds and will paid out on the percent of the project complete as the work progresses. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for the completion of the work.

Contractor is to contact “Iowa One Call” for utility locations a minimum of two (2) days prior to any excavation/construction. The ticket number must be provided to Engineer.

# NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

## IA-9 SUBSURFACE DRAIN INVESTIGATION, REMOVAL, AND REPAIR

### 1. SCOPE

The work shall consist of investigation, location, repair, and/or removal of subsurface drains (tile) near new or existing animal waste storage facilities or in wetland restoration, enhancement, or creation project areas, or other situations where subsurface drains may be present.

### 2. INVESTIGATION AND LOCATION

An inspection trench at least 10 inches wide shall be dug at the location shown on the drawings or as directed by the engineer or his representative. The trench shall be at least 6 feet deep measured from the original ground line, unless otherwise shown on the plans. The Engineer or his representative shall examine the trench and excavated material to identify tile lines.

Size, material, operating condition and direction of flow of each conduit shall be documented. Location and flow line elevation of each conduit shall be surveyed with horizontal and vertical control based on benchmarks shown on the plans.

The inspection trench shall be documented by surveying the natural ground and trench bottom location and elevations at the beginning, end, and every 50 feet for trenches longer than 50 feet.

Backfilling shall not be started without approval of the Engineer. See Section 5 for backfill specifications.

Trench shields, shoring and bracing, or other methods necessary to safeguard the workers and work, and to prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the contractor.

### 3. TILE REPAIR

Unless designated for removal, replace damaged conduit with new conduit having equal or greater capacity using material specified in Section 6 or 7. When replacing short sections of clay or concrete tile with single-wall corrugated polyethylene pipe, use the next larger nominal size.

Make connections with manufactured fittings and tight joints. Where joints have gaps that would allow soil to enter, cover the joint with a permanent type material such as coal tar pitch treated roofing paper, fiber glass sheet or mat, or plastic sheet.

If the investigation trench has been excavated below the existing drain grade, backfill the trench with gravel or well-pulverized soil in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to provide a firm foundation for the conduit at the existing grade. Do not backfill with any soil containing broken tile fragments.

Using selected soil free of hard clods, rocks, or frozen soil, hand tamp the backfill material around the haunch of the pipe in layers not over four (4) inches thick to provide support. Hold the conduit in place

mechanically while placing excavated material around and over the conduit to ensure proper alignment and grade is maintained. Complete the backfill operation according to Section 5.

#### **4. TILE REMOVAL**

Remove conduits as shown on the plans or directed by the Engineer or his representative, including envelope filter material or other flow enhancing material when present.

Cap or plug the open ends of the disconnected conduit to prevent soil entry when the conduit will continue to function downstream, or otherwise shown on the plans. For a minimum distance of two feet around each sealed conduit end, backfill in layers not over four (4) inches thick and tamp by hand or manually directed power tamper to a density equal to or greater than the surrounding undisturbed soil. Do not backfill with any soil containing broken tile fragments, large stones, frozen material, or large dry clods.

Where tile are located beneath an existing animal waste facility, remove the tile or fill the entire length of tile with concrete or Portland cement grout as shown on the plans. When tile removal is specified, the owner shall contact the Iowa Department of Natural Resources (IDNR) for permission to remove the drainage tile under the structure. The structure shall be emptied of waste or lowered to a point below the tile prior to its removal. The structure must be retested for percolation and the results submitted to IDNR and approval received prior to reusing the structure.

If shown on the plans or directed by the engineer, reroute upstream drain lines so the capacity of the upstream drainage system is maintained. Install conduit in accordance with Iowa Construction Specification IA-46, Tile Drains for Land Drainage.

#### **5. BACKFILL**

Compact soil around disturbed tile as specified in Section 3 (Tile Repair) and Section 4 (Tile Removal). Keep the backfill within 5 feet of the conduit free from large stones, frozen material, and large dry clods. Unless otherwise shown on the plans, backfill the remainder of the trench as follows:

For trenches located under or near structures, backfill in 12-inch layers and compact each layer to a density equal to or greater than the surrounding undisturbed soil.

For other locations, backfill the remainder of each trench with the excavated soil material which shall extend above the ground surface and be well rounded over the trench.

#### **6. MATERIALS**

Unless otherwise shown on the plans, conduit and fittings used for repair shall conform to the specifications listed in Table 1. Perforated pipe shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the pipe. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

**Table 1. Acceptable pipe for subsurface drain repair**

<b>Kind of Pipe<sup>#</sup></b>	<b>Specification</b>
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 6 inch	ASTM F 405
Corrugated Polyethylene (PE) Pipe and Fittings, 3 to 24 inch	ASTM F 667
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 2 to 60 inch	ASTM F 2648 <sup>§</sup>
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 12 to 60 inch	ASTM F 2306 <sup>§</sup>
Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120	ASTM D 1785
PVC Pressure-Rated Pipe (SDR Series)	ASTM D 2241
Clay drain tile	ASTM C 4
Concrete drain tile	ASTM C 412

<sup>#</sup>Pipe sizes are nominal and the ranges are inclusive

<sup>§</sup>Pipe conforming to AASHTO M 252 (3 to 10 inch), or AASHTO M 294 (12 to 60 inch) is acceptable.

## **7. SPECIFIC SITE REQUIREMENTS**

### **A. Measurement and Payment**

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

### **B. Items of Work and Construction Details**

#### **“Tile Investigation”:**

##### **1. Bid Item No. 9**

This item will consist of the excavation necessary to locate and verify the connection locations and elevations for the existing tiles as shown on the plans. This item shall also include backfilling of the trenches.

The Contractor shall locate and verify existing tile location(s) and elevations prior to construction and shall notify the Engineer of any discrepancies.

If extra work is required to locate additional tile not shown on the drawings, the Contractor can request additional compensation, but it must first be approved by the division.

Measurement for this item shall be measured in hours to the nearest half hour. Payment for Drainage Tile Investigation shall be made as noted in the plans.

**Construction Specification  
000 IA-11 Removal of Water**

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**1. SCOPE**

The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the plans and specifications.

**2. DIVERTING SURFACE WATER**

The Contractor shall build, maintain and operate all cofferdams, channels, diversions, flumes, sumps, and other temporary protective works needed to divert surface water away from the construction site while construction is in progress.

**3. DEWATERING THE CONSTRUCTION SITE**

Foundations, cutoff trenches, borrow areas and other parts of the construction site shall be dewatered as needed for proper execution of the construction work. The Contractor shall furnish, install, operate and maintain all works and equipment needed to perform the dewatering.

**4. EROSION AND POLLUTION CONTROL**

Removal of water from the construction site, including the borrow areas shall be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized.

**5. REMOVAL OF TEMPORARY WORKS**

After temporary works have served their purposes and before the Contractor leaves the site, they shall be removed.

**6. SPECIFIC SITE REQUIREMENTS**

**A. Measurement and Payment**

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

**B. Items of Work and Construction Details**

1. Subsidiary Item - Dewatering

This item shall include all costs to divert, pump, dam or other means to dewater the site as needed to complete construction activities.

No separate payment will be made for Removal of Water. Compensation for this item shall be made subsidiary to other bid items requiring removal of water in order to complete.

**Construction Specification**  
**000 IA-45 Plastic (PVC, PE) Pipe**

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**1. SCOPE**

The work shall consist of furnishing and installing plastic pipe and the necessary fittings specified herein or as shown on the drawings. This specification does not cover subsurface drainage systems.

**2. MATERIALS**

Corrugated Polyethylene (PE) Tubing. Corrugated PE tubing and fittings shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
Corrugated Polyethylene(PE) Tubing and Fittings, Nominal Sizes 3 to 6 inch, inclusive.....	ASTM F 405
Large Diameter Corrugated Polyethylene Tubing and Fittings, Nominal Sizes 8 to 24 inch, inclusive.....	ASTM F 667
Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.....	ASTMF 894

Poly(Vinyl Chloride) (PVC) Plastic Pipe. PVC pipe and fittings shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
PVC Plastic Pipe, Schedules 40, 80 and 120.....	ASTM D 1785
PVC Pressure-Rated Pipe (SDR Series).....	ASTM D 2241
PVC Pressure Pipe, 4 in. through 12 in., for Water Distribution.....	AWWA C900
PVC Water Transmission Pipe, Nominal Diameters 14 in through 36 in.....	AWWA C905

PVC and PE Plastic Pipe. Plastic pipes meant for non-potable, livestock water supply shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
Polyethylene (PE) Plastic Pipe, (SIDR-PR) Based on Controlled Inside Diameter.....	ASTM D 2239
PVC Pressure-Rated Pipe (SDR Series).....	ASTM D 2241

**3. FITTINGS AND JOINTS**

Pipe joints shall conform to the details shown on the drawings. Pipe shall be installed and joined in accordance with the manufacturer’s recommendations.

Joints may be bell and spigot type with elastomeric gaskets, coupling type with elastomeric gasket on each end, or solvent cemented. Gaskets shall conform to ASTM D 1869. Solvent cemented joints shall not be used for pond spillway pipes. Solvent cemented joints for PVC pipe and fittings shall be in

accordance with ASTM D 2855. When a lubricant is required to facilitate joint assembly, it shall be a type having no detrimental effect on the gasket or pipe material.

Mechanical joints (split couplings and snap couplings) may be used when joining PE pipe and fittings when the pipe is used for non-pressure flow and a free draining sand or gravel bedding material is provided. Elastomeric-sealed mechanical joints shall be used when joining PE pipe and fittings under pressure flow or where seepage cannot be tolerated. Where non-pressure pipe is specified, the fittings shall be of the same or similar materials as the pipe and shall provide the same durability and strength as the pipe.

A special case of livestock water supply involves pipes through a dam or embankment. Only PE pipe meeting the above specification may be used. PE pipe, of 1 ¼, 1 ½, or 2-inch diameter shall be installed so that there are no joints within the embankment area.

Where pressure pipe is specified, fittings shall have a design capacity equal to or exceeding that specified for the pipe to which it is attached. Fittings shall be cast iron, steel, one piece injection molded plastic fitting or fabricated from plastic pipe and one piece injection molded plastic fittings. Pressure pipe fittings shall conform to the requirements of the applicable specification listed below.

<u>Kind of Fitting</u>	<u>Specification</u>
Threaded PVC Plastic Pipe Fittings, Schedule 80.....	ASTM D 2464
PVC Plastic Pipe Fittings, Schedule 40.....	ASTM D 2466
PVC Plastic Pipe Fittings, Schedule 80.....	ASTM D 2467
Butt Heat Fusion (PE) Plastic Fittings for PE Plastic Pipe and Tubing.....	ASTM D 3261
Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.....	ASTM D 3139
PVC Pressure Pipe, 4 in. through 12 in., for Water Distribution.....	AWWA C900
PVC Water Transmission Pipe, Nominal Diameters 14 in through 36 in.....	AWWA C905

#### **4. HANDLING AND STORAGE**

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and does not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal surfaces or rocks). All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40 degrees F (4.4 degrees C) or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically coated to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for a period of 15 days or longer.

#### **5. TRENCHING**

Plastic pipe conduits shall be installed in trenches or plowed in according to the following methods:

1. **Trencher Constructed** - When conditions permit, trenching for pipelines, which are buried from 5 to 6 feet deep, are usually done with a narrow 4 to 6 inch wide chain trencher. Where there is little gravel and the ground is not too wet, these trenchers bring up well pulverized soil that makes good backfill material. Where rocks are not present, any of this material may be backfilled directly around the pipe. There is no practical way to compact the fill in these narrow trenches. The owner must be made aware that this material normally consolidates to its maximum extent in two to five years, but depressions or low spots can be hazards to livestock, humans and equipment.

2. **Backhoe Constructed Trench** – Backhoe trenches are usually a minimum of 12 inches wide. The material frequently comes out of the trench as clods, large chunks, and rocks. Immediately backfill over the pipe with 4 to 6 inches of soil that is free of these clods, large chunks, and rocks. If adequate excavated material is not available, then material such as sand or fine gravel should be imported and placed around the pipe to a depth of 4 to 6 inches over the top of the pipe. Fill the trench with the remaining excavated material.
3. **Plowing** – Plowing, or ripping, is a trenchless method for installing plastic pipe. It is a multi-stage process consisting of positioning a vibrating or static (non-vibrating) plow equipped with a trailing product guide which feeds pipe to the depth setting of the plow as it moves forward. The pipe is inserted into the ground continuously along a predetermined path and depth. The vertical depth of installation is controlled by hydraulic adjustment of the plow shear head and the surface contours. The depth of insertion must be continually adjusted to compensate for changes in terrain.

## 6. LAYING AND BEDDING THE PIPE

Plastic pipe conduits and fittings shall be installed as shown on the drawings and specified herein. The pipe shall be laid so that there is no reversal of grade between joints, unless otherwise shown on the drawings. The pipe shall be placed with the bell end upstream, unless otherwise specified. The pipe shall be carefully placed on the bedding or into the pipe trench.

Care shall be taken to prevent distortion and damage during unusually hot (over 90 degrees F) or cold weather (under 40 degrees F). After the pipe has been assembled in the trench, it shall be allowed to reach ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

The pipe ends and the couplings shall be free of foreign material when assembled. During the placement of the pipe, each open end of the pipeline shall be closed off by a suitable cover or plug at the end of work on the pipeline each day and until work resumes or installation is complete.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid.

Pipe shall be firmly and uniformly supported throughout the entire length. Bell-holes shall be made in the bedding under bells or couplings and other fittings to prevent the pipe from being supported by fittings.

1. **Earth Bedding.** When bedding is specified, the pipe shall be firmly and uniformly bedded in a shaped bedding groove that closely conforms to the bottom of the pipe for a depth equal to a minimum of 1 inch or 5 percent of the diameter of the pipe, whichever is greater. The bedding material shall be free of rocks or stones greater than 0.5 inch diameter and earth clods greater than 2 inch diameter.
2. **Sand or Gravel Bedding.** When sand or gravel bedding is specified, the pipe shall be firmly and uniformly placed on a sand or gravel bed. Sand or gravel fill shall be carefully placed and compacted as specified herein and as shown on the drawings.

A few installations of above ground pipelines have been noted. These installations are normally laid directly on the ground and very close to an existing fence line for protection. Only those pipelines designed to withstand exposure to ultraviolet radiation may be utilized for these installations.

Adequate thrust control shall be incorporated in these installations.

## 7. BACKFILL

The pipe shall be held down during backfilling to the top of the pipe to prevent its being lifted from its original placement.

Within 2 feet of the pipe, backfill shall be carefully placed and compacted by means of hand tamping or manually directed power tampers or plate vibrators to form a continuous uniform support around the pipe. Maximum thickness of layers before compaction within 2 feet of the pipe shall be 4 inches and at more than 2 feet from the pipe a maximum thickness before compaction shall be 9 inches. Unless otherwise specified, the initial backfill shall be compacted to a density equivalent to that of the adjacent fill or foundation materials.

The water content of cohesive backfill material shall be such that, kneaded in the hand, the soil will form a ball which does not readily separate. For non-cohesive sand and gravel backfill material, water content is not a concern for thin lifts.

## 8. SPECIFIC SITE REQUIREMENTS

### A. Measurement and Payment

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

### B. Items of Work and Construction Details

#### **“Anti-Seep Device”:**

1. Bid Item No.	5
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This item includes installation of an anti-seep device at the locations shown on the plans. Item shall be either pre-manufactured gum rubber collar or bentonite clay. Anti-Seep Device shall extend 6-inches in width and depth beyond the extents of the open trench. Device shall be manufacturer-produced or made of bentonite pellets and formed to a minimum 4-inch width.

Measurement and Payment for the Anti-Seep Devices shall be a per Each item, and shall include all necessary work to install device.

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

**IA-46 TILE DRAINS FOR LAND DRAINAGE**

**1. SCOPE**

The work shall consist of furnishing and installing drainage tubing and tile and the necessary fittings and appurtenances.

**2. MATERIALS**

Concrete drain tile shall conform to the requirements of ASTM C 412 and clay drain tile shall conform to the requirements of ASTM C 4.

Corrugated polyethylene (PE) pipe (tubing) and fittings shall conform to ASTM F 405 (3" to 6") or F 667 (3" to 24"), as appropriate. Corrugated profile wall (dual wall) polyethylene (PE) pipe shall meet or exceed the requirements of ASTM F 2648 (2" to 60") or ASTM F 2306 (12" to 60"). Pipe conforming to AASHTO M 252 (3" to 10") or AASHTO M 294 (12" to 60") is acceptable. Perforated tubing shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the tubing. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

**3. EXCAVATION**

Unless otherwise specified, excavation for and subsequent installation of each drain line shall begin at the outlet end and progress upstream.

The trench or excavation for the tile shall be constructed to the line, depths, cross sections, and grade shown on the drawings or as directed by the NRCS Inspector. The trench bottom shall be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 6 inches of compacted earth or sand bedding in the trench to bring it up to the conduit grade.

If not otherwise shown on the drawings, trench width at the top of the conduit shall be the minimum required to permit installation and provide bedding conditions suitable to support the load on the conduit, but with not less than three (3) inches of clearance on each side of the conduit. Maximum trench width shall be the conduit diameter plus 12 inches measured at the top of the conduit, unless approved bedding is installed.

Trench shields, shoring and bracing, or other methods, necessary to safeguard the workers and work, and to prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the contractor.

Plow installation is allowed. Minimum trench width shall be two (2) inches wider than the conduit on each side. Grade control and bedding conditions shall be closely inspected during plow installation. Boulders, cobbles, or cemented soil can cause the plow to jump or lose grade. These hardpoints can also puncture or dimple and deform the pipe.

**4. PREPARING THE BEDDING**

Unless otherwise specified, no filter or envelope is required. In stable soils the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90 degree "V" groove in its center. The groove shall be shaped to fit the size of tile. The 90-degree "V" groove shall not be used on conduits greater than 6 inches in diameter.

If the bottom of the trench does not provide a sufficiently stable or firm foundation for the drain tile, a sand-gravel mix or other approved materials shall be used to stabilize the bottom of the trench.

## **5. FILTER OR ENVELOPE MATERIAL**

When a filter is specified, the shape of the bottom of the trench, gradation and the thickness of the filter or envelope material to be placed around the tile will be as shown on the drawings. The envelope or filter material shall be placed in the bottom of the trench just prior to the laying of the tile. The tile shall then be laid and the envelope or filter material placed over the tile.

All tile 10" and larger shall be installed with a course aggregate envelope to a minimum of 6" above the top of the pipe. Spoon trench installation with aggregate envelope over the top of the pipe is acceptable as shown in the plans.

## **6. PLACEMENT AND JOINT CONNECTIONS**

All drains shall be laid to grade.

Joints between lateral drain tile shall vary with soil type as follows:

- a. Peat and muck - 1/4 inch preferred, 3/8 inch maximum
- b. Clay - 1/8 inch preferred, 1/4 inch maximum
- c. Silt and loam - 1/16 inch preferred, 1/8 inch maximum
- d. Sand - tightest possible fit.

Joint between main drain tile which serve only to collect and transport drainage water from lateral tile lines should be the tightest fit possible.

Where the joint width exceeds the maximum above, the joint shall be covered with a permanent type material such as coal tar pitch treated roofing paper, fiber glass sheet or mat, or plastic sheet.

After placement and blinding of plastic tubing, but prior to backfilling, sufficient time shall elapse to allow the tubing to reach the ambient temperature of the trench. All split fittings shall be securely tied with nylon cord before backfill is placed. When corrugated plastic tubing is used, no more than 5% stretch will be allowed.

## **7. CONNECTIONS**

Lateral connections will be made with manufactured appurtenances (wyes, tees, etc.) comparable in strength and durability with the specified tile or tubing unless otherwise shown on the drawings.

Existing tile lines not shown on the drawings but encountered during installation shall be bridged across the trench or connected into the new line, as directed by NRCS.

Connections with the outlet pipe shall be made watertight.

## **8. OUTLETS**

A continuous section of non-perforated conduit at least 20 feet long shall be used at the outlet. At least two-thirds of the outlet pipe shall be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side slope protected from erosion. Acceptable materials for use at the outlet include the following:

- a. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum;
- b. Smooth steel pipe with a minimum wall thickness of 3/16 inch;

- c. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier; or
- d. Corrugated profile wall (dual wall) polyethylene pipe (PE).

All plastic (PVC) and polyethylene pipe (PE) outlets shall include ultra-violet stabilizer. PVC or PE pipe outlets shall not be used where burning vegetation on the outlet ditch bank is likely to create a fire hazard.

The outlet shall be equipped with a flap-gate type rodent guard.

## 9. BLINDING

After the tubing or tile is placed in the excavated groove, friable material from the sides of the trench shall be placed around the tubing, completely filling the trench to a depth of not less than three inches over the top of the tubing. For material to be suitable it must not contain hard clods, rocks, frozen soil, or fine material which will cause a silting hazard to the drain. Tubing placed during any one day shall be blinded by the end of the day's work.

## 10. BACKFILLING

The backfilling of the trench shall be completed as rapidly as consistent with the soil conditions. Automatic backfilling machines may be used. Backfill shall extend above the ground surface and be well rounded over the trench.

Unless otherwise shown on the plans, in mineral soils, the minimum cover over subsurface drains shall be 2.4 feet. In organic soils, the minimum depth of cover after initial subsidence shall be 3.0 feet.

## 11. SPECIAL SPECIFICATIONS

### A. Measurement and Payment

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

### B. Items of Work and Construction Details

#### “Tile Connection”:

1.	Bid Item No.	15
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This item consists of intercepting and rerouting tile at locations shown on the plans.

Tile connections shall be made and encased in a Portland cement concrete (PCC) collar at least twelve (12) inches wide and four (4) inches thick, continuous around the joints. Alternative connections must be approved by the Engineer.

Measurement and payment for the Field Connections shall be a per Each item, and shall include all necessary fittings and adapters, watertight joints, excavation, and backfill.

**“Fittings”:**

2. Bid Item No. 16

This item will consist of furnishing and installing the pipe fittings listed on the plans.

All other fittings not specifically listed on the plans shall be incidental to pipe installation or bid item.

Measurement and payment for Fittings shall be a per Each item.

**“Drain Tubing”:**

3. Bid Item No. 17 - 20

This item will consist of furnishing and installing the type, material, size, and construction method of the pipe at the locations shown on the plans. Open trench installation is required at the locations shown on the plans.

Alle tile connections are incidental to pipe installation unless otherwise noted on the plans.

The cleanouts shown on the plans for the bioreactors at Site 31 shall be paid as part of Bid Item No. 20. All appurtenances to install the cleanouts shall be incidental to this work.

Any fence cutting/removal needed shall be incidental to this item.

Measurement and payment for the drain tubing shall be on an installed linear foot basis, and shall include all necessary fittings and adapters, watertight joints, excavation, and backfill.

## Construction Specification 000 IA-51 Corrugated Metal Pipe Conduits

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### 1. SCOPE

The work shall consist of furnishing and placing circular, arched or elliptical corrugated metal pipe and the necessary fittings.

### 2. MATERIALS

Metallic-coated steel corrugated pipe and fittings shall be zinc-coated or aluminized, Type 2, and shall conform to the requirements of ASTM A 760 and A 929 for the specified type and size of pipe. Aluminum corrugated pipe shall conform to the requirements of ASTM B 745 for the specified type and size of pipe. All pipe is subject to the following additional requirements:

1. When polymer coating is specified, pipe, coupling bands and anti-seep collars shall be coated in accordance with ASTM A 762. All riveted joints shall be caulked as described in paragraph B.
2. Pipe with annular corrugations shall be furnished with caulked seams. Riveted pipe joints shall be caulked with a bituminous mastic material during fabrication to provide a watertight joint. All circumferential and longitudinal seams shall be caulked before riveting. This shall be accomplished by applying a uniform bead of the mastic compound to the inner lap surface before riveting such that when the rivets are in place, all voids are filled and a coating of mastic is between the lap surfaces. The inner surface of coupling bands shall be asphalt coated in the field prior to installation. A neoprene gasket having a minimum thickness of 3/8 inch and a minimum width of 7 inches may be used in lieu of mastic coated coupling bands.
3. Welded or lock seams in helical corrugated pipe are considered to be watertight.
4. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands, the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating off the coupling bands.
5. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. If specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

### 3. COUPLING BANDS

Coupling bands shall meet the requirements of the table below or have detailed drawings submitted for approval by the State Conservation Engineer. Coupling bands shall be of the same minimum thickness (gage) as the pipe being connected.

### 4. FABRICATION

Fabrication of all appurtenances shall be done as shown on the drawings. All appurtenances shall be made of metallic-coated steel when corrugated steel pipe is used and aluminum when used with aluminum pipe. Dissimilar metals shall not be installed in contact with each other.

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four 1/2-inch Diam. galvanized rods with tank lugs for annular or helical corrugated metal pipe. Bands shall have a minimum lap of 3 inches.	All	All
Hugger band from Armco Steel Corp. for helical corrugated metal pipe with reformed ends; and for annular corrugated pipe. Bands include O-ring gaskets and two 1/2-inch Diam.	35	48
Hugger band without rods and lugs but	20	24
Angles riveted or welded to a coupling band and drawn tight with bolts. Bands shall be a minimum of 7 corrugations wide and have a minimum lap of 2 inches.	35	15
Flanged couplings for helical corrugated 25 1/2 pipe welded to the ends of the pipe and field assembled by a minimum of 3/8-inch Diam. bolts. A joint sealer shall be placed between the flanges to ensure water tightness	25	12
1/ Use is limited to sites where soft foundation and conduit elongation is not anticipated.		

## 5. REPAIR OF DAMAGED COATINGS

The Contractor shall place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in a manner to prevent damage to the pipe or coating. Breaks, scuffs, or other damage to the various coatings shall be repaired as follows:

1. Metallic Coating - by thoroughly wire brushing the damaged area and cleaning with solvent, and then painting two coats of one of the following paints:
  - a. Zinc Dust - Zinc Oxide Primer conforming to ASTM D 79 and D 520.
  - b. Single package, moisture cured urethane prime in silver metallic color.
  - c. Zinc-rich cold galvanized compound, brush, or aerosol applications.
2. Polymer Coating - apply two coats of polymer material similar to and compatible with the durability, adhesion and appearance of the original polymer coating. The repair coating shall be a minimum thickness of 0.010 (10 mils) after drying and shall bond securely to the pipe.

## 6. LAYING AND BEDDING THE PIPE

The pipe shall be laid to the line and grade shown on the drawings and shall be firmly and uniformly bedded throughout its entire length. Details of the bedding are as shown on the drawings.

The pipe shall be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides at approximately the vertical mid-height of the pipe. Field welding of corrugated galvanized steel pipe will not be permitted. The pipe sections shall be joined with coupling bands.

## 7. BACKFILLING

Special care shall be taken during backfill operations not to disturb the grade and alignment.

The pipe shall be tied down or loaded sufficiently during backfilling around the sides to prevent its being lifted from the bedding.

Backfill material shall have sufficient moisture so that optimum compaction can be obtained. Backfill around the pipe shall be placed in layers not more than 4 inches thick before compaction.

Each layer of backfill shall be compacted with power tampers, hand tampers, or plate vibrators to the same density requirements as specified for the adjacent embankment. Backfill over and around the pipe shall be brought up uniformly on all sides. The passage of earth moving equipment will not be allowed over the pipe until backfill has been placed above the top of the pipe surface to a depth of two (2) feet.

## 8. SPECIFIC SITE REQUIREMENTS

### A. Measurement and Payment

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

### B. Items of Work and Construction Details

#### **“20-Foot Corrugated Metal Pipe Tile Extension, with Animal Guard”:**

##### 1. Bid Item No. 21

This item will consist of furnishing and installing the CMP pipe and fittings shown on the plans for tile outlets, including animal guard at outlet end of pipe.

Each installation of corrugated metal pipe tile extension shall be a continuous twenty (20) linear foot section of 16-gauge minimum, zinc coated or aluminum coated with annular or helical corrugations.

Connect dissimilar pipes with manufactured adapters or couplings if available. A concrete collar shall be used as shown on the plans. Connections shall be watertight.

Installation shall be so at least two-thirds of the outlet pipe shall be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side slope protected from erosion.

Measurement and payment shall be on a per Each basis – including all necessary fittings and adapters, animal guards, watertight joints, excavation, and backfill - and will constitute full compensation for this bid item and related subsidiary items.

Payment will constitute full compensation for the following related items: Pollution Control, Removal of Water, and Animal Guard.

#### **“Water Control Structure CMP Sleeve – 5’ x 48” CMP Riser”:**

##### 2. Bid Item No. 24

This item will consist of furnishing and installing the CMP sleeve around the water control structures on Site 31 and Site 34 as shown in the plans.

Each installation shall be a continuous five (5) linear foot section of 16-gauge minimum, zinc coated or aluminum coated with annular or helical corrugations.

Measurement and payment shall be on a per Each basis – including all necessary aggregate base, aluminized metal footing ring, and crushed stone backfill as shown in the details on the plans.

3. Subsidiary Item – CMP Animal Guard

This item will consist of furnishing and installing the CMP animal guard, for each size tile such as AgriDrain RG series or IDALS approved equal.

No separate payment will be made for the CMP animal guard. Compensation for this item shall be included in the payment for CRCS and CMP tile outlet pipes.

4. Subsidiary Item – Corrugated Metal Water-tight Coupling Bands

This item will consist of furnishing and installing the corrugated metal coupling bands for connections of all pipe sections.

No separate payment will be made for the CMP coupling bands. Compensation for this item shall be included in the payment for CRCS metal outlet pipe.

**Practice Specification  
Saturated Buffer (Code 604)**

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**SCOPE**

The work consists of furnishing materials, installing all components, and performing all clearing and grubbing, excavations, grading, and earthfill required to construct the Saturated Buffer as shown on the plans or as staked in the field.

It is the Landowner’s responsibility to locate any existing subsurface drains that may be under, along, or crossing the saturated buffer prior to construction. The NRCS is not responsible for any subsurface drains damaged during construction.

**MATERIALS**

Earth materials used in backfilling around the structure and pipe must be suitable material obtained from excavated material or from other approved sources as shown on the plans, described in Section 8, or approved by the Inspector. The fill material must be free from brush, roots, frozen material, sod, stones over 6 inches in diameter, or other undesirable material.

All disturbed areas must be finished so they are suitable for the planned use after construction is completed. If needed, stockpile topsoil and spread over excavations and other areas to facilitate establishment of vegetation.

Pipe, pipe sizes, fittings, and other appurtenances must be as specified on the plans. These items must conform to the “materials” section of Practice Specification IA-620, Underground Outlet, or as shown in Section 8 of this specification.

Structures must be fabricated and installed as shown on the plans. Structures must be of durable material, structurally sound, and resistant to damage by rodents or other animals. Structures must be of rigid material which does not require supplemental support to remain in a vertical position. Materials which meet these requirements include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum,
2. Smooth steel pipe, with 3/16-inch minimum wall thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with an SDR of 43 or less,
4. High-density polyethylene pipe (PE). Round pipe shall have an SDR of 43 or less. Square intakes shall have minimum wall thickness as shown in the following table:

**Square PE Intake**

Nominal Size	Maximum Thickness
6 inch	0.16 inch
8 inch	0.21 inch
10 inch	0.26 inch
12 inch	0.31 inch

All plastic and polyethylene structures must include ultra-violet stabilizer to protect them from solar degradation.

Appurtenances (i.e. tees and elbows) for polyvinyl chloride (PVC) inlets must be schedule 40 or heavier.

**EXCAVATION**

Remove all trees, stumps, roots, brush, and other undesirable materials from the work area as shown on the plans or as agreed upon with the Landowner and Inspector. Burning of trees and brush must comply with all applicable state and local regulations.

Cuts and fills should be made in such a manner that topography will be enhanced. Excess spoil material must be placed, spread, leveled, shaped, or hauled away as shown on the plans or as staked in the field.

All excavations must conform to the lines, grades, elevations, bottom width, and side slopes shown on the construction plans or as staked in the field. The conduit trench bottom must be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 6 inches of compacted fill or sand bedding in the trench to bring it up to the conduit grade.

If not otherwise shown on the plans, trench width at the top of the conduit must have a minimum clearance of 3 inches from outside edge of the conduit. The trench width at the top of the conduit must have a maximum clearance of 6 inches from the outside edge of the conduit unless an approved bedding material is used.

Plow installation is allowed. The minimum trench width must be 2 inches wider than the conduit on each side. Grade control and bedding conditions must be closely monitored during the plow installation.

All excavation for structure installation must be sloped to no steeper than 2:1.

## **STRUCTURE INSTALLATION**

Install structures according to the lines, grades, and elevations shown on the plans and as staked in the field. Prefabricated structures must be handled in accordance with manufacturer recommendations to ensure the structure's integrity after installation.

Place backfill around the structure in 9-inch lifts and hand compacted. The moisture content of the fill material must be such that a ball formed with the hands does not crack or separate when struck sharply with a pencil and will easily ribbon out between the thumb and finger.

The finished surfaces must present a workmanlike appearance.

## **PIPE INSTALLATION**

Install pipe as shown on the plans and/or as staked in the field.

Unless otherwise specified, no filter or envelope is required around the distribution pipe. In stable soils, shape the bottom of the trench to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. Shape the groove to fit the size of tile. The 90-degree "V" groove must not be used on conduits greater than 6 inches in diameter.

If the bottom of the trench does not provide a sufficiently stable or firm foundation for the distribution pipe, use a sand-gravel mix or other approved material to stabilize the bottom of the trench.

When a filter is specified, the shape of the bottom of the trench and the gradation and thickness of the filter or envelope material to be placed around the conduit will be as shown on the plans. Place the filter or envelope material in the bottom of the trench. Install the conduit as shown on the plans. Place the filter or envelope material over the conduit.

The slope of the distribution lines is critical. Extra care must be taken to ensure that these lines are laid on a uniform grade throughout the length of the line or as shown on the plans. Anchor the pipe or place a vertical load on it, while exposed, at regular intervals to prevent uplift and separation from the bedding during backfill. Backfill the trench above the ground surface and round the top of the earthfill over the trench.

The minimum depth of backfill over the distribution conduit is 2.4 feet.

Make lateral connections with manufactured appurtenances (wyes, tees, couplings, etc.) comparable in strength and durability with the type of conduit being used. Pipe connections to the structure must be watertight.

## **OUTLET**

Use a continuous section of non-perforated conduit at least 20 feet long at the outlet. Bury at least two-thirds of the outlet pipe in the ditch bank with the end of the pipe placed above the toe of the ditch, or protect the side slope from potential erosion due to discharge of the pipe. Acceptable materials for use of the outlet conduit include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum;

2. Smooth steel pipe with a minimum wall thickness of 3/16 inch;
3. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier;  
or
4. Corrugated profile wall (dual wall) polyethylene pipe (PE).

All plastic (PVC) and polyethylene pipe (PE) outlets must include ultra-violet stabilizer. Do not use PVC and PE pipe outlets where vegetation on the ditch bank may be burned and will likely damage the pipe.

All outlet pipes must have a flap-gate type animal guard.

## **SEEDING**

Establish a protective cover of vegetation on the entire soil saturation area and all surfaces disturbed by construction as shown on the plans or staked in the field. Plant species must be water tolerant and suitable for wet soil conditions. Seeding and mulching must be performed in accordance with the IA-CPA4, Seeding Plan, and Construction Specification IA-6, Seeding and Mulching for Protective Cover.

## **Specific Site Requirements**

### **A. Measurement and Payment**

Compensation for any work item described in the contract documents but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and bid items to which they are made subsidiary are identified in Items of Work and Construction Details section of this specification.

For items of work which lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for each item will be made at the contract lump sum price and will constitute full compensation for completion of the work.

For items of work for which specific unit prices are established in the contract, the payment will be made based on the approved quantity measured by the engineer or weight tickets. Payment will constitute full compensation of the work completed as defined by each work item.

### **B. Items of Work and Construction Details**

This Practice Specification covers multiple items included in the project. The Contractor shall confirm construction of the saturated buffer is consistent between this Practice Specification and other specifications included as part of the project. Any discrepancies shall be brought to the attention of the Engineer.

For the water control structures, the bid item(s) shall include furnishing and installing the water control structures at the locations shown on the plans. The plans list the required dimensions for each water control structure. Incidental to this bid item are all appurtenances necessary to meet the plans and specs, including, but not limited to, stable base, couplers, stop board removal tool, and structure lid with locking mechanism. Contractor shall provide detailed shop drawings of the water control structures and all appurtenances. Measurement and payment for the water control structure shall be a per Each item shall also include all necessary fittings and adapters, watertight joints, excavation, and backfill. Measurement and payment for the water control structure shall be a per Each item shall also include all necessary fittings and adapters, watertight joints, excavation, and backfill.

Fiberglass marking flags used to mark the location of the water control structures shall be paid under Bid Item No. 6. Flags shall be at least 6 feet tall and have a rod diameter greater than or equal to 5/16". Measurement and payment for the flags shall be a per Each item.

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

**SCOPE**

This work consists of installation of underground outlets and any appurtenant water control structures in accordance with an approved plan and design.

**MATERIALS**

Materials for underground outlets must meet the requirements as shown in the plans and specifications. They must be field inspected for any deficiencies such as thin spots or cracking prior to installation.

Conduit

The following reference specifications pertain to products currently acceptable for use as underground outlets:

**Plastic Pipe**

3 through 24 inch Corrugated Polyethylene (PE) Pipe and Fittings	ASTM F667
12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe	ASTM F2306
2 to 60 in. Annular Corrugated Profile Wall Polyethylene (PE) Pipe	ASTM F2648
3 to 24 in. Lined Flexible Corrugated Polyethylene Pipe	ASTM F3390
Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings (4-36 inch)	ASTM F949
Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	ASTM D2729
Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings	ASTM D3034
Poly (Vinyl Chloride) (PVC) Plastic Pipe (Sch Series)	ASTM D1785
Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)	ASTM D 2241

**Clay Pipe**

Clay Drain Tile	ASTM C4
Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated	ASTM C700

**Concrete Pipe**

Concrete Drain Tile (4-36 inch)	ASTM C412
Concrete Pipe for Irrigation or Drainage	ASTM C118
Nonreinforced Concrete Sewer, Storm Drain and Culvert Pipe	ASTM C14
Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	ASTM C76
Perforated Concrete Pipe	ASTM C444

**Other Pipe**

Styrene-Rubber (SR) Plastic Drain Pipe and Fittings	ASTM D2852
Corrugated Aluminum Pipe for Sewers and Drains	ASTM B745
Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains	ASTM A760

Inlet

Fabricate and install the inlet as shown on the plans. Inlets must be of durable material, structurally sound, and resistant to damage by rodents or other animals. Inlets must be of rigid material, which does not require supplemental support to remain in a vertical position. Materials, which meet these requirements, include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum,
2. Smooth steel pipe, with 3/16-inch minimum wall thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with an SDR of 43 or less,
4. High-density polyethylene pipe (PE). Round pipe shall have an SDR of 43 or less. Square intakes shall have minimum wall thickness as shown in the following table:

**Square Intake Wall Thickness**

Nominal Size	Minimum Thickness
6 inch	0.16 inch
8 inch	0.21 inch
10 inch	0.26 inch
12 inch	0.31 inch

All plastic and polyethylene inlets must include ultra-violet stabilizer to protect from solar degradation.

Perforations in the inlet must be smooth and free of burrs. Unless otherwise specified, the above ground portion of the inlet will have holes evenly spaced around the perimeter of the inlet in accordance with the following table:

**Minimum Number of Holes**

Inlet Size	Minimum Number of 1" Diameter Holes per Foot of Inlet
4 inch	20
5 inch	24
6 inch	30
8 inch	40
10 inch	50
12 inch	60

If slots or round holes other than 1 inch in diameter are provided, the total cross sectional area of the openings per foot will be equivalent to that provided by 1 inch diameter round holes meeting the above criteria.

The below ground portion of the inlet may be perforated with holes 5/16-inch in diameter or less to provide drainage around the inlet.

Appurtenances (i.e. tees and elbows) for polyvinyl chloride (PVC) inlets must be schedule 40 or heavier.

Additional subsurface drainage tubing or tile may be used in conjunction with the surface inlet to improve access and farmability around the inlet. These underground extensions (when used) will have a minimum length of 10 feet.

The inlet must be offset from the main conduit except as noted below. A minimum of 8 feet of non-perforated conduit will be installed between the inlet and the main conduit. The minimum diameter of the offset line is 3 inches. When conduit capacity is based on orifice flow from the inlet, fabricate the inlet so that an orifice can easily be installed.

Only the top inlet in a terrace system may be placed directly on the main conduit. If the topmost inlet in a terrace system is placed directly on the main conduit, the conduit must be non-perforated from the inlet to the toe of the terrace back slope.

Outlet

Use a continuous section of non-perforated conduit at least 20 feet long at the outlet. Two-thirds of the outlet pipe must be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or protect the side slope from erosion. Acceptable materials for use at the outlet include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum;
2. Smooth steel pipe, with 3/16-inch minimum wall thickness;
3. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier; or
4. Corrugated profile wall (dual wall) polyethylene (PE) pipe meeting or exceeding the requirements of ASTM F 2648 (2" to 60"), ASTM F 2306 (12" to 60"). Pipe conforming to AASHTO M 252 (3" to 10"), or AASHTO M 294 (12" to 60") is acceptable.

All plastic and polyethylene pipe outlets must include ultra-violet stabilizer. PVC and PE pipe outlets must not be used where burning vegetation on the outlet ditch bank is likely to create a fire hazard.

Connections with the outlet pipe must be made watertight.

Equip the outlet with a flap gate rodent guard.

## **TRENCH EXCAVATION**

Trench excavation must be sufficient to provide required cover after other construction is completed.

The trench bottom will be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 6 inches of compacted earth or sand bedding in the trench to bring it up to the conduit grade. In stable soils, shape the bottom of the trench to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. Shape the groove to fit the size of conduit. Do not use the 90-degree "V" groove on conduits greater than 6 inches in diameter.

Unless otherwise shown on the drawings, use a trench width at the top of the conduit the minimum required to permit installation and provide bedding conditions suitable to support the load on the conduit, but with not less than 3 inches of clearance on each side. Use a maximum trench width of the conduit diameter plus 12 inches measured at the top of the conduit, unless approved bedding is installed.

Plow installation is allowed except under the base width of the terrace or embankment. Trench width will be at least two (2) inches wider than the conduit on each side to allow sufficient bedding to support the pipe.

## **INSTALLATION**

Install the underground outlet system to the line and grade shown in the plans or as staked in the field. Install and properly blind or bed conduit lines prior to placement of any other earthfill over the lines.

Join conduit lines with standard factory couplers, if applicable, to produce a continuous system. Use internal couplers if they do not cause excessive flow restrictions. Protect conduit ends during installation.

Install all appurtenant structures, including trash and rodent guards, promptly and make provisions for protecting them during installation. Cap all conduit ends except the outlet and inlets with screens with standard factory end caps or concrete. When corrugated plastic tubing is used, no more than 5% stretch will be allowed.

Orifice plates, when specified, must have smooth edges and fit tightly.

## **TRENCH BACKFILL**

Bed and backfill conduits throughout the base width of the basin embankment or terrace ridge. Place friable soil material in 4 inch layers and hand tamped to a depth of 2 feet above the conduit. Slope the sides of the remaining trench no steeper than 3 horizontal to 1 vertical and place backfill in 9 inch layers and machine compacted.

Water packing may be used as an alternative to mechanical compaction. If the conduit is non-perforated, fill it with water during the water packing procedure. The initial backfill, before wetting, must be of sufficient depth to ensure complete coverage of the pipe after consolidation has taken place. Perform water packing by adding water in such quantity as to thoroughly saturate the initial backfill without inundation. Allow the wetted fill to dry until firm before final backfill is begun. Perform final backfill by placing friable soil material in 4 inch layers and hand tamping to a depth of 2 feet above the conduit.

Slope the sides of the remaining trench no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Backfill conduit which is not under the embankment or terrace ridge with select bedding material containing no hard objects larger than 1½ inches in diameter to a minimum depth of 6 inches over the conduit. Hold the conduit in place mechanically while select backfill material is placed around and over the conduit. This is to ensure that the proper conduit grade is maintained. Place all backfill material so that deflection or displacement of the conduit will not occur. Backfill the remainder of the trench above the conduit as rapidly as consistent with the soil conditions. Extend backfill above the ground surface and be well rounded over the trench. Large stones, frozen material, and large clods are not allowed in the backfill material.

## **FINISH**

Smooth work areas and leave in a workmanlike manner. Establish vegetation or other protective cover as specified.

## Specific Site Requirements

## CONSTRUCTION INSPECTION PLAN

## CONSTRUCTION INSPECTION PLAN: SATURATED BUFFER

The work shall be performed in accordance with the drawings and specifications unless otherwise approved, in writing, by design engineer. For items of work requiring inspection, it is the responsibility of the contractor to keep the design engineer, Heartland Co-op, and IDALS informed of the progress of work so that timely observation of critical construction elements may be performed. Work installed without observation of required work items will not be certified as meeting NRCS standards.

### Items of Work Requiring Inspection (see Plans for Details)

<b>Water Control Structure</b>	Plum, Bedding, Connections, Plates
<b>Dispersion Pipe</b>	Elevations, Connections, Grade Changes, End Caps
<b>Crossing Existing Tile</b>	Elevation, Verify Use of Nonperforated Tile
<b>Seeding and Fertilizing for Protective Cover</b>	Submit fertilizer and seed tags for record

ISG is to provide as-built elevations per the diagram below. As-built elevation data is to be submitted to the landowner, Heartland, Co-op, IDALS, and design engineer for review. Landowner is responsible for completing and maintaining the Operation and Maintenance Plan per their contract using copy provided with design manual.

### Construction Checkout and As-Built Elevations Diagram

