

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS**

For

_____ County, Iowa

List of Specifications

Specification Number

Title

Pages

These specifications are part of the construction plans. The work shall be performed in accordance with the drawings and specifications unless otherwise approved, in writing, by NRCS. For items of work requiring NRCS inspection, it is the responsibility of the contractor to keep the local NRCS office informed of the progress of work so that timely inspections may be performed. Work installed without NRCS inspection will not be certified as meeting NRCS standards.



Construction Specification 000 IA-1 Site Preparation

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.

Specific Site Requirements



Construction Specification 000 IA-3 Structure Removal

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
000 000 IA CS-005 Pollution Control 2011

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.

Specific Site Requirements



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

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 on Form IA-CPA-4.

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.

Specific Site Requirements



Seeding Plan

Site 1

Name [REDACTED]

Date 8/25/2026

Tract No. [REDACTED]

Field No. [REDACTED]

Contract No. [REDACTED]

Type of Seeding: [REDACTED]

Prepared by SMM

Seeding Percent Pure Live Seed=(% Germination + Hard Seed) * % Purity
100

Conservation Practice None

Enter Acres: [REDACTED] 1

Species	Acres	Pounds Per Acre - Circle One Below		Total Needed	
		Bulk	PLS*		
Brome	0.5	25	Pounds	12.5	Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
		General Soil Test			
Fertilizer & Lime					
Lime (ECCE)					
Nitrogen		50		0	
Phosphate (P205)		200		0	
Potash (K20)		100		0	

Seeding will be completed: March 1 - May 15 [REDACTED] 2027

Additional Seeding Criteria Seeding can be done os dormant also Between November 15-Freeze 2026

Seeding was completed by [REDACTED]
(Date)

[REDACTED]
(Producer's Signature)

[REDACTED]
(Date)

Field Office Clarion

Certified by [REDACTED]
(NRCS Representative)

When seeding is completed, return seeding plan to the Natural Resources Conservation Services. For state cost-share projects, attach receipts for seed, fertilizer, lime and mulch. For Federal cost-share, return receipts to Farm Service Agency.



Seeding Plan

Site 2

Name [REDACTED]

Date 8/25/2026

Tract No. [REDACTED]

Field No. [REDACTED]

Contract No. [REDACTED]

Type of Seeding: [REDACTED]

Prepared by SMM

Seeding Percent Pure Live Seed=(% Germination + Hard Seed) * % Purity
100

Conservation Practice None

Enter Acres: [REDACTED] 1

Species	Acres	Pounds Per Acre - Circle One Below		Total Needed
		Bulk	PLS*	
Brome	1	25	Pounds	25 Pounds
			Pounds	Pounds
			Pounds	Pounds
			Pounds	Pounds
			Pounds	Pounds
			Pounds	Pounds
			Pounds	Pounds
		General Soil Test		
Fertilizer & Lime				
Lime (ECCE)				
Nitrogen		50		0
Phosphate (P205)		200		0
Potash (K20)		100		0

Seeding will be completed: March 1 - May 15 [REDACTED] 2027

Additional Seeding Criteria Seeding can be done os dormant also Between November 15-Freeze 2026

Seeding was completed by [REDACTED]
(Date)

[REDACTED]
(Producer's Signature)

[REDACTED]
(Date)

Field Office Clarion

Certified by [REDACTED]
(NRCS Representative)

When seeding is completed, return seeding plan to the Natural Resources Conservation Services. For state cost-share projects, attach receipts for seed, fertilizer, lime and mulch. For Federal cost-share, return receipts to Farm Service Agency.

Seeding Plan

Site 3

Name [REDACTED]
Prepared by SMM

Date 8/25/2026
Tract No. [REDACTED]
Field No. [REDACTED]
Contract No. [REDACTED]
Moisture Regime [REDACTED]

Program: Iowa Water Quality Initiative

Acres: 0.30

Seeding Mix Summary

Grasses	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
1	<i>Andropogon gerardii</i>	Big Bluestem	10.002	2.723	0.82
2	<i>Sorghastrum nutans</i>	Indiangrass	10.001	2.269	0.68
3	<i>Elymus virginicus</i>	Virginia Wildrye	1.999	1.296	0.39
4	<i>Panicum virgatum</i>	Switchgrass	10.002	1.945	0.58
5	<i>Sporobolus compositus</i>	Rough Dropseed	8.000	0.726	0.22
SUBTOTAL GRASSES			40.004	8.959	2.688
Forbs/Legumes	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
SUBTOTAL FORBS			0.000	0.000	0.000
Woody	Scientific Name	Common Name	Seeds/Ft ²	PLS Lbs/Acre	PLS Lbs Total
SUBTOTAL VINES/WOODY			0.000	0.000	0.000
TOTAL			40.004	8.959	2.688

Estimated Cost/Acre

Estimated Total Cost \$0.00

	Soil Test Information	Total Needed lbs
Lime (ECCE) (Actual Lime)		
Nitrogen		
Phosphate (P205)		
Potash (K20)		

Seeding Dates: _____

Additional Seeding Criteria: _____

Seeding was completed by according to the above requirements.
(Date)

(Producer's Signature)

(Date)

Field Office _____

Certified by _____
(NRCS Representative)

When seeding is completed, return seeding plan to the Natural Resources Conservation Services.

For CRP cost-share, return receipts to Farm Service Agency.

For all other cost-share projects, attach seed tags and receipts for seed, fertilizer, lime, etc.



Seeding Plan

Site 4

Name [REDACTED]

Date 8/25/2026

Tract No. _____

Field No. _____

Contract No. _____

Type of Seeding: [REDACTED]

Prepared by SMM

Seeding Percent Pure Live Seed=(% Germination + Hard Seed) * % Purity
100

Conservation Practice None

Enter Acres: [REDACTED] 1

Species	Acres	Pounds Per Acre - Circle One Below		Total Needed	
		Bulk	PLS*		
Brome	0.2	25	Pounds	5	Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
			Pounds		Pounds
		General Soil Test			
Fertilizer & Lime					
Lime (ECCE)					
Nitrogen		50		0	
Phosphate (P205)		200		0	
Potash (K20)		100		0	

Seeding will be completed: March 1 - May 15 [REDACTED] 2027

Additional Seeding Criteria Seeding can be done os dormant also Between November 15-Freeze 2026

Seeding was completed by _____
(Date)

(Producer's Signature)

(Date)

Field Office Clarion

Certified by _____
(NRCS Representative)

When seeding is completed, return seeding plan to the Natural Resources Conservation Services. For state cost-share projects, attach receipts for seed, fertilizer, lime and mulch. For Federal cost-share, return receipts to Farm Service Agency.

**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

1. Bid Item No. 2

This item shall consist of mobilizing and demobilizing personnel and equipment in preparation to perform the work within the scope of this contract. Mobilization and demobilization for seeding is incidental to this item.

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.

This item shall not include transportation of personnel, equipment and operating supplies within the work limit 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

Kind of Pipe [#]	Specification
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 ^{\$}
Corrugated Profile Wall (Dual Wall) Polyethylene (PE) pipe, 12 to 60 inch	ASTM F 2306 ^{\$}

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

[#]Pipe sizes are nominal and the ranges are inclusive

^{\$}Pipe conforming to AASHTO M 252 (3 to 10 inch), or AASHTO M 294 (12 to 60 inch) is acceptable.

7. SPECIFIC SITE REQUIREMENTS



Construction Specification 000 IA-11 Removal of Water

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.

Specific Site Requirements



Construction Specification 000 IA-21 Excavation

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials. The cutoff trench and any other required excavations shall be dug to the lines and grades shown on the drawings or as staked in the field. Structure or trench excavations will conform to all safety requirements of OSHA.

2. USE OF EXCAVATED MATERIALS

Suitable materials from the specified excavations shall be used in the construction of required permanent earth fill. The suitability of materials for specific purposes shall be determined by the NRCS Inspector.

3. DISPOSAL OF WASTE MATERIAL

All surplus or waste material shall be disposed of in areas shown on the drawings or as approved by the NRCS Inspector. The waste material shall be smoothed and sloped to provide drainage.

4. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavations will conform to all safety requirements of OSHA.

5. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas as shown on the drawings or as approved by NRCS and the landowner. On wetland projects, borrow shall not be taken from the wetland area within 10 feet of the embankment or as shown on the drawings.

Borrow areas shall be excavated and grading completed in a manner to eliminate steep or unstable side slopes or hazardous or unsightly conditions.

6. OVER-EXCAVATION

Excavation beyond the specified lines and grades shall be corrected by filling the resulting voids with compacted earthfill, except that if the earth is to become the subgrade for riprap, sand or gravel bedding or drainfill, the voids shall be filled with material conforming to the specifications for the riprap, bedding or drainfill, as appropriate.

Specific Site Requirements



Construction Specification IA-23 Earthfill

1. Scope

The work shall consist of the construction of earth fills required by the drawings and specifications. The completed work must conform to the lines, grades, and elevations shown on the drawings or as staked in the field.

2. Materials

Obtain all fill materials from required excavations and designated borrow areas. Fill materials must not contain sod, brush, roots or other bio-degradable materials. Remove rocks larger than 6 inches in diameter prior to compaction of the fill.

3. Foundation Preparation

Strip foundations for earthfill a minimum of 6 inches to remove vegetation and other unsuitable materials. Scarify foundation surfaces to a minimum depth of 2 inches prior to placing fill material.

Do not slope foundation and abutment surfaces steeper than 1.5 horizontal to 1 vertical unless otherwise shown on the drawings.

4. Placement

Do not place fill until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by NRCS. Do not place fill upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

Adjacent to structures or pipes, place fill in a manner which will prevent damage. Increase the height of the fill adjacent to structures or pipes at approximately the same rate on all sides.

The materials used throughout the earth fill must be essentially uniform. Use selective placement as shown on the drawings or approved by NRCS.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, scarify it to a minimum depth of 2 inches before the next layer is placed.

Maintain the top surfaces of embankments approximately level during construction, except maintaining a cross-slope of approximately 2% to ensure effective drainage.

When moving fill material from the borrow area(s) to the embankment by use of bulldozers only, use the following steps:

- Immediately after the borrow material is pushed to the embankment, spread it in horizontal lifts placed parallel to the centerline of the embankment.
- Compactive effort will then be applied by operating equipment parallel to the centerline of the fill or embankment.
- Lift thicknesses must be in strict compliance with Clause 6, below.

Sectional fills are not allowed unless they are shown on the construction drawings.

5. Control Of Moisture Content

The moisture content of the fill material must be adequate for obtaining the required compaction.

Material that is too wet must be dried to meet this requirement, and add water to material that is too dry and mix until the requirement is met.

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.

Prevent earth foundations under and adjacent to concrete structures from drying and cracking before concrete and backfill are placed.

Apply water to the fill materials at the borrow areas insofar as possible.

6. Compaction

Compact earth fill by one of the following methods as specified on the plans or in Section 8, Special Specifications. If no method is specified, compaction will be in accordance with Method 1.

- Method 1 – Place earthfill so that the wheels or tracks of the loaded hauling equipment, traveling in a direction parallel to the centerline of fill, pass over the entire surface of each layer being placed.
- Method 2 - Two (2) complete passes of a tamping-type roller will be made over each layer. The roller must be capable of exerting a minimum of two hundred (200) pounds per square inch.
- Method 3 - Minimum density must be 90% of the maximum density as determined by ASTM D 698 and as shown on the plans.

The maximum thickness of a lift of fill before compaction is 9 inches, unless otherwise indicated on the drawings.

Place fill adjacent to structures, pipe conduits, and appurtenances in layers not more than 4 inches thick and compacted to a density equivalent to that of the surrounding fill.

Methods used to obtain compaction for fine or coarse grained materials are as follows:

- For fine grained materials, hand tamping or manually directed power tampers may be used.
Use hand compaction only to compact the earthfill under the bottom half of circular pipes. Do not use manually directed power tampers in tight spaces where applying full compactive effort will result in direct contact of the tamper plate with the pipe. Care should be taken so that compaction around the spillway pipe does not cause uplift of the pipe resulting in a void beneath the pipe.
- For coarse grained materials (sands and gravels), use vibratory plate compactors for obtaining compaction. However, use hand tamping to compact the material under the bottom half of circular pipes.

In all cases, follow manufacturer instructions for the specific compaction equipment being used. Do not operate heavy equipment within 2 feet of any structure or pipe.

Do not start compacting of fill adjacent to concrete structures until the concrete is 7 days old.

7. Islands Mounds, And Loafing Areas On Wetland Restoration, Enhancement, Or Creation Projects

Locate islands randomly within the wetland area at locations shown on the drawings or as staked in the field. Locate the orientation of island shorelines randomly with attention given to prevailing winds to limit wave damage. In general, make the side of the island with the longest dimension parallel to the prevailing wind direction. Side slopes of islands must be as shown on the drawings, but in no case will be steeper than 6 horizontal to 1 vertical. Island shapes must be irregular.

Construct loafing areas in the areas shown on the drawings or as staked in the field and shall be graded to drain runoff water. The elevation of at least one loafing area should be above the maximum water level whenever possible.

Excavated material not suitable for embankments, wetland dikes, or islands can be used to create mounds or blended into surrounding topography to create a natural appearance. Do not spread spoil material on existing wetland areas.

Site-Specific Requirements

Reset



Construction Specification 000 IA-26 Topsoiling

1. SCOPE

The work shall consist of salvaging topsoil from borrow areas or required excavations and spreading it on the exposed disturbed areas.

2. QUALITY OF TOPSOIL

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign materials.

3. EXCAVATION

After the site has been cleared and grubbed, the topsoil shall be removed from borrow areas and required excavation areas to the depth as shown on the drawings. Topsoil shall be stockpiled at locations approved by NRCS.

4. SPREADING

Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Surfaces designated to be covered shall be lightly scarified just prior to the spreading operation. Where compacted fills are designated to be covered by topsoil, the topsoil shall be placed concurrently with the fill and shall be bonded to the compacted fill with the equipment.

Topsoil shall be placed to the minimum depth shown on the drawings. After the spreading operation is completed, the surface shall be finished to a reasonably smooth surface.

Specific Site Requirements

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

1. SCOPE

The work consists 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 must conform to the requirements of the applicable specification listed below:

Kind of Pipe	Specification
Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings	ASTM F667
Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe	ASTM F894

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

Kind of Pipe	Specification
Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40,80, and 120	ASTM D1785
Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)	ASTM D2241
Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. for Water Transmission and Distribution	AWWA C900

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

Kind of Pipe	Specification
Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter	ASTM D2239
Standard Specification for Polyethylene (PE) Plastic Tubing	ASTM D2737
Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter	ASTM D3035
Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40,80, and 120	ASTM D1785
Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)	ASTM D2241
Standard Specification for Crosslinked Polyethylene (PEX) Tubing	ASTM F876

3. FITTINGS AND JOINTS

Pipe joints must conform to the details shown on the drawings. Install and join pipe 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 must conform to ASTM D 1869. Do not use solvent cemented joints for pond spillway pipes. Solvent cemented joints for PVC pipe and fittings must be in accordance with ASTM D 2855. When a lubricant is required to facilitate joint assembly, it must 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 must 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 must 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. Install PE pipe, of 1 ¼, 1 ½, or 2-inch diameter so that there are no joints within the embankment area.

Where pressure pipe is specified, fittings must have a design capacity equal to or exceeding that specified for the pipe to which it is attached. Fittings must 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 must conform to the requirements of the applicable specification listed below. Other fittings may be approved by NRCS, but ONLY prior to installation.

Pipe Fittings

<u>Kind of Fitting</u>	<u>Specification</u>
<u>Pressure Pipe</u>	
Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	ASTM D2464
Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	ASTM D2466
Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	ASTM D2467
Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Pipe	ASTM D2609
Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing	ASTM D2683
Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals	ASTM D3139
Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	ASTM D3261
Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. for Water Transmission and Distribution	AWWA C900
Solvents	
Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems	ASTM D2564
Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets	ASTM D2855
All PEX fittings must be approved by NRCS prior to installation	N/A

4. HANDLING AND STORAGE

Deliver pipe to the job site and handle 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, take care to prevent impact blows, abrasion damage, and gouging or cutting (by metal surfaces or rocks). Strictly observe all special handling requirements of the manufacturer. Take special care to avoid impact when the pipe must be handled at temperatures of 40 degrees F (4.4 degrees C) or less.

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

5. TRENCHING

Install plastic pipe conduits 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

Install plastic pipe conduits and fittings as shown on the drawings and specified herein. Lay the pipe so that there is no reversal of grade between joints, unless otherwise shown on the drawings. Place the pipe with the bell end upstream, unless otherwise specified. Carefully place the pipe on the bedding or into the pipe trench.

Take care 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, allow it to reach ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

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

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

Firmly and uniformly support the pipe throughout the entire length. Make bell-holes 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, firmly and uniformly bed the pipe 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 must 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, firmly and uniformly place the pipe on a sand or gravel bed. Carefully place sand or gravel fill and compact as specified herein and as shown on the drawings.

Plastic pipe installed above ground must be designed to withstand exposure to ultraviolet radiation. Install and anchor above ground pipe as detailed in the construction drawings.

Adequate thrust control shall be incorporated in these installations.

7. BACKFILL

Hold the pipe down during backfilling to the top of the pipe to prevent its being lifted from its original placement.

Within 2 feet of the pipe, carefully place and compact backfill 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 is 4 inches and at more than 2 feet from the pipe a maximum thickness before compaction is 9 inches. Unless otherwise specified, compact the initial backfill to a density equivalent to that of the adjacent fill or foundation materials.

The water content of cohesive backfill material must 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.

Site-Specific Requirements



Construction Specification IA-46 Tile Drains for Land Drainage

1. SCOPE

The work consists of furnishing and installing drainage pipe (tubing) and tile and the necessary fittings and appurtenances.

2. MATERIALS

Materials must meet the requirements as shown on the drawings. Field inspect for any deficiencies such as thin spots or cracking prior to installation.

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.

All pipe material must meet the following reference specifications:

Plastic Pipe

Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings	ASTM F667
Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Non-Pressure Gravity-Flow Storm Sewer and Subsurface Drainage Applications	ASTM F2306
Standard Specification for 2 in. to 60 in. Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications	ASTM F2648
Standard Specification for 3 through 24 in. Lined Flexible Corrugated Polyethylene Pipe for Land Drainage Applications	ASTM F3390
Standard Specification for Corrugated Polyethylene Drainage Pipe 3"-10"	AASHTO M252
Standard Specification for Corrugated Polyethylene Drainage Pipe 12"-60"	AASHTO M294

Clay and Concrete Pipe

Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile	ASTM C4
Standard Specification Concrete Drain Tile	ASTM C412

3. EXCAVATION

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

Construct the trench or excavation for the conduit to the line, depth, cross section, and grade shown on the drawings, or as directed by the NRCS Inspector. The 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 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 must 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 is the conduit diameter plus 12 inches measured at the top of the conduit, unless approved bedding is installed.

The contractor must furnish, place, and subsequently remove trench shields, shoring and bracing, or other

methods, necessary to safeguard the workers and work, and to prevent damage to the existing improvements.

Plow installation is allowed. The minimum allowable trench width is two (2) inches wider than the conduit on each side. Grade control and bedding conditions must be closely inspected during plow installation. Boulders, cobbles, or cemented soils can cause the plow to jump and 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, 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. Do not use the 90-degree "V" groove 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, use a sand-gravel mix or other approved materials 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 conduit will be as shown on the drawings. Place the envelope or filter material in the bottom of the trench just prior to the laying of the conduit. Then lay the conduit and place the envelope or filter material over the conduit.

6. PLACEMENT AND JOINT CONNECTIONS

All drains must be laid to grade.

Joints between lateral concrete and clay drain tiles must vary with soil type as follows:

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

Joints 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, cover the joint 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 must elapse to allow the tubing to reach the ambient temperature of the trench. Securely tie all split fittings with nylon cord before backfill is placed. When corrugated plastic tubing is used, no more than 5% stretch is allowed.

7. CONNECTIONS

Make lateral connections with manufactured appurtenances (wyes, tees, etc.) comparable in strength and durability with the specified conduit unless otherwise shown on the drawings.

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

Make connections with the outlet pipe watertight.

8. OUTLETS

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, 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:

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 burning vegetation on the outlet ditch bank is likely to create a fire hazard.

Equip the outlet with a flap-gate type rodent guard.

9. BLINDING

After the conduit is placed in the excavated groove, place friable material from the sides of the trench around the conduit, completely filling the trench to a depth of not less than six (6) inches over the top of the conduit. 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. Blind conduit placed during any one day by the end of the day's work.

10. BACKFILLING

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

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

Site-Specific Requirements



Construction Specification 000 IA-51 Corrugated Metal Pipe Conduits

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

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
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 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
<u>1/</u> 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.

Specific Site Requirements

**Construction Specification
000 IA-95 Geotextile**

1. SCOPE

This work shall consist of furnishing all materials, equipment, and labor necessary for the installation of geotextile.

2. MATERIAL QUALITY

Geotextile shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns, having a composition of at least 95 percent, by weight, of polypropylene, polyester or polyvinylidene-chloride. The geotextile shall be formed into a stable network of filaments or yarns that retain their relative position to each other, are inert to commonly encountered chemicals and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. Unless otherwise specified, the class and type of geotextile shall be as shown on the drawings and shall meet the requirements for materials that follow:

1. Woven Geotextile shall conform to the physical properties listed in Table 1. The woven geotextile shall be manufactured from monofilament yarns that are woven into a uniform pattern with distinct and measurable openings. The geotextile shall be manufactured so that the yarns will retain their relative position with regard to each other. The yarns shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.
2. Nonwoven Geotextile shall conform to the physical properties listed in Table 2. Nonwoven geotextile shall be manufactured from randomly oriented fibers that have been mechanically bonded together by the needle-punched process. In addition, one side may be slightly heat bonded. Thermally bonded, nonwoven geotextile, in addition to mechanically bonded, nonwoven geotextile, may be used for Road Stabilization. The filaments shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure.
3. The geotextile shall be shipped in rolls wrapped with a protective covering to keep out mud, dirt, dust, debris and direct sunlight. Each roll of geotextile shall be clearly marked to identify the brand, type and production run.

3. STORAGE

Prior to use, the geotextile shall be stored in a clean dry place, out of direct sunlight, not subject to extremes of either hot or cold, and with the manufacturer's protective cover in place. Receiving, storage, and handling at the job site shall be in accordance with the requirements in ASTM D 4873.

4. SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions and standing or flowing water (unless otherwise shown on the drawings).

5. PLACEMENT

Prior to placement of the geotextile, the soil surface will be inspected for quality assurance of design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when material is placed on or against it. The geotextile may be folded and overlapped to permit proper placement in the designated area.

The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified), and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a "U", "L", or "T" shape or contain "ears" to prevent total penetration. Steel washers shall be provided on all but the "U" shaped pins. The upstream or up-slope geotextile shall overlap the abutting down-slope geotextile. At vertical laps, securing

pins shall be inserted through both layers along a line through approximately the midpoint of the overlap. At horizontal laps and across slope laps, securing pins shall be inserted through the bottom layer only. Securing pins shall be placed along a line approximately 2 inches in from edge of the of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate, to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to be left in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used, overlaying the existing geotextile. The patch shall extend a minimum of 2 feet from the edge of any damaged area.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. Geotextile shall be placed in accordance with the following applicable specification according to the use indicated in drawings:

Slope protection – Class I or II as indicated in Tables 1 and 2.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. Rock shall not be pushed or rolled over the geotextile.

Class I, unprotected – limit height for dropping stone onto bare geotextile to 3 feet.

Class II, protected – require the use of 6 inches a clean pit-run gravel over the geotextile to cushion the stone and limit the height of drop to 3 feet.

On slopes with strong seepage flow, the geotextile must be in intimate contact with the soil to prevent erosion of the soil surface. Use 6 inches of a clean pit-run gravel over the geotextile to hold it in place and minimize voids under the riprap. Embedment of the geotextile in a trench to form a cutoff at regular intervals down the slope will prevent erosion under the fabric. Place cutoffs more closely together in highly erodible soils and wider apart in more stable soils

Subsurface drains – Class III as indicated in Tables 1 and 2.

The geotextile shall not be placed until drainfill or other material can be used to provide cover within the same working day. Drainfill material shall be placed in a manner that prevents damage to the geotextile. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet.

Road stabilization – Class IV as indicated in Tables 1 and 2.

The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting conformation to the surface irregularities when the roadway fill material is placed on its surface. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet. Unless otherwise specified, the minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer, but they shall be removed before the permanent covering material is placed.

Table 1. Requirements for Woven Geotextiles^{1/}**Table 1. Requirements for Woven Geotextiles^{1/}**

Property	Test Method	Class I	Class II	Class III	Class IV
Grab tensile strength (pounds)	ASTM D4632	247 minimum	180 minimum	180 minimum	315 minimum
Elongation at failure (%)	ASTM D4632	< 50	< 50	< 50	< 50
Trapezoidal tear strength (pounds)	ASTM D4533	90 minimum	67 minimum	67 minimum	112 minimum
Puncture strength (pounds)	ASTM D6241	495 minimum	371 minimum	371 minimum	618 minimum
Ultraviolet light (% retained strength)	ASTM D4355	50 minimum	50 minimum	50 minimum	70 minimum
Permittivity (sec ⁻¹)	ASTM D4491			as specified	
Apparent opening size (AOS) ^{2/}	ASTM D4751			as specified	
Percent open area (POA) (%)	USACE ^{3/} CWO-02215-86			as specified	

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Maximum average roll value.

3/ Note: CWO is a USACE reference.

Table 2. Requirements for Nonwoven Geotextiles^{1/}

Table 2. Requirements for Nonwoven Geotextiles^{1/}

Property	Test Method	Class I ^{2/}	Class II ^{2/}	Class III ^{2/}	Class IV ^{2/}
Grab tensile strength (pounds)	ASTM D4632 grab test	202 minimum	157 minimum	112 minimum	202 minimum
Elongation at failure (%)	ASTM D4632	50 minimum	50 minimum	50 minimum	50 minimum
Trapezoidal tear strength (pounds)	ASTM D4533	79 minimum	56 minimum	40 minimum	79 minimum
Puncture strength (pounds)	ASTM D6241	433 minimum	309 minimum	223 minimum	433 minimum
Ultraviolet light (retained strength) (%)	ASTM D4355	50 minimum	50 minimum	50 minimum	50 minimum
Permittivity (sec ⁻¹)	ASTM D4491		0.70 minimum or as specified		
Apparent opening size (AOS) (mm) ^{3/}	ASTM D4751		0.22 maximum or as specified		

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Needle punched geotextiles may be used for all classes. Heat-bonded or resin-bonded geotextiles may be used for class IV only.

3/ Maximum average roll value.

Specific Site Requirements



Practice Specification Saturated Buffer (Code 604)

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-CPA-4, Seeding Plan, and Construction Specification IA-6, Seeding and Mulching for Protective Cover.

Specific Site Requirements

Practice Specification Denitrifying Bioreactor (Code 605)

SCOPE

The work consists of constructing a denitrifying bioreactor as required by the construction plans.

UTILITIES

The contractor is responsible for calling Iowa One Call at least 48 hours prior to beginning any excavation work. The landowner is responsible for locating other infrastructure such as tile lines and structures. The landowner will obtain all necessary permissions from regulatory agencies, or document that no permits are required.

GENERAL

Carry out construction operations in a manner and sequence that erosion and air and water pollution are minimized and held within legal limits.

The completed job must present a workmanlike appearance and conform to the line, grades, and elevations shown on the drawings or as staked in the field.

Carry out all operations in a safe and skillful manner. Observe safety and health regulations and use appropriate safety measures.

Save documentation of materials used (geotextile tags, seed tags, photographs of pipe labeling, etc.) and provide to NRCS.

Remove all trees, stumps, brush, and debris from the site and disposed of so they will not interfere with construction or proper functioning of the structure.

EXCAVATION

Unless otherwise specified, begin excavation for and subsequent installation of the pipe and structures at the outlet end and progress upstream.

Excess spoil material must be placed, spread, leveled, shaped, or hauled away as shown on the construction plans or as staked in the field. Finish the completed job to a degree so the surface can be traveled with farm-type equipment unless otherwise specified in the construction plans.

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.

Trench shields, shoring, bracing, or other methods necessary to safeguard the workers and prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the contractor. Occupational Safety and Health Administration (OSHA) requirements relating to trench safety shall be followed.

MEDIA CHAMBER

Line the bottom and sides of the media chamber with plastic as shown on the construction drawings. Plastic must have a minimum thickness of 4 mil.

If a soil cap is to be constructed over the top of the chamber, use geotextile to separate the media from the soil. Geotextile must be non-woven, class II, and meet the requirements of Iowa Construction Specification IA-95, Geotextile.

Carbon source media must meet the following requirements:

1. Wood material must be chipped, not shredded. At minimum, 90% of the chips by weight must be 1-inch to 2-inch in length (longest direction).
2. Wood chips must be free from objectionable material such as dirt, fines, stones, leaves, long stringy material, etc. Decomposed or partially decomposed wood chips shall not be used.
3. Wood must not be treated for ground contact.

4. Wood made from high tannin content species such as oak, cedar, or redwood is to be avoided. NRCS will reject any proposed wood chips with more than 50% by volume oak wood chip materials. The contractor is advised to check with NRCS in advance for acceptance of the media to be used in the bioreactor.

Spread the media evenly around the chamber. There must be no air pockets, bridging, or uneven surface of the media. Media must be placed in a manner that avoids damage to the distribution and collection pipes in the chamber.

Mound the top surface of the media chamber with the material specified in the plans to allow for settlement of the media and to shed water. Mound the center of the trench as shown on the plans but no less than 10% of the total depth of the media material.

WATER CONTROL STRUCTURE AND PIPE

The materials and manufacture of the water control structure, pipe, anti-seep collars, coupling bands, coatings, and other appurtenances must be as shown on the construction drawings and conform to materials and applicable reference specifications as shown in Iowa Construction Specification IA-620, Underground Outlet.

Place the water control structure and pipe couplers on a stable base. The stable base may be compacted earth, compacted sand, or a concrete pad. Extend the stable base no less than 1 foot around the structure.

Install the structure with all stop boards in their tracks. Place impervious backfill material around the structure and appurtenances by hand and in layers not more than 6 inches thick before compaction. Thoroughly compact each layer, by means of hand tamping, to the same density as the surrounding materials. Increase the height of fill at approximately the same rate on all sides of the structure.

Lay the pipe to the lines, grades, and elevations shown on the drawings. Bed the pipe firmly and uniformly throughout its entire length. Use hand tamping methods around pipes that are within 20 feet of the water control structure. Beyond that distance, the pipe may be laid with a tile plow or trencher designed for proper bedding of the pipe, and the disturbed soil allowed to naturally subside back into place.

OUTLET

Where the construction plans call for a free outlet, use a continuous section of non-perforated conduit at the outlet, unless a headwall is used. All outlets must have an animal guard, installed to allow passage of debris.

The continuous section of non-perforated conduit must be long enough to satisfy all requirements of Conservation Practice Standard 606 – Subsurface Drain:

- At least two-thirds of the pipe must be buried in the ditch bank.
- The cantilever section must extend to the toe of the ditch side slope or to the side slope protected from erosion.
- The continuous section must be at least 20 feet long.

Acceptable materials for use at the outlet include the following:

- Corrugated metal pipe, galvanized or aluminum, 16-gauge, minimum thickness,
- Smooth steel pipe with 3/16 of an inch minimum thickness,
- Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 35 or less or schedule 40 or heavier, and
- Dual wall corrugated polyethylene pipe.

All plastic and polyethylene pipe outlets must include an ultra-violet stabilizer.

VEGETATION

Establish a protective cover of vegetation on all surfaces of the areas disturbed by construction. Perform seeding and mulching in accordance with the Seeding Plan, IA-CPA-4, and Construction Specification IA-6, Seeding and Mulching for Protective Cover.

Establish vegetation as soon after construction as possible.

9. Specific Site Requirements



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.

7. Specific Site Requirements