CONSTRUCTION SPECIFICATIONS

SUPPLEMENTAL MEASUREMENT PAYMENT/ITEMS OF

WORK AND CONSTRUCTION DETAILS

FOR

HARDIN CREP WETLAND PROJECT

SITE HAR892029C

HARDIN COUNTY, IOWA

LICENSED PROFESSIONAL ENGINEER JAMES D. LEIDING 17000 IOWA	I hereby certify that this engineering document was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer and Land Surveyor under the laws of the State of Iowa. (Signature) James D. Leiding (Date) 9/19/14 Printed or typed name James D. Leiding P.E. My renewal date is December 31, 2015 License Number is 17000 Pages or sheets covered by this seal: Entire Document

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NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

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.

2. FOUNDATION PREPARATION

The construction areas shall be stripped of 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 or impede drainage of adjacent land.

4. DISPOSAL OF REFUSE MATERIALS

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

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

5. SALVAGE

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

6. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. 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.
2. 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 prices and will constitute full compensation for completion of the work.
3. All work described in section IA-1 will be included in the payment for Clearing and Grubbing and Topsoil Strip, Salvage, and Respread.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
    a. Bid Item 5, Clearing and Grubbing
        (1) This item will consist of the removal of all woody growth within the construction area.
        (2) Lump sum item to be considered full compensation for all work related to clearing and grubbing.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-5 POLLUTION CONTROL

1. SCOPE

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

2. MATERIALS

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

3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

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

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

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

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

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

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

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

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

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

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

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

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

4. CHEMICAL POLLUTION

The Contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to be used to dispose of chemical pollutants, such as drained lubricating or transmission oils, greases, soaps, concrete mixer wash water, asphalt, etc., produced as a by-product of the construction work. At the completion of the construction work, sumps shall be removed and the area restored without causing pollution.

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

5. AIR POLLUTION

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

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

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

6. MAINTENANCE, REMOVAL, AND RESTORATION

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

7. SPECIAL SPECIFICATIONS

A. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Subsidiary Item, Sediment Filters

(1) This item consists of all work to install, maintain and remove sediment filters for the project. Sediment filters to be removed once vegetation is established.

(2) No separate payment will be made for sediment filters. Compensation for this item will be incidental to other items of work.

(3) Contractor shall perform all construction activities in a manner that will minimize water pollution, air pollution, and soil erosion. Sediment filters shall be placed as needed where off-site erosion could occur.

b. Subsidiary Item, Pollution Control

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

(2) No separate payment will be made for Pollution Control. Compensation for this item will be incidental to other items of work.

NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION

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.

The 10:1 Safety bench, which is below the Normal Pool Elevation and does not receive seed, shall be graded and tilled to a uniform surface.

On side slopes steeper than 2-1/2 horizontal to1 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.

Contractor shall submit the Form IA-CPA-4 for each seed type to be used at least 3 weeks prior to beginning seeding operations.

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

4. MULCH APPLICATION

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

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

5. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific prices are established in the contract, each area treated is measured as specified in this specification section and the area calculated to the nearest 0.1 acre.

Payment for treatment is made at the contract unit price for the designated treatment, which will constitute full compensation for completion of the work.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefor are:

a. Bid Item 1, Structure and Channel Seeding

(1) This item will consist of seeding the dike except the upstream sideslope below the weir elevation, the tile outlet channel sideslopes, and any other disturbed areas as determined by the engineer.

(2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Life Seed (PLS) where PLS = (percent germination plus percent dormant seed) times percent purity.

(3) Seeding rates are as follows:

Smooth Bromegrass	25 lbs. / ac.

(4) Seed shall be applied with a drill and placed at ¼ to ½ inch deep.

(5) Fertilizer shall be applied on the entire seeding area at the following rate:

Nitrogen	30 lbs. / ac.
Phosphorus (P_2O_5)	30 lbs. / ac.
Potassium (K_2O)	40 lbs. / ac.

No lime is needed.

(6) Straw mulch shall be applied at the rate of 2 tons per acre on the dike and auxiliary spillway.

(7) Seeding will be completed during the following seeding periods:

Spring	March 1 to May 15
Summer	August 1 to September 15
Fall	November 15 to freeze-up

If construction is completed during any other time of the year, the seeding shall be performed at the next seeding period.

(8) If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at a rate of one and one-half bushels per acre.

(9) Measurement will be based on the area successfully seeded.

b. Bid Item 2, Fire Break Seeding

(1) This item will consist of seeding the outside 30' of the perimeter of the site except for the western side along N Avenue and northern side along 145th Street.

(2) All seed must be cleaned and weed free. Seeding rates are expressed in bulk pounds per acre. Seed quality shall not drop below 70% Pure Life Seed (PLS) where PLS=(percent germination plus percent dormant seed) times percent purity.

(3) Seeding rates are as follows:

Timothy Grass	0.5 lb. /ac.
Red top Grass	0.6 lb. /ac.
Perennial Rye Grass	1.0 lb. /ac.
Alfalfa	0.5 lb. /ac.
Ladino Clover	1.0 lb. /ac.
Kopu II White Clover	0.5 lb. /ac.
Red Clover	1.0 lb. /ac.
Alsike Clover	1.0 lb. /ac.

Partridge Pea 1.0 lb. /ac.

(4) Seed shall be applied with a drill and placed at ¼ inch or less deep.

(5) No Fertilizer shall be applied on the seeding area.

(6) Inoculants shall be for the types of seeds specified and applied per manual recommendations.

(7) No Mulch will be applied.

(8) Seeding will be completed during the following seeding periods:

Spring	March 1 to May 15
Summer	August 1 to September 15
Fall	November 15 to freeze-up

If construction is completed during any other time of the year, the seeding shall be performed at the next seeding period.

(9) Measurement will be based on the area successfully seeded.

c. Bid Item 3, Buffer Seeding

(1) This item will consist of seeding the borrow area and the other disturbed areas not seeded by Bid Item 1 and 2 and that are above the weir elevation within the easement boundary.

(2) All seed must be cleaned and weed free. Seeding rates are expressed in pounds of pure live seed per acre.

(3) Seeding mixture shall include a minimum of 5 native grasses and 10 native forbs. The mixture shall provide a minimum of 30 grass seeds per square foot and 10 forbs seeds per square foot. Number of seeds will be based on Table 3 in NRCS Standard 327 "Conservation Cover." Contractor's proposed seed mix shall be submitted to the Engineer for approval at least 3 weeks before seed is to be applied.

(4) Alternative seeding mixtures which meet NRCS standard 327 (Conservation Cover) requirements for native grass and forb/legume mixture may be substituted for above seeding mixture and must be approved by Engineer.

(5) Seeding will be completed during the following seeding periods:

Spring	April 1 to July 1
Fall	November 15 to freeze-up

(6) Prepare a firm seedbed for all planting methods:

(a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved methods; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment. If the land was used for pasture and has a smooth surface, the preparation in non-disturbed areas to be seeded shall include moving any vegetation taller than 12 inches and applying a burn down herbicide, such as glyposate, at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked as needed to thoroughly loosen and pulverize the soil to a depth of three (3) inches. If emergent growth occurs again prior to seeding, the area shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died (about one week). If the pasture has a rough surface that would negatively impact the seeding, the area shall be thoroughly disked and then cultipacked prior to seeding.

(b) After the disking operation, and prior to seed application, firm the seedbed with a cultipacker or similar piece of equipment.

(c) No lime or fertilizer will be applied.

(7) Sow seed with the contour using a grassland or rangeland drill set for the specified seeding rates. The drill shall be equipped with double coulter furrow openers. The drill shall be subject to acceptance by Engineer. Overlap each successive seeding pass to ensure complete coverage.

(8) Plant seed no more than one-quarter inch deep; some seed may be seen on the surface after seeding.

(9) Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall also be allowed in areas not accessible to drills or other equipment. Once broadcast, the seed must be covered with soil to a depth no greater than one quarter (1/4)inch by means of hand rakes or other approved methods.

(10) Upon completion of the seeding operation, cultipack the seedbed to provide a positive seed-soil contact. If the drill seeder is equipped with an approved cultipacker or press wheels, separate operations shall not be necessary. The type of cultipacker / seeder to be used shall be subject to acceptance by Engineer.

(11) No Mulch will be applied.

(12) Measurement will be based on the area successfully seeded.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-8 MOBILIZATION AND DEMOBILIZATION

1. SCOPE

This work shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

The work shall 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 requirement for commencement of work.

2. EQUIPMENT AND MATERIALS

Mobilization shall include all activities and costs for transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary 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.

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

The work includes mobilization and demobilization activities 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 of 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 invoices by the contractor showing specific mobilization and demobilization costs and evidence of the charges of suppliers, subcontractors, and others. If the total of such payments is less than the lump sum contract price, the unpaid balance will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for the completion of the work.

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

4. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and the construction details therefor are

a. Bid Item 4, Mobilization and Demobilization

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

(2) 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.

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

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

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

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

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

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

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.

6. SPECIAL SPECIFICATIONS

A. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefor are:

a. Subsidiary Item, Dewatering

(1) This item shall include all costs to divert, pump, dam or other means to dewater the site.

(2) No separate payment will be made for Removal of Water. Compensation for this item shall be included in the payment for Earthfill; Corrugated Metal Pipe; and Water Control Structure.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-13 SHEET PILING

1. SCOPE

The work shall consist of furnishing and driving the specified sheet piling at the location shown on the drawings.

2. MATERIALS

Sheet piling shall conform to the requirements of ASTM A328 (Steel Sheet Piling), A572 (High-Strength Low-Alloy Columbium-Vanadium Structural Steel), or A690 (High-Strength Low-Alloy steel H-Piles and Sheet Piling for Use in Marine Environments). The sheet piling provided shall meet the required cross-section, section modulus, thickness, and steel grade shown on the drawings. Fabrication of sheet piles from shorter lengths of pile stock is not permitted.

3. DRIVING SHEET PILE

The piling shall be driven in a manner so as to insure perfect interlocking throughout the entire length of each pile. The piles shall be held in proper alignment during driving by means of suitable temporary guide structures which shall be removed when they have served their purpose.

Piling shall be driven to the full depth shown on the drawings unless otherwise approved by the engineer.

4. CUTTING OFF PILES

The contractor shall cut the piling off at the specified elevations. Piling length shall be sufficient to permit removal of all materials damaged by driving.

5. DEFECTIVE PILING

Any piling damaged in driving, driven out of its proper location, driven below the specified cut off elevation, or inaccurately cut off shall be pulled and replaced or re-driven. Any piling ruptured in the interlock or otherwise damaged during driving shall be pulled and replaced.

6. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the area of sheet pile walls, acceptably placed, will be computed to the nearest square foot within the neat lines shown on the drawings. Payment will be made at the constitute full payment for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.
2. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in this specific Section.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

   a. Bid Item 6, Steel Sheet Pile

      (1) This item shall consist of furnishing and installing the steel sheet piling shown on the drawings. This item shall include field cutting the side slopes of the sheet piling to the specified slope shown on the drawings.

      (2) The sheet piling will be installed starting from the center of the weir section and progressing away from centerline. Bends and deflections shall be made with prefabricated pieces specifically made for a location.

      (3) Sheet piling shall have the minimum following requirements:

         (a) Minimum section modulus of 12.70 cu. in. per foot of wall.

         (b) Minimum grade of steel shall be 36 ksi.

         (c) Minimum moment of inertia of 58.0 per pile.

      (4) Payment will constitute full compensation for related subsidiary items.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-21 EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

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 and not impede the drainage of adjacent land.

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 the NRCS and the landowner.

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

Borrow areas to be excavated in a manner that will increase the Normal Pool Area. Maximum tie in slopes for borrow areas to existing is 4:1.

When the quantities of suitable materials obtained from specified excavations or on-site borrow areas are insufficient to construct the specified fills, additional materials shall be obtained from an offsite location secured by the contractor and hauled/trucked to the site. Material shall be approved by the Engineer prior to commencement of hauling and placement.

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.

7. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. 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.
2. 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.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:
   a. Bid Item 7, Tile Investigation and Removal
      (1) This item will consist of the excavation necessary to locate and remove any tile under the dike, to remove tile at the other tile main locations shown on the plans, and locate the field tile lines.
      (2) The outlet location is all that is currently known about these tiles.
      (3) The extent of removal shall be as shown on the drawings.
      (4) The investigation should reveal where the tile crosses the dike line or where it is located if it doesn't cross the dike line. The tile will be removed only if it crosses the dike line.
      (5) Payment will constitute full compensation for related subsidiary items: Structure Excavation and Backfill of Required Excavations.
   b. Bid Item 8, Excavation, Channel
      (1) This item will consist of the excavation for the outlet channel for the sheet pile structure.
      (2) The excavated material from the outlet channel shall be disposed of as directed by the Engineer.
      (3) The material excavated from the plunge pool for the sheet pile structure may be used within the dike if the material is suitable earthfill material. If the material is not suitable for constructing the dike it shall be disposed of as directed by the Engineer.
      (4) Payment will constitute full compensation for related subsidiary items: Pollution Control, Removal of Water, Diversion Dikes and Backfill of Required Excavations.
   c. Bid Item 9, Excavation Core Trench
      (1) This item shall consist of excavation of a core trench along the centerline of the berm and weir sheet pile wall area as shown on the plans.
      (2) Payment will constitute full compensation for excavation and disposal of excavated material from the core trench. Payment for fill material will be by the Earthfill, Clay Core item.
   d. Subsidiary Item, Borrow Excavation
      (1) This item will consist of borrowing from the auxiliary spillway, borrow areas shown on the drawings and offsite locations as needed to construct the dike, auxiliary spillway and fill areas.

(2) No borrow is to be taken from the wetland pool except as shown on the drawings. Borrow Areas in the wetland pool must have a minimum of 6" depth of topsoil replacements.

(3) The topsoil from the borrow area shall be removed to a minimum depth of 6" and stockpiled. When the borrow operations have been completed the topsoil shall be uniformly spread over the entire borrow area.

e. Subsidiary Item, Structure Excavation

(1) This item shall consist of the excavation necessary to install the steel sheet pile, riprap, reinforced concrete pipe, corrugated metal pipe conduit, corrugated metal pipe tile outlets and water control structure in the locations and as shown on the drawings.

(2) No separate payment will be made for Structure Excavation. Compensation for this item will be included in payment for Corrugated Metal Pipe; Reinforced concrete pipe; Water Control Structure; Steel Sheet Pile; Riprap and Tile Drains.

f. Subsidiary Item, Topsoil Stripping Excavation

(1) This item shall consist of stripping and salvaging the topsoil to a depth of six (6) inches from borrow and embankment areas.

(2) No separate payment will be made for Stripping of Topsoil. Compensation for this item will be included in payment for Topsoil, Strip, Salvage, and Respread.

g. Subsidiary Item, Sediment and Tile berms

(1) This item shall consist of necessary sediment berms to control erosion during construction of sediment and tile berms as shown on the plans.

(2) No separate payment will be made for sediment and tile berms. Compensation will be included with related items of work.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-23 EARTHFILL

1. SCOPE

The work shall consist of the construction of earth fills required by the drawings and specifications.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. Fill materials shall contain no sod, brush, roots or other bio-degradable materials. Rocks larger than 6 inches in diameter shall be removed prior to compaction of the fill.

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials. Foundation surfaces shall be scarified to a minimum depth of 2 inches.

Foundation and abutment surfaces shall not be sloped steeper than 1.5 horizontal to 1 vertical unless otherwise shown on the drawings.

4. PLACEMENT

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

Adjacent to structures or pipes, fill shall be placed in a manner which will prevent damage. The height of the fill adjacent to structures or pipes shall be increased at approximately the same rate on all sides.

Except where a clay core is shown on plans, the materials used throughout the earth fill shall be essentially uniform. Selective placement shall be 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, it shall be scarified to a depth of not less than 2 inches before the next layer is placed.

The top surfaces of embankments shall be maintained approximately level during construction, except that a cross-slope of approximately 2% shall be maintained to ensure effective drainage.

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

- Immediately after the borrow material is pushed to the embankment, it shall be spread 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 shall be in strict compliance with Clause 6, below.

5. CONTROL OF MOISTURE CONTENT

The moisture content of the fill material shall be adequate for obtaining the required compaction. Material that is too wet shall be dried to meet this requirement, and material that is too dry shall have water added and mixed until the requirement is met.

The moisture content of the fill material shall 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.

Earth foundations under and adjacent to concrete structures shall be prevented from drying and cracking before concrete and backfill are placed.

The application of water to the fill materials shall be accomplished at the borrow areas insofar as possible.

6. COMPACTION

Earth fill shall be compacted by one of the following methods as specified on the plans. If no method is specified, compaction will be in accordance with Method 1.

- Method 1 - Earthfill shall be placed 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 – A minimum of two (2) complete passes of a tamping-type roller will be made over each layer. The roller shall be capable of exerting a minimum of one hundred (100) pounds per square inch.
- Method 3 - Minimum density shall 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 shall be 9 inches, unless otherwise indicated on the drawings.

Fill adjacent to structures, pipe conduits, and anti-seep collars shall be placed in layers not more than 4 inches thick and compacted to a density equivalent to that of the surrounding fill by hand tamping, manually directed power tampers, or plate vibrators. 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. Hand tamping only shall be used to compact the earthfill under the bottom half of circular pipes. Equipment shall not be operated within 2 feet of any structure or pipe.

Compacting of fill adjacent to concrete structures shall not be started until the concrete is 7 days old.

7. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the volume of earthfill will be computed to the nearest cubic yard by the method of average cross-sectional end areas. No deduction in volume will be made for embedded items, such as, conduits, inlet structures and their appurtenances. The pay limits for computation shall be as shown on the drawings with the further provision that earthfill required to fill voids resulting from over excavation of the foundation, outside specified lines and grades, will be included in the measurement for payment only under the following conditions:

   - Where such over excavation is directed by the engineer to remove unsuitable material, and
   - Where the unsuitable condition is not a result of the contractor's improper construction operations as determined by the engineer.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

   a. Bid Items 10, 11 and 12, Earthfill, Clay Core, Suitable Material for Berm and Pool Construction

      (1) This item shall consist of the earthfill necessary to construct the dike including backfill of the stripping, topsoil and core trench excavations as shown on the plans.

      (2) The majority of the earthfill material shall be from the designated borrow areas, unless other areas are approved by the engineer.

         (a) It is anticipated that there will be insufficient suitable earthfill material for clay core construction available on site.

         (b) Contractor will be required to secure suitable material from an offsite location and haul necessary material to the site.

      (3) Compaction shall be Method 1.

      (4) Rocks larger than 6" shall be removed prior to compaction.

      (5) Payment for Earthfill, Clay Core shall include the cost of stripping the offsite borrow area, loading, hauling and placement of the material, and re-establishment of the borrow area to the satisfaction of the borrow area owner.

      (6) Payment will constitute full compensation for the following related subsidiary items: Pollution Control, Removal of Water, Topsoil Spreading and Borrow Excavation.

   b. Subsidiary Item, Backfill Required Excavation

      (1) This item shall consist of backfilling the areas excavated to install the water control structure, pipe conduits and to locate and remove the tile lines.

      (2) Compaction adjacent to the structures shall be as indicated above. All other compaction shall be Method 2 or equivalent.

      (3) No separate payment will be made for Backfill of Structure Excavation. Compensation for this item will be included in payment for Corrugated Metal Pipe; Reinforced Concrete Pipe; Water Control Structure; Tile Investigation and Removal and Tile Drains.

NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION

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.

Excess Topsoil shall be left in the stock pile or placed in stockpile at location approved by Owner/NRCS and left for owner's use.

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.

5. SPECIAL SPECIFICATIONS

A. Bid Item 13, Topsoil, Strip, Salvage, and Respread

1. This item shall consist of stripping all areas of excavation, borrow site, and foundation area of the dike structure to a depth of 6 inches and salvage to stockpile for respread.
2. Respread of stockpiled topsoil shall be spread to a depth of 6 inches of all areas constructed or disturbed in Excavation and Earthfill, Dike.
3. When the borrow operations have been completed, the topsoil shall be uniformly spread over the entire borrow area shaped and graded to drain.
4. No additional compensation will be given for stockpiling of excess topsoil material.
5. Payment will constitute full compensation for related subsidiary items: Site Preparation, Pollution Control, Removal of Water, Diversion Dikes and Backfill of Required Excavations.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-46 TILE DRAINS FOR LAND DRAINAGE

1. SCOPE

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

2. MATERIALS

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

Corrugated polyethylene tubing and fittings shall conform to ASTM F 405 or F 667, as appropriate. Corrugated profile wall polyethylene (PE) pipe shall conform to ASTM F 2648. Perforated tubing shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the tubing. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

3. EXCAVATION

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

The trench or excavation for the tile shall be constructed to the line, depths, cross-sections, and grade shown on the drawings or as directed by the NRCS Inspector. If not otherwise shown on the drawings, trench width at the top of the drain should be the minimum required to permit installation and provide bedding conditions suitable to support the load on the drain but with not less than 3 inches of clearance on each side of the drain.

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

Plow installation is allowed. Minimum trench width shall be 2 inches wider than the conduit. Grade control and bedding conditions shall 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, the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. The groove shall be shaped to fit the size of tile. The 90-degree "V" groove shall not be used on conduits greater than 8 inches in diameter.

If the bottom of the trench does not provide a sufficiently stable or firm foundation for the drain tile, a sand-gravel mix or

other approved materials shall be used to stabilize the bottom of the trench.

Drain tile shall not be laid on a rock foundation. In the event that boulders, rock or ledge rock or cemented materials that prevent satisfactory bedding are encountered at the required grade, the trench shall be excavated to a depth of at least 6 inches below grade and backfilled to grade with a sand-gravel mixture or other approved material.

5. FILTER OR ENVELOPE MATERIAL

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

6. PLACEMENT AND JOINT CONNECTIONS

All drains shall be laid to grade.

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

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

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

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

7. CONNECTIONS

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

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

Connections with the outlet pipe shall be made watertight.

Where no connection to existing or proposed tiles are shown on the plans, the end of the tile shall be capped to prevent any soil intrusion. At the end of the tile a 6' T-post shall be installed and extend beyond the ground surface.

8. OUTLETS

A continuous section of non-perforated conduit at least 20 feet long shall be used at the outlet. Two-thirds of the outlet pipe shall be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side slope protected from erosion. See IA-51 for CMP outlets on field tile. Acceptable materials for use at the outlet include the following:

a. Corrugated metal pipe, galvanized or aluminum, 16 gauge;
b. Smooth steel pipe with a minimum wall thickness of 3/16 inch;
c. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier; or
d. Dual wall corrugated polyethylene pipe (PE).

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

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

9. BLINDING

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

10. BACKFILLING

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

11. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the quantity of each pipe size is determined as the sum of the nominal laying lengths of the pipe sections installed. Payment will be made at the contract unit price for the length of pipe installed. Such payment constitutes full compensation for transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.
2. Compensation for any item of work described in the contract 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 the bid items to which they are made subsidiary are identified in this specification Section.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Bid Item 14, 15, 16 Corrugated Polyethylene Tubing, 5", 8", 12"

(1) These items consist of furnishing and installing the corrugated polyethylene tubing as shown on the drawings.

(2) The corrugated polyethylene tubing shall conform to ASTM F405 or F667.

(3) Installation of a cap and t-post at tile terminations.

(4) Payment will constitute full compensation for the following subsidiary items: Structure Excavation and Backfill of Structure Excavation.

NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION

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:

A. 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.

B. 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.

C. Welded or lock seams in helical corrugated pipe are considered to be watertight.

D. 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.

E. 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.

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four ½-inch Diam. Galvanized rods with tank lugs for annular or helical corrugated metal pipe. Bands shall have a minimum lap of 3 inches.	All	All
Hugger band from Armco Steel Corp. for helical corrugated metal pipe with reformed ends; and for annular corrugated pipe. Bands including O-ring gaskets and two ½-inch Diam. Galvanized rods and lugs.[1/]	35	48
Hugger band without rods and lugs but including O-ring gaskets.[1/]	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

[1/] Use is limited to sites where soft foundation and conduit elongation is not anticipated.

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.

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:

A. Metallic Coating - by thoroughly wire brushing the damaged area and cleaning with solvent, and then painting two coats of one of the following paints:

1. Zinc Dust - Zinc Oxide Primer conforming to ASTM D 79 and D 520.
2. Single package, moisture cured urethane prime in silver metallic color.
3. Zinc-rich cold galvanized compound, brush, or aerosol applications.

B. Polymer Coating - apply two coats of polymer material similar to and compatible with the durability, adhesion and appearance of the original polymer coating. The repair coating shall be a minimum thickness of 0.010 (10 mils) after drying and shall bond securely to the pipe.

6. LAYING AND BEDDING THE PIPE

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

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

7. BACKFILLING

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

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

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

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

8. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the quantity of each pipe size is determined as the sum of the nominal laying lengths of the pipe sections installed. Payment will be made at the contract unit price for the length of pipe installed. Such payment constitutes full compensation for transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.
2. For items of work for which lump sum prices are established in the contract, payment for corrugated metal pipe structures is made at the contract lump sum price. Such payment constitutes full compensation for transporting and installing the pipe structure complete with metal pipe, fittings and appurtenances, and all other items necessary and incidental to the completion.

3. Compensation for any item of work described in the contract 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 the bid items to which they are made subsidiary are identified in this specification Section.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

   a. Bid Item 17, Corrugated Metal Pipe, 6" Diameter

      (1) These items will consist of furnishing and installing the corrugated metal pipe tile outlets including animal guards as shown on the drawings.

      (2) The corrugated metal pipe shall be 16 gage zinc coated or aluminum coated with annular or helical corrugations.

      (3) Payment will constitute full compensation for the following related subsidiary items: Structure Excavation and Backfill of Structure Excavation.

   b. Bid Item 18, Corrugated Metal Pipe, 10" Diameter

      (1) These items will consist of furnishing and installing the corrugated metal pipe tile outlets including animal guards as shown on the drawings.

      (2) The corrugated metal pipe shall be 16 gage zinc coated or aluminum coated with annular or helical corrugations.

      (3) Payment will constitute full compensation for the following related subsidiary items: Structure Excavation and Backfill of Structure Excavation.

   c. Bid Item 19, Corrugated Metal Pipe, 15" Diameter

      (1) These items will consist of furnishing and installing the corrugated metal pipe tile outlets including animal guards as shown on the drawings.

      (2) The corrugated metal pipe shall be 16 gage zinc coated or aluminum coated with annular or helical corrugations.

      (3) Payment will constitute full compensation for the following related subsidiary items: Structure Excavation and Backfill of Structure Excavation.

   d. Subsidiary Item, Antiseep Collars

      (1) This item will consist of providing and installing the antiseep collars as shown on the drawings.

      (2) Antiseep collars shall be Agridrain collars or equal and fabricated to fit 18" RCP pipe as detailed in the plans.

      (3) No separate payment will be made for antiseep collars. Compensation for this item shall be included in the payment for Water Control Structure.

NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION

IA-61 LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments, structures and blankets, including filter layers or bedding where specified.

2. MATERIALS

Rock for loose rock riprap, filter layers or bedding shall come from sources approved by NRCS. The rock shall be excavated, selected and handled as necessary to meet the quality and grading requirements of this specification and the construction drawings.

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to sub rounded in shape. The least dimension of an individual rock fragment shall be not less than 1/3 the greatest dimension of the fragment unless otherwise specified on the construction drawings.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap or bedding course is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall be compacted to a density equal to the adjacent existing soil material.

Rock materials shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by NRCS.

4. EQUIPMENT-PLACED ROCK RIPRAP

Rock shall be placed by equipment on the surfaces and to the depths specified. The riprap shall be constructed to the full thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact, one to another with the smaller rocks and spalls filling the voids between the larger rocks.

Riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to adjacent structures.

5. HAND-PLACED RIPRAP

Rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger

rocks firmly in contact, one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge unless otherwise specified.

6. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding beneath riprap, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

7. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work which specific unit prices are established in the contract, the quantity of rock riprap placed within the specific limits will be measured to the nearest tone by actual weight. For each load of rock riprap placed as specified the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton. Payment will be made at the contract unit price for rock riprap. Such payment will be considered full compensation for completion of the work.
2. Compensation for any item of work described in the contract 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 the items to which they are made subsidiary are identified in this specification Section.

B. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefor are:
   a. Bit Item 23, Riprap
      (1) This item shall consist of furnishing and place the rock riprap in the stilling basin downstream and upstream reach of the steel sheet pile structure, as shown on the drawings.
      (2) Rock shall be class E Revetment Stone as defined by Iowa Department of Transportation.
      (3) All riprap shall be screened by running the stone over a grizzly or plate screen with a minimum opening of 8 inches. This operation shall be done at the quarry. The portion of the stone that is removed by the screening operation will not be acceptable for use as riprap.
      (4) Payment will constitute full compensation for the following related subsidiary items: Pollution Control, Removal of Water, Structure Excavation and Geotextile.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-62 CONCRETE GROUT FOR RIPRAP

1. SCOPE

The work shall consist of furnishing, transporting, and placing concrete grout in the construction of grouted rock riprap sections as shown on the drawings.

2. MATERIALS

Cement shall be Type I or Type II Portland cement conforming to ASTM C 150. Fly ash shall be in strict compliance with ASTM C 618, Class F or C. It may be used as a partial substitution for Portland cement for amounts not to exceed 20 percent of the total amount of cementitious material in the grout. The loss by ignition shall not exceed 4.0 percent. Fine aggregate shall conform to ASTM C 33 and shall be composed of clean, uncoated grains of material. Water shall be clean and free of harmful chemicals. Air entraining admixtures shall conform to ASTM C 260.

3. GROUT MIX

The grout mix shall be as follows:

a) Cement:	10 sacks or 940 pounds per cubic yard
b) Fine concrete aggregate:	2,100 pounds per cubic yard
c) Water:	45 gallons per cubic yard or enough to provide a thick creamy consistency
d) Air content:	6 to 10 percent.

When ready-mixed grout is furnished, the contractor shall furnish to NRCS a delivery ticket showing the time of loading and the quantities of materials used for each load of grout mix.

No mixing water in excess of the amount called for in the grout mix shall be added during mixing, hauling or after arrival of the mix at the delivery point.

4. CONVEYING AND PLACING

Grout mix shall be delivered to the site and placed within 1 1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick setup of the grout mix, discharge of the concrete shall be accomplished in 45 minutes unless a set-retarding admixture is used, in which case the manufacturer's recommended time limit will apply.

Grout mix shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation.

The grout mix shall not be placed until the rock riprap has been inspected and approved.

Rock to be grouted shall be kept wet for at least 2 hours immediately prior to grouting. Grout shall not be placed in standing or flowing water.

The grout shall be consolidated by spading or mechanical vibration. The grout shall not be forced to flow laterally to its final location.

The average rate of grout application shall be 5.4 cubic feet per square yard of riprap (0.6 cubic feet per square foot).

5. CURING CONCRETE

Concrete shall be cured for 7 days by either:

a) Applying white pigmented curing compound at a rate of 1 gallon per 150 square feet or as recommended by the manufacturer.

b) Water soak exposed surface for the entire 7 days.

c) Cover with burlap, mats or other material and maintain in a moist condition.

d) Cover with four (4) mil plastic sheeting while concrete is still wet.

Grout mix shall not be placed when daily minimum temperatures are expected to be lower than 40 degrees F unless facilities are provided to maintain the temperature of the materials at 50 to 90 degrees F during the placement and curing period. Grout may not be placed on frozen surfaces. When freezing conditions are expected, rock shall be heated to 50 to 90 degrees F for at least 24 hours prior to placing grout.

6. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the quantity of concrete grout placed within the specified limits will be computed to the nearest 0.1 cubic yard by volume. The volume of grout will be determined from the summation of all statement-of-delivery tickets for concrete grout delivered to the site and acceptabley placed in the work. Payment for concrete grout will be made at the contract unit price for each item. Such payment will be considered full compensation for all labor, materials, equipment, and all other items necessary and incidental to the completion of the work.

2. Compensation for any item of work described in the contract 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 the items to which they are made subsidiary are identified in this specification Section.

B. Items of work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

   a. Bid Item 24, PCC Grout

      (1) This item shall consist of furnishing and placing concrete grout on those portions of the riprap shown on the drawings.

      (2) The grout shall be consolidated into the voids with the use of a concrete vibrator. A smooth surface is not to be created by the grouting operation.

      (3) Grouting operation shall not be performed except in the presence of the Engineer.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-81 METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating, and installing metalwork including metal parts of composite structures.

2. MATERIALS

Steel shall be of structural quality. Finished surfaces shall be smooth and true to assure proper fit.

Bolts, nuts, washers, rods, rivets, etc., shall be of a material equal to the steel being fastened.

3. PROTECTIVE COATINGS

Protective coatings will consist of either galvanizing or painting and shall be applied by the fabricator.

Galvanizing shall consist of a zinc coating by the hot dip process, except that bolts, nuts, and washers may have a electrodeposited zinc coating.

Paint System for this specification shall consist of the application of one coat of Epoxy Polyamide Primer (lead and chromate free) and one or more coats of Epoxy Polyamide (intermediate or finish), lead free. When finished, it will have a minimum dry film thickness of 8.0 mils.

4. FABRICATION

Materials shall be carefully fabricated as shown on the drawings. The fabrication shall be smooth and true to assure proper fit. Galvanized items shall not be cut, welded, or drilled after the zinc coating is applied.

5. ERECTION

The metal shall be erected true and plumb, closely conforming to the drawings.

6. SPECIAL SPECIFICATIONS

A. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Subsidiary Item, C-Channel Waler

(1) This item shall consist of furnishing and placing the c-channel waler as shown on the

drawings.

(2) No separate payment will be made for c-channel waler. Compensation for this item will be included in the payment for Steel Sheet Piling.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

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:

a. 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.

b. 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.

c. 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. In no case shall material be dropped on uncovered geotextile from a height greater than 3 feet.

6. SPECIAL SPECIFICATIONS

A. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

    a. Subsidiary Item, Geotextile

        (1) This item shall consist of furnishing and placing geotextile on all earth surfaces that contact the rock riprap as shown on the drawings.

        (2) Geotextiles shall conform to the requirements of the IDOT Engineering Fabric for embankment erosion control.

        (3) The geotextile shall be placed with the long dimension parallel to the channel.

        (4) No separate payment will be made for geotextile. Compensation of this item will be included in the payment for the related bid item, Riprap.

TABLE 1. REQUIREMENTS FOR WOVEN GEOTEXTILES

Property	Test Method	Class I	Class II & III	Class IV
Tensile strength (pound)[1/]	ASTM D 4632 grab test	200 minimum in any principal direction	120 minimum in any principal direction	180 minimum in any principal direction
Elongation at failure (percent)[1/]	ASTM D 4632 grab test	<50	<50	<50
Puncture (pounds)[1/]	ASTM D 4833	90 minimum	60 minimum	60 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum
Apparent opening size – AOS	ASTM D 4751	As specified, but no smaller than 0.212 mm (#70)[2/]	As specified, but no smaller than 0.212 mm (#70)[2/]	As specified, but no smaller than 0.212 mm (#70)[2/]
Percent open area (percent)	CW-02215-86	4.0 minimum	4.0 minimum	4.0 minimum
Permittivity sec^{-1}	ASTM D 4491	0.10 minimum	0.10 minimum	0.10 minimum

[1/] Minimum average roll value (weakest principal direction).
[2/] U.S. standard sieve size
Note: CWO is a USACE reference.

TABLE 2. REQUIREMENTS FOR NONWOVEN GEOTEXTILES

Property	Test Method	Class I	Class II	Class III	Class IV[3]
Tensile strength (pound)[1]	ASTM D 4632 grab test	180 Minimum	120 minimum	90 Minimum	115 minimum
Elongation at failure (%)[1]	ASTM D 4632 grab test	≥50	≥50	≥50	>50
Puncture (pounds)[1]	ASTM D 4833	80 minimum	60 minimum	40 minimum	60 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent opening size – AOS	ASTM D 4751	As specified max. #40[2]	As specified max. #40[2]	As specified max. #40[2]	As specified max. #40[2]
Permittivity sec^{-1}	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

[1] Minimum average roll value (weakest principal direction).
[2] U.S. standard sieve size
[3] Heat-bonded or resin bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle punched geotextiles are required for all other classes.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-620 UNDERGROUND OUTLET

1. SCOPE

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

2. MATERIALS

Materials for underground outlets shall meet the requirements as shown in the plans and specifications. They shall 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

Corrugated Polyethylene (PE) Pipe and Fittings (3-6) inch ..... ASTM F 405

3 through 24 in. Corrugated Polyethylene (PE) Pipe and Fittings ..... ASTM F 667

Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth
Interior and Fittings (4-36 inch) ..... ASTM F 949

Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings ..... ASTM D 2729

Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings ..... ASTM D 3034

Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) ..... ASTM D 2241

Polyethylene Plastics Pipe and Fittings Materials ..... ASTM D 335

Clay

Clay Drain Tile ..... ASTM C 4

Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated ..... ASTM C 700

Vitrified Clay Pipe, test methods ..... ASTM C 301

Concrete

Concrete Drain Tile (4-36 inch) ..... ASTM C 412

Concrete Pipe for Irrigation or Drainage ..... ASTM C 118

Concrete Pipe, Manhole Sections, or Tile (test methods) ..... ASTM C 497

Concrete Sewer, Storm Drain and Culvert Pipe ..... ASTM C 14

Reinforced Concrete Culvert, Storm Drain and Sewer Pipe ..... ASTM C 76

Perforated Concrete Pipe ..... ASTM C 444

Portland Cement ..... ASTM C 150

Other

Styrene-Rubber (SR) Plastic Drain Pipe and Fittings ..... ASTM D 2852

Corrugated Aluminum Pipe for Sewers and Drains ..... ASTM B 745

Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains ..... ASTM A 760

Inlet

The inlet shall be fabricated and installed as shown on the plans. Inlets must be of durable material, structurally sound, and resistant to damage by rodents or other animals. Inlets shall 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:

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 shall 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 of an inch in diameter or less to provide drainage around the inlet.

Appurtenances (i.e. tees and elbows) for polyvinyl chloride (PVC) inlets shall 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) shall have a minimum length of 10 feet.

The inlet shall be offset from the main conduit except as noted below. A minimum of 8 feet of non-perforated conduit shall be installed between the inlet and the main conduit. The minimum diameter of the offset line shall be 3 inches. When conduit capacity is based on orifice flow from the inlet, such inlets shall be fabricated 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 top most inlet in a terrace system is placed directly on the main conduit, the conduit shall be non-perforated from the inlet to the toe of the terrace back slope.

Outlet

A continuous section of non-perforated conduit at least 20 feet long shall be used at the outlet. Two-thirds of the outlet pipe shall be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side slope shall be 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 3/16 inch minimum wall thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with an 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 shall include ultra-violet stabilizer. PVC and PE pipe outlets shall not be used where burning vegetation on the outlet ditch bank is likely to create a fire hazard.

Connections with the outlet pipe shall be made watertight.

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

3. TRENCH EXCAVATION

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

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

Unless otherwise shown on the drawings, trench width at the top of the conduit should be 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. Maximum trench width shall be 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 shall be at least two (2) inches wider than the conduit on each side to allow sufficient bedding to support the pipe.

4. INSTALLATION

The underground outlet system shall be installed to the line and grade shown in the plans or as staked in the field. Conduit lines shall be installed and properly blinded or bedded prior to placement of any other earthfill over the lines.

Conduit lines shall be joined with standard factory couplers, if applicable, to produce a continuous system. Internal couplers may be used if they do not cause excessive flow restrictions. Conduit ends shall be protected during installation.

All appurtenant structures, including trash and rodent guards, shall be installed promptly and provisions shall be made for protecting them during installation. All conduit ends except the outlet and inlets with screens shall be capped 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, shall have smooth edges and fit tightly.

5. TRENCH BACKFILL

Conduits shall be bedded and backfilled throughout the base width of the basin embankment or terrace ridge. Fiable soil material shall be placed in 4 inch layers and hand tamped to a depth of 2 feet above the conduit. The sides of the

remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Water packing may be used as an alternative to mechanical compaction. If the conduit is non-perforated, it shall be filled with water during the water packing procedure. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pope after consolidation has taken place. Water packing is accomplished by adding water in such quantity as to thoroughly saturate the initial backfill without inundation. The wetted fill shall be allowed to dry until firm before final backfill is begun. Final backfill shall be accomplished by placing friable soil material in 4 inch layers and hand tamping to a depth of 2 feet above the conduit. The sides of the remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

Conduit which is not under the embankment or terrace ridge shall be backfilled with select bedding material containing no hard objects larger than 1 ½ inches in diameter to a minimum depth of 6 inches over the conduit. The conduit shall be held 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. All backfill material shall be placed so that deflection or displacement of the conduit will not occur. The remainder of the trench above the conduit shall be backfilled as rapidly as consistent with the soil conditions. Backfill shall extend 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.

6. FINISH

Work areas shall be smoothed and left in a workmanlike manner. Vegetation or other protective cover shall be established as specified.

7. SPECIAL SPECIFICATIONS

A. Rubber Gasket Joints

1. Rubber gasket joints are specified for all reinforced concrete pipe on this project.
2. The joints and gaskets shall conform to the requirements of ASTM C 443.

B. Precast Concrete Manhole Sections

1. If a precast concrete structure for the water control structure is to be used, prior approval from the Engineer shall be required.

C. Measurement and Payment

1. For items of work for which specific unit prices are established in the contract, the quantity of each pipe size is determined as the sum of the nominal laying lengths of the pipe sections installed. Payment will be made at the contract unit price for the length of pipe installed. Such payment constitutes full compensation for transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work.
2. 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 prices and will constitute full compensation for completion of the work.
3. Compensation for any item of work described in the contract 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 the items to which they are made subsidiary are identified in this specification Section.

D. Items of Work and Construction Details

1. Items of work to be performed in conformance with this specification and the construction details therefore are:

a. Bid Item 20, Corrugated Metal Pipe

1) This item consists of furnishing and installing the corrugated metal pipe as shown on the drawing.

2) CMP shall conform to the requirements of IA-51.

3) Pipe bedding and trench backfill shall be incidental to this item.

4) Measurements will be from center of inlet to center of manhole to beginning of CMP apron and through fabricated CMP bends.

b. Bid Item 21, Corrugated Metal Pipe Bend

1) This item consists of furnishing and installing the corrugated metal pipe bend fabricated to the angle shown on the plans.

2) Pipe for the bend shall conform to IA-51 and be the same class as the pipe material.

3) Bedding and Trench Backfill shall be incidental to this item.

4) Shall be paid per each bend installed and pipe measured through the bends.

c. Bid Item 22, Water Control Structure

1) This item consists of furnishing and installing the fabricated corrugated metal structure, the stop log storage structure, the upstream inlet and rip rap stone, the downstream CMP apron and animal guard and the CMP anti-seep collars as shown and detailed in the plans.

2) Structure foundation and backfilling shall be incidental to this item.

3) Grate, covers, locking devices, stop log channel and stop log removal tools shall be incidental to this item.

4) Payment will constitute full compensation for the following subsidiary items:

Pollution Control, Removal of Water, Structure excavation, Backfill of Structure excavation, Antiseep collars and RCP apron.

d. Subsidiary Item, Antiseep Collars

1) This item will consist of providing and installing the antiseep collars as shown on the drawings.

2) Antiseep collars shall be Agridrain collars or equal and fabricated to fit 18" CMP pipe as detailed in the plans.

3) No separate payment will be made for antiseep collars. Compensation for this item shall be included in the payment for Water Control Structure.

e. Subsidiary Item, 18" CMP Apron

1) This item will consist of providing and installing the 18" CMP Apron and animal guard as shown on the drawings.

2) No separate payment will be made for CMP Aprons. Compensation for this item shall be included in the payment for Water Control Structure.

f. Subsidiary Item, Perforated Intake Riser

1) This item shall consist of furnishing and installing the 24" diameter CMP Riser, fabricated bend, beehive grate and connection collar to the CMP pipe.

2) No separate payment will be made for the perforated intake riser. Compensation for this item shall be included in the payment for Water Control Structure.