SUPPLEMENTAL MEASUREMENT PAYMENT/ITEMS OF
WORK AND CONSTRUCTION DETAILS

FOR

CREP WETLAND PROJECT
SITE Emm993330B

EMMET COUNTY, IOWA

November 2015

LICENSED PROFESSIONAL ENGINEER JUSTIN P. CHRISTENSEN 17950 IOWA	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa. By _____ 11/5/15 Justin P. Christensen, P.E. (date) License Number 17950 My license renewal date is December 31, 2015
	Pages or sheets covered by this seal: ALL

DGR Project No. 363115

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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, banksloping 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 1.5:1.

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.

Stockpiled materials around a construction site should not hinder subsequent construction operations.

4. DISPOSAL OF REFUSE MATERIALS

Waste materials from clearing and structure removal shall be burned or buried at locations approved by the owner. Buried materials shall be covered with a minimum of 2 feet of earthfill.

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 incidental. Such items and bid items to which they are made incidental 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, Site Stripping
      (1) This item will consist of work necessary to begin construction including, but not limited to, removing and disposing of existing vegetation on areas to be excavated or foundation areas for fill and core trench excavation. Work under this item also includes stockpiling and spreading topsoil following grading operations.
      (2) This item also includes stripping, stockpiling and spreading topsoil from structure and borrow areas.

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 left open during a winter shutdown period 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 therefor are:

(a) Incidental 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 included in the payment for Mobilization and Excavation.

(b) Incidental Items, 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 included in the payment for Mobilization; Excavation; Corrugated Metal Pipe; Water Control Structure; Steel Sheet Pile; Riprap; and Grout.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-6 SEEDING AND MULCHING FOR PROTECTIVE COVER

1. SCOPE

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

2. SEEDBED PREPARATION AND APPLICATION

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

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

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

3. MATERIALS

The seeding, fertilizing, and mulching requirements are as specified on Form IA-CPA-4.

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

4. MULCH APPLICATION

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

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

5. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. For items of work for which specific unit 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 fo 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, Structure and Channel Seeding

(1) This item will consist of seeding the dike except the upstream sideslope below the weir elevation, auxiliary spillway, 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, Buffer Seeding

(1) This item will consist of seeding the borrow area and the other disturbed areas not seeded by Structure and Channel Seeding 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. All seed must be yellow-tagged Iowa ecotype.

(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 2 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 mowing 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. SPECIAL SPECIFICATIONS

A. Measurement and Payment

1. 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.

2. 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.

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, Mobilization

      (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 incidental 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 therefore are:
      a. Incidental 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 Excavation; 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, A572, or A690. The sheet piling provided shall meet the required cross-section, section modulus, thickness, and steel grade shown on the drawings.

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 redriven. 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 contract unit price for each type, kind and weight of piling. Such payment will 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 incidental. Such items and the items to which they are made incidental 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, Steel Sheet Pile

      (1) This item shall consist of furnishing and installing the steel sheet piling and whaler as shown on the drawings. This item shall include field cutting the side slopes of the sheet piling to the specified 2:1 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.

      (3) Sheet piling shall have the following requirements:

         (a) Minimum section modulus of 22.0 cu. in. per foot of wall.

         (b) Minimum grade of steel shall be 50 ksi.

      (4) Payment will constitute full compensation for related incidental item: Pollution Control, Structure Excavation and Backfill of Structure Excavation.

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.

4. STRUCTURE AND TRENCH EXCAVATION

Structure or trench excavations will conform with 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 finally graded in a manner to eliminate steep or unstable side slopes or hazardous or unsightly conditions.

6. OVER-EXCAVATION

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

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 excavation and embankment 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.

2. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made incidental. Such items and the items to which they are made incidental 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, Excavation and Embankment

(1) This item shall consist of the excavation and embankment necessary for grading the site as indicated on the drawings.

(2) Payment will constitute full compensation for the following related incidental items: Pollution Control, Removal of Water, Borrow Excavation, Channel Excavation, Earthfill and Structure Excavation.

(b) Incidental Item, 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 this tile.

(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) The excavated material from the outlet channels for tile outlets shall be disposed of along side the outlet channel as directed by the Engineer.

(6) No separate payment will be made for Tile Investigation and removal. Compensation for this item will be included in payment for Site Stripping.

(c) Incidental Item, Channel Excavation

(1) This item will consist of the excavation for the plunge pool for the sheet pile structure.

(2) 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.

(3) No separate payment will be made for Channel Excavation. Compensation for this item will be included in payment for Earth Fill.

(d) Incidental Item, Borrow Excavation

(1) This item will consist of borrowing from the auxiliary spillway and the borrow areas shown on the drawings as needed to construct the dike and auxiliary spillway.

(2) Borrow is intended to be taken from the wetland pool as shown on the drawings. Borrow from any other area will not be allowed unless additional suitable material for Earth Fill is

needed. Other borrow sites shall be approved by the Owner and NRCS inspector.

(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.

(4) No separate payment will be made for borrow excavation or topsoil spreading. Compensation for this item will be included in the payment for Earth Fill.

(e) Incidental Item, Structure Excavation

(1) This item shall consist of the excavation necessary to install the steel sheet pile, riprap, 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; Water Control Structure; Steel Sheet Pile; and Riprap.

(f) Incidental Item, Topsoil Stripping and Spreading

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

(2) No separate payment will be made for Stripping and Spreading of Topsoil. Compensation for this item will be included in payment for Site Stripping.

(g) Incidental Item, Core Trench Excavation

(1) This item shall consist of excavation of a core trench along the centerline of the berm as shown on the plans.

(2) No separate payment will be made for Core Trench Excavation. Compensation for this item will be included in payment for Site Stripping.

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 1.5:1 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.

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.

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 of the loaded, rubber tired, hauling equipment traveling in a direction parallel to the centerline of fill pass over the entire surface of the layer being placed.

Method 2 - 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.

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 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 excavation and embankment 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.
2. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made incidental. Such items and the items to which they are made incidental 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) Incidental Item, Earthfill

(1) This item shall consist of the earthfill necessary to construct the dike including backfill of the stripping, top soil and core trench excavations.

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

(3) Compaction shall be Method 1.

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

(5) No separate payment will be made for Earthfill. Compensation for this item will be included in payment for Excavation.

(b) Incidental Item, Backfill Required Excavation

(1) This item shall consist of backfilling the areas excavated to install the corrugated metal pipe structure and to locate and remove the tile line.

(2) Compaction adjacent to the structures shall be as indicated above. All other compaction shall be Method 1 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; Water Control Structure; and Site Stripping.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-31 CONCRETE

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing, and curing Portland cement concrete including steel reinforcement.

2. MATERIALS

Portland Cement shall conform to ASTM C 150 and shall be Type I or Type II.

Fine Aggregates shall conform to ASTM C 33 and shall be composed of clean, uncoated grains of material.

Coarse Aggregates shall be gravel or crushed stone conforming to ASTM C 33 and shall be clean, hard, durable and free from clay or coating of any character. The maximum size of coarse aggregate shall be 1 1/2 inches.

Water shall be clean and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

Air entraining agent shall conform to ASTM C 260.

Pozzolan (fly ash) shall be in strict compliance with ASTM C 618, Class F or C. The loss by ignition shall not exceed 6.0 percent.

Water-reducing admixtures shall conform to ASTM C 494 and may be the following types:

1. Type A - Water-reducing admixture
2. Type D - Water-reducing and retarding admixture
3. Type F - Water-reducing, high range admixture (superplasticizer).
4. Type G - water-reducing, high range, and retarding admixture (superplasticizer).

Type D or G admixture may be used when the air temperature is over 80 degrees F. at the time of mixing and/or placement.

Calcium Chloride or other antifreeze compounds or accelerators will not be allowed.

Preformed expansion joint filler shall be a commercially available product made of bituminous, sponge rubber or closed cell foam materials with a minimum thickness of 1/2 inch.

Reinforcing steel shall be free from loose rust, oil, grease, paint, or other deleterious matter. Reinforcing steel shall conform to one or more of the following:

1. Reinforcing Bars - ASTM A 615, A 616 or A617, Grade 40 or greater, deformed.
2. Welded Wire Fabric - ASTM A 185 or A 497.

Waterstops shall be either metallic or nonmetallic. Metallic waterstops shall be fabricated from sheets of copper or galvanized steel. Nonmetallic waterstops shall be made of natural or synthetic rubber or vinyl chloride polymer or copolymer. Rubber, polymer and copolymer waterstops shall have ribbed or bulb-type anchor flanges and a hollow tubular center bulb, unless otherwise shown on the drawings. All waterstops shall be of the sizes shown on the drawings.

Curing compound shall be a liquid membrane-forming compound suitable for spraying on the concrete surface. The curing compound shall meet the requirements of ASTM C 309 Type 2 (white pigmented).

3. CONCRETE DESIGN MIX

The contractor will be responsible for the determining the design mix proportions in accordance with the requirements included in this paragraph and shall provide a copy of the mix to the NRCS Engineer at least 3 days prior to placing any concrete. The concrete mix shall be of such proportions as to provide a minimum strength of 3500 p.s.i. in 28 days, unless otherwise shown on the drawings. The air content shall be 4 to 8 percent of the volume of the concrete at the time of placement. The slump shall be 2 to 5 inches except when superplasticizer is used. The slump shall be 3 inches or less prior to the addition of superplasticizer admixture and shall not exceed 7 1/2 inches following addition and mixing. The fine aggregate shall be 30-50 percent of the total combined aggregate based on oven dry weights. The contractor shall provide tests to verify that the design mix meets the requirements. In lieu of this, either of the following mix proportions per cubic yard may be used:

Mix Number	Minimum Cement Bags/Pounds	Fly Ash Pounds	Maximum** Water Gallons
1	6.0/564	0	36
2	5.0/470	45-90	33

**Total of available aggregate moisture, mixing water added at the plant and mixing water added at the site.

4. MIXTURES AND MIXING

Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C 94. Concrete shall be uniform and thoroughly mixed when delivered to the forms. No mixing water in excess of the amount shown for the design mix or in an amount that would cause the maximum slump to be exceeded shall be added to the concrete during mixing, hauling or after arrival at the point of delivery. The concrete shall be batched and mixed so that the temperature of the concrete at the time of placing shall be between 50 and 90 degrees F.

5. BATCH TICKET

The contractor shall obtain from the supplier a delivery ticket for each batch of concrete before unloading at the site. The following information shall be included on the ticket: name of concrete supplier, job name or location, date, truck number, amount of concrete, time loaded or time of first mixing cement, aggregate, and mixing water added at the plant, type and amount of cement, type and amount of admixtures, oven dry weights of fine and coarse aggregate, and moisture content(%) or weight of water contained in the aggregates.

The following information shall be added to the batch ticket on site: mixing water added on site, time concrete arrived on site and time concrete was unloaded.

Upon completion of the concrete placement, copies of all batch tickets shall be provided to NRCS.

6. REINFORCING STEEL

Before reinforcement is placed, the surfaces of the bars or mesh shall be cleaned to remove any loose, flaky rust, mill scale, oil, grease, or other foreign substances. After placement, the reinforcement shall be maintained in a clean condition until it is completely embedded in the concrete.

Reinforcing bars shall be cut and bent according to ACI Standard 315.

Tack welding of bars shall not be permitted. Reinforcement shall be accurately placed as shown on the drawings and secured in position in a manner that will prevent its displacement during placement of concrete. Metal chairs, metal hangers, metal spacers or concrete chairs shall be used to support reinforcement. Precast concrete chairs shall be manufactured from concrete equal in quality to the concrete being placed. Precast concrete chairs shall be moist at the time concrete is placed

Splices of reinforcing bars shall be made only at the locations shown on the drawings, unless other wise approved by the NRCS Engineer. All reinforcing splices and placement shall be in accordance with ACI 318 and shown on the drawings.

After placement of the reinforcement, concrete shall not be placed until the reinforcement has been inspected and approved by NRCS.

7. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete, the forms and subgrade shall be free of woodchips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. All surfaces shall be firm and damp prior to placing concrete. Placement of concrete on mud, dried earth, uncompacted fill, or frozen subgrade will not be permitted.

The forms and associated false-work shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and elevations. Forms will be mortar tight. Forms with torn surfaces, worn edges, dents or other defects will not be used. Forms shall be coated with a nonstaining form release agent before being set into place. Excess form coating material shall not stand in puddles in the forms or come in contact with the steel reinforcement or hardened concrete against which fresh concrete is to be placed.

Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially manufactured type. Non fabricated wire shall not be used. Form ties shall be constructed so that the ends or end fasteners can be removed without causing spalling at the surface of the concrete.

Metal form ties used within the forms on hydraulic structures with a total volume of concrete exceeding five cubic yards shall be equipped with cones or other devices that permit their removal to a depth of at least one inch without damage to the concrete. The holes resulting from cones and other devices shall be patched in accordance with Section 9.

Form ties except those specifically covered by the preceding paragraph shall be broken off flush with the formed surface. Any surface areas which have been spalled or otherwise damaged shall be repaired in accordance with Section 9.
Steel tying and form construction adjacent to new concrete shall not be started until concrete has cured at least 12 hours.

Concrete joints shall be of the type and at the locations shown on the drawings.

Splices in metal waterstops shall be brazed, welded or overlapped and bolted. Splices in nonmetallic waterstops shall be cemented or joined as recommended by the manufacturer.

8. PLACING CONCRETE

Concrete shall not be placed until the subgrade, forms, and steel reinforcement have been inspected and approved by the NRCS Inspector. Any deficiencies are to be corrected before the concrete is delivered for placement.

Concrete shall be delivered to the site and discharged into the forms within 1 1/2 hours after the introduction of the cement to the aggregates. When a superplasticizer is used, the concrete shall be discharged within the manufacturer's recommended time limit for discharge after addition of the admixture. In hot weather or under conditions contributing to quick setup of the concrete, 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.

Addition of water at the job site may be done at the beginning of placement of each load of concrete in order to obtain allowable slump, provided that the maximum water content and water/cement ratio in the design mix is not exceeded. Addition of water will not be permitted after placement of the load has started.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into corners and around reinforcement and other embedded items in a manner which prevents segregation. Formed concrete shall be deposited in layers 24 inches or less in depth and shall be continuously deposited so that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of "cold joints". Concrete containing superplasticizer shall be placed in lifts not exceeding 5 feet in depth. If the surface layer of concrete sets during placement to the degree that it will not flow and merge with the succeeding layer when tamped or vibrated, the contractor shall discontinue placing concrete and install a construction joint. Construction joints shall be completed as shown on the drawings or by one of the following methods:

1. The joint shall be constructed using a 6 inch wide by 1/4 inch steel plate. The surfaces of the construction joint shall be prepared by washing and scrubbing with a wire brush or wire broom to expose coarse aggregate. The steel plate shall be embedded 3" in the concrete.

2. The joint surface shall be cleaned to expose coarse aggregate by sandblasting or air-water cutting after the concrete has gained sufficient strength to prevent displacement of the coarse aggregate or cement fines. The surface of the concrete shall not be cut so deep as to undercut the coarse aggregate. The joint shall be washed to remove all loose material after cutting.

The surfaces of all construction joints shall be kept continuously moist for at least 1 hour prior to placement of the new concrete. The new concrete shall be placed directly on the cleaned and washed surface. New concrete shall not be placed until the hardened concrete has cured at least 12 hours.

Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation. Concrete containing superplasticizer shall not be dropped more than 12 feet vertically.

Immediately after the concrete is placed in the forms, it shall be consolidated by vibration, spading or hand tamping as necessary to insure smooth surfaces and dense concrete. Care should be taken not to over-vibrate concrete containing superplasticizer. Vibration shall not be supplied directly to the reinforcing steel, the forms or concrete which has hardened to the degree that it does not insure a monolithic bond with the preceding layer, The use of vibrators to transport concrete in the forms or conveying equipment will not be permitted.

9. FORM REMOVAL AND FINISHING

Forms shall be left in place for at least 24 hours after placing concrete. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit concrete to take the stresses due to its own weight uniformly and gradually.

Immediately after removal of the forms, concrete which is honey combed, damaged or otherwise defective shall be repaired or replaced. All cavities or depressions resulting from form tie removal shall be patched with a non-shrink grout, mortar mix or epoxy-type sealer. Non-shrink grout consists of 1 part cement and 2-1/2 parts sand that will pass a No. 16 sieve. Only enough water shall be added to produce a filling which is at the point of becoming rubbery when the material is solidly packed.

All repaired and patched areas shall be cured as required in Section 10.

10. CURING

Concrete shall be cured for a period of not less than 7 consecutive days by one of the following approved methods:

A. Membrane Curing: Concrete shall be cured with white pigmented curing compound. The compound shall be sprayed on moist concrete as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed. Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete, such as construction joints, shear plates, reinforcing steel, and other embedded items. Surfaces subjected to heavy rainfall or running water within 3 hours after curing compound has been applied or surfaces damaged by subsequent construction operations during the curing period, shall be reapplied in the same manner as the original application.

B. Moist Curing: Concrete shall be cured by maintaining all surfaces continuously wet for the entire curing period.

C. Cover: Adequately cover an exposed structure with burlap mats, or other material and continually soak with water.

11. BACKFILLING

Backfilling may begin when the curing period has ended. Backfill against the structure will be placed in no more than 4-inch layers and compacted by hand tamping or with manually directed power tampers or plate vibrators. Layers compacted in this manner shall extend not less than 2 feet from any part of the concrete structure.

12. HOT AND COLD WEATHER CONCRETING

When the atmospheric temperature may be expected to drop below 40° F. at the time concrete is delivered to the work site , during placement, or at any time during curing period, concrete shall be mixed, placed and protected in accordance with ACI Standard 306, "Recommended Practice for Cold Weather Concreting."

When climatic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 90° F. at the time of delivery to the work site, during placement or during the first 24 hours after placement, concrete shall be mixed, placed and protected in accordance with ACI Standard 305, "Recommended Practice for Hot Weather Concreting."

13. SPECIAL SPECIFICATIONS

None

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-32 CONCRETE FOR NONSTRUCTURAL SLABS

1. SCOPE

The work shall consist of forming, placing, finishing, and curing Portland cement concrete slabs including steel reinforcement.

2. MATERIALS

Cement shall be Type I or Type II Portland cement. Aggregate shall meet Iowa Department of Transportation requirements for Coarse and Fine Aggregate for Concrete, Sections 4110 and 4115 of IDOT Standard Specifications for Highway and Bridge Construction. Water shall be clean and free of harmful chemicals. Reinforcing steel shall be deformed billet-steel bars, Grade 40 or 60. Welded wire fabric shall conform to the requirements of ASTM A 185.

3. CONCRETE MIX

The concrete mix shall provide a minimum strength of 3500 psi at 28 days. The mix shall contain not less than 6 sacks of cement per cubic yard and not more than 6 gallons of water per sack of cement. The water/cement ratio shall not exceed 0.53:1 including free water in the aggregates. Air entrainment shall range from 4% to 8%. Slump shall be 2" to 5".

The contractor shall be responsible for determining the design mix proportions and shall provide a copy of the mix to the NRCS Inspector at least 3 days prior to placing any concrete. A concrete batch ticket shall be supplied to the inspector at the time of delivery to the site. The minimum information to be included shall be the name of the supplier, size of load, time of loading, type and amount of cement, type and amount of admixtures, saturated surface dry weights of fine and coarse aggregate, mixing water added at the plant and free water in aggregates.

4. REINFORCING STEEL

Reinforcing steel shall be free from loose rust, concrete, oil, grease, or paint.

Reinforcing shall be accurately placed and secured in position in a manner that will prevent its displacement during placement of concrete. The use of heat or welding in cutting, bending and splicing of reinforcing steel will not be permitted.

In slabs, steel shall be supported by precast concrete bricks, corrosion resistant metal chairs, or non-metal chairs. The concrete brick shall have strength equal to or greater than 3500 psi. Metal chairs shall have a protective epoxy coating, plastic coating, galvanized finish or be stainless steel.

Splices of reinforcing bars shall be lapped 30 diameters but not less than 12 inches. Bars shall not be spliced by welding. Welded wire fabric shall be lapped at least one mesh width.

5. FORMS FOR CONCRETE

All edges shall be formed. All forms shall be true to line and grade, mortar tight, and rigid. Forms shall be left in place for a minimum of 24 hours.

6. PLACING CONCRETE

Concrete shall be placed in final position within one and one-half hours after mixing the aggregate with cement and shall be consolidated by spading or mechanical vibration. The concrete shall not be forced to flow laterally to its final location. Concrete shall not be dropped more than 5 ft. vertically.

Addition of water at the job site may be done at the beginning of placement of each load of concrete in order to obtain allowable slump, provided that the specified water/cement ratio will not be exceeded. Addition of water will not be permitted after placement of the load has proceeded.

All concrete placed on earth shall be placed on clean firm damp surfaces, free of frost, ice, running water, or mud.

Concrete shall be placed at air temperatures between 40°F and 80°F, unless special measures are taken to protect the concrete. Review special concrete placement procedure with NRCS prior to placement of concrete. Concrete shall be protected from freezing for 7 days after placement.

7. JOINTS

Install joints as shown on the drawings. A formed construction joint shall be made at the locations shown on the drawings, at the end of the day or at any time when a cold joint would occur.

Control joints are required every 8 to 12 ft. in both directions, unless otherwise shown on the drawings. They shall be tooled or sawed to a depth of 1/4 of the slab thickness.

8. CURING CONCRETE

Concrete shall be cured for 7 days by either:

1) Applying white pigmented curing compound at a rate of 1 gallon per 150 square feet or as recommended by the manufacturer.
2) Water soak exposed surface for the entire 7 days.
3) Cover with burlap, mats or other material and maintain in a moist condition.
4) Cover with 4 mil plastic sheeting while concrete is still wet.

9. SPECIAL SPECIFICATIONS

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-45 PLASTIC (PVC, PE) PIPE

1. SCOPE

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

2. MATERIALS

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

Kind of Pipe	ASTM Specification
Corrugated PE Tubing and Fittings, Size 3 to 6 inch, inclusive	F 405
Large Diameter Corrugated PE Tubing and Fittings, Size 8 to 24 inch, inclusive	F 667
PE Large Diameter Profile Wall Sewer and Drain Pipe	F 894

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

Kind of Pipe	ASTM Specification
PVC Plastic Pipe, Schedules 40, 80 and 120	D 1785
PVC Pressure-Rated Pipe (SDR Series)	D 2241

3. FITTINGS AND JOINTS

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

Joints may be bell and spigot type with elastomeric gaskets, coupling type with elastomeric gasket on each end, or solvent cemented. Solvent cemented joints may not be used for ponds. Solvent cemented joints for PVC pipe and fittings shall be in accordance with ASTM D 2855. When a lubricant is required to facilitate joint assembly, it shall be a type having no detrimental effect on the gasket or pipe material.

Mechanical joints (split couplings and snap couplings) may be used when joining PE pipe and fittings when the pipe is used for non-pressure flow and a free draining sand or gravel bedding material is provided. Elastomeric-sealed mechanical joints shall be used when joining PE pipe and fittings under pressure flow or where seepage cannot be tolerated.

Where non-pressure pipe is specified, the fittings shall be of the same or similar materials as the pipe and shall provide the same durability and strength as the pipe.

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

Kind of Fitting	ASTM Specification
Threaded PVC Plastic Pipe Fittings, Schedule 80	D 2464
PVC Plastic Pipe Fittings, Schedule 40	D 2466
Socket-Type PVC Plastic Pipe Fittings, Schedule 80	D 2467
Butt Heat Fusion PE Plastic Fittings for PE Plastic Pipe and Tubing	D 3261
Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals	D 3139
PVC Pressure Pipe, 4-12 in., for Water	C 900
PVC Water Transmission Pipe, Nominal Diameters, 14-36 in.	C 905

4. HANDLING AND STORAGE

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

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

5. LAYING AND BEDDING THE PIPE

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

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

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

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

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

a. Earth Bedding. When bedding is specified, the pipe shall be firmly and uniformly bedded in a shaped bedding groove that closely conforms to the bottom of the pipe for a depth equal to a minimum of 1 inch or 5 percent of the diameter of the pipe, whichever is greater. The bedding material shall be free of rocks or stones greater than 0.5 inch diameter and earth clods greater than 2 inch diameter.

b. Sand or Gravel Bedding. When sand or gravel bedding is specified, the pipe shall be firmly and uniformly placed on a sand or gravel bed. Sand or gravel fill shall be carefully placed and compacted as specified herein and as shown on the drawings.

6. BACKFILL

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

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

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

7. SPECIAL SPECIFICATIONS

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. 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.

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.

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.

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 drain tile shall vary with soil type as follows:

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

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

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

After placement and blinding of plastic tubing, but prior to backfilling, sufficient time shall elapse to allow the tubing to reach the ambient temperature of the trench. All split fittings shall be securely tied with nylon cord before backfill is placed.

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.

8. 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.

9. 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.

10. 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, which includes required excavation, dewatering and porous backfill.

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 incidental. Such items and the bid items to which they are made incidental are identified in the following paragraphs.

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, HDPE Perforated Tile

(1) This item will consist of providing and installing the corrugated polyehtylene tubing as shown on the drawings including any field bends.

(2) This item shall be installed and backfilled as shown in the drawings.

(3) Payment will constitute full compensation for the following related incidental items: Pollution Control, Removal of Water, Trench Excavation, Porous Backfill and Trench Backfill.

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 6.

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 the Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four 1/2-inch diam. galvanized rods with tank lugs for annular or helical corrugated metal pipe. Bands shall have a minimum lap of 3 inches.	All	All
Hugger band from Armco Steel Corp. for helical corrugated metal pipe with reformed ends and for annular corrugated pipe. Bands include O-ring gaskets and two 1/2-inch diam. 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 place between the flanges to ensure water tightness.	35	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) Singles 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 of the work, which includes required excavation, dewatering and earth backfill.
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 incidental. Such items and the bid items to which they are made incidental are identified in the following paragraphs.

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, Corrugated Metal Pipe, 24"
Bid Item, Water Control Structure, 48"

(1) This item will consist of providing and installing the corrugated metal pipe and water control structure as shown on the drawings including the 24" bar guard at the inlet end of the pipe, a 24" rat guard at the outlet end of the pipe and any field bends.

(2) The water control structure shall be Contech or Agri-Drain Inline Water Level Control Structure as shown in the plans or equal.

(3) The structure shall be provided with adjustable stoplogs and handle to remove and install stoplogs.

(4) The corrugated metal pipe shall be 14-gage for the structure and 16-gage for the pipe and shall be zinc coated or aluminum coated with annular or helical corrugations.

(5) The structure height shall be as shown in the plans.

(6) Payment will constitute full compensation for the following related incidental items: Pollution Control, Removal of Water, Structure Excavation, Concrete base and ring, Backfill of Structure Excavation and Antiseep Collars.

(b) Bid Item, CMP Tile Outlet

(1) This item will consist of providing and installing the corrugated metal pipe at the outlet end of the tiles to be replaced that daylight into the basin. Item will also include a rodent guard at the outlet end of the pipe.

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

(c) Incidental 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 Agri-Drain collars or equal.

(3) No separate payment will be made for antiseep collars. Compensation for this item shall be included in the payment for Corrugated Metal Pipe, 24".

(d) Incidental Items, Factory Fabricated 90 Degree CMP Bend

(1) This item will consist of providing and installing the corrugated metal pipe 90 degree bend as shown on the drawings and field connections.

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

(3) No separate payment will be made for this item. Compensation for this item shall be included in the payment for Corrugated Metal Pipe, 24"

(e) Incidental Items, Rodent guards

(1) This item will consist of providing and installing rodent guards on the outlet of tile lines.

(2) Rodent guards shall be Agri-Drain guards or equal.

(3) No separate payment will be made for rodent guards. Compensation for this item shall be included in the payment for Corrugated Metal Pipe, 24" or CMP Tile Outlet

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 subrounded 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 ton 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 time of work to which it is made incidental. Such items and the items to which they are made incidental 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, 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) Riprap placed upstream of the steel sheet pile shall be not be placed to a height above the top of the steel structure.
      (5) Geotextile Filter Fabric shall be placed beneath all riprap. Refer to section IA-95 for Geotextile specifications.
      (6) Equipment placed riprap shall be done in a manner not to damage the underlying geotextile. If contractor damages geotextile at any time, it shall be removed and replaced at the contractor's expense.
      (7) Payment will constitute full compensation for the following related incidental items: Pollution Control, Removal of Water, Structure Excavation and Geotextile Filter Fabric.

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 (ASTM C 150). Fly ash conforming to Section 4108 of the IDOT Standard Specifications for Highway and Bridge Construction may be substituted for equivalent amount of Portland cement for amounts not to exceed 20 percent of the total amount of cementitious material in the grout. Aggregate shall meet Iowa Department of Transportation requirements for Fine Aggregate for Concrete, Section 4110 of IDOT Standard Specifications for Highway and Bridge Construction. Water shall be clean and free of harmful chemicals. Air entraining admixtures shall conform with 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).

8. CURING CONCRETE

Concrete shall be cured for 7 days by either:

1) Applying white pigmented curing compound at a rate of 1 gallon per 150 square feet or as recommended by the manufacturer.
2) Water soak exposed surface for the entire 7 days.
3) Cover with burlap, mats or other material and maintain in a moist condition.
4) Cover with 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° F unless facilities are provided to maintain the temperature of the materials at 50° F to 90° F during placement and curing period. Grout may not be placed on frozen surfaces. When freezing conditions are expected, rock shall be heated to 50° F to 90° F for at least 24 hours prior to placing grout.

9. 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 acceptably 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 incidental. Such items and the items to which they are made incidental 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, 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. The actual amount of grout needed may be reduced by the Engineer during construction.
      (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 an 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. Incidental 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 geotextiles.

2. MATERIAL QUALITY

Geotextiles 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 geotextiles 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 geotextiles, in addition to mechanically bonded, nonwoven geotextiles, 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 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. Incidental Item, Geotextile

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

      (2) Geotextiles shall conform to the requirements of 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 (pounds) 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 non smaller than 0.212 mm (#70) 2/
Percent open area (percent)	CWO-02215-86	4.0 minimum	4.0 minimum	1.0 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 (pounds) [1/]	ASTM D 4632 grab test	180 minimum	120 minimum	90 minimum	115 minimum
Elongation at failure (%) [1/]	ASTM D 4632	≥50	≥50	≥ 50	>50
Puncture (pounds)	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 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.