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CONSTRUCTION SPECIFICATIONS

FOR

BEN850929B NEIGHBOR WETLAND
BENTON COUNTY, IOWA

October 2026



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.

Dan Jensen — 10/8/2026

Signature — Date

Printed or typed name: Dan J. Jensen

License Number: 25063

My License Renewal Date is: December 31, 2027

Pages, Sheets, or Divisions covered by this Seal: All

PREPARED BY:

SHIVEHATTERY
ARCHITECTURE + ENGINEERING

PROJECT #2240012790

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS

For
BEN850929B WETLAND
Benton County, Iowa

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

Construction Specification
000 IA-1 Site Preparation

1. SCOPE

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

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

2. FOUNDATION PREPARATION

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

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

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

3. STRIPPED MATERIAL DISPOSAL

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

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

4. DISPOSAL OF REFUSE MATERIALS

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

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

5. SALVAGE

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

6. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Bid Item No. 1 - “Site Stripping and Preparation”

This item will consist of work to remove and dispose of existing material to remove vegetation on areas to be excavated or filled. Total depth of vegetative stripping and topsoil stripping shall equal a combined depth of 12", with the estimated cubic yards of top soil removal as shown in the plans on sheet C001. The topsoil replacement quantity shall be paid separately.

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

This item will be paid out as a lump sum.

2. Bid Item No. 2 - “Crop Damages”

This item consists of crop damage that results from construction activities. It is recommended contractor remove corn residue rather than knock it down.

Payment for crop damage will be made to the nearest 0.1 acre as measured by the Engineer or their representative. The unit rate for crop damage will be determined by the Division near the completion of construction and added to the contract with a Change Order. Payment will be made to contractor who will pay landowner.

Construction Specification
000 000 IA CS-005 Pollution Control 2011

1. SCOPE

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

2. MATERIALS

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

3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

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

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

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

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

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

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

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

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

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

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

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

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

4. CHEMICAL POLLUTION

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

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

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

5. AIR POLLUTION

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

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

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

6. MAINTENANCE, REMOVAL, AND RESTORATION

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

7. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Subsidiary Item - Pollution Control

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

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

1. Bid Item No. 23 - “Pollution Control, Turf Reinforcement Mat – Type 5B”:

This item includes procurement and installation of type 5B turf reinforcement mat. Use a TRM that is constructed of a web of mechanically or melt bonded polymer netting, monofilaments, or fibers that are entangled or woven to form a strong and dimensionally stable mat. Non-woven bonding methods include polymer welding, thermal or polymer fusion, or the placement of fibers between two high-strength, biaxially oriented nets, mechanically bound by parallel stitching with polyolefin thread. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation.

Must be in accordance with SUDAS 9040. Installation shall be per the manufacturer’s recommendations.

Staples, anchoring devices, and any other products or materials necessary for proper installation will be considered incidental.

2. Bid Item No. 24 - “Pollution Control, Silt Fence”:

This item includes procurement and installation of silt fence ditch checks as shown on the plans and as detailed. Silt fence installation shall be in accordance with SUDAS 9040.

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

1. SCOPE

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

2. SEEDBED PREPARATION AND APPLICATION

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

On side slopes steeper than 2-1/2 horizontal to1 vertical, the 3 inch minimum depth of seedbed preparation is not required, but the soil shall be worked enough to insure sufficient loose soil to provide adequate seed cover.

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

3. MATERIALS

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

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

4. MULCH APPLICATION

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

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

5. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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B. Items of Work and Construction Details

1. Bid Item No. 3 - “Structure and Channel Seeding”

This item will consist of seeding the dike except the upstream side slope below the weir elevation, auxiliary spillway, the tile outlet channel side slopes and any other disturbed areas noted on the plans or as determined by engineer.

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

Seeding rates are as follows:

Smooth Brome grass	25 pounds/acre

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

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

Nitrogen (N)	30 pound/acre
Phosphorus (P_2O_5)	30 pounds/acre
Potassium (K_2O)	40 pounds/acre

Straw mulch shall be applied at a rate of 2 tons per acre on all areas receiving structure and channel seeding.

Seeding shall 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.

If seeding is completed during the spring seeding period, a companion crop of oats shall be seeded at a rate of 1-1/2 bushels per acre.

Measurement will be based on the areas successfully seeded to the nearest 0.1 acre.

2. Bid Item No. 4 - “Buffer Seeding”

This item will consist of seeding the areas designated on the plans as buffer seeding and include borrow areas, disturbed areas not seeded as part of structural seeding, and other areas within the easement. Buffer seeding is not required in area below normal pool elevation established by the weir elevation.

Some areas of the site may have existing CRP vegetation or steep slopes with existing vegetation. Local NRCS personnel will determine if these areas will be included as part of the buffer seeding areas for this project or will be left as is. This may affect the bid quantity and Contractor will verify with Engineer the number of acres that will require buffer seeding.

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

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 Iowa Conservation Practice 327 “Native Species for Wildlife”. Contractor’s proposed seed mix shall be submitted to Engineer and local NRCS office for approval at least 2 weeks before seed is to be applied.

Seeding shall be completed during the following seeding periods:

Spring	April 1 to June 30
Fall	November 15 to Freeze-up

The seed bed shall be properly prepared prior to seeding:

(a) Any weed control measures shall be completed prior to seeding. If spraying is used, then a span of two weeks shall be allowed between spraying and seeding.

(b) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, areas to be seeded shall be disked to thoroughly loosen and pulverize the soil to a depth of 3 inches. This may require multiple passes of 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 an appropriate herbicide at the labeled rates to emergent growth 2 to 4 weeks after mowing. After the vegetation has died, the area shall be disked thoroughly loosen and pulverize the soil depth of 3 inches. If emergent growth occurs prior to seeding, the areas shall receive a second application of herbicide. Seeding shall not occur until the existing vegetation has died (about 1 week).

(c) If deeper disking is used at the site, a lighter disk or spring harrow shall be used to remove deep furrows.

(d) After disking operations and prior to seed application, the seedbed shall be firmed with a cultipacker or similar piece of equipment.

(e) No lime or fertilizer is to be applied.

Sow seed with 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.

Plant seed not more than 1/4 inch deep; some seed may be seen on the surface after seeding.

Broadcasting by centrifugal-type or hydroseeder broadcasters, or by hand shall 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 1/4 inch by means of hand rakes or other approved methods.

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.

No mulch shall be required.

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

3. Subsidiary Item - Weed Control

Weed control may be needed in portions of this site depending upon the start date of the contract, the initiation of grading, and the seeding dates.

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

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

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

Construction Specification 8—Mobilization and Demobilization

1. SCOPE

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

2. EQUIPMENT AND MATERIAL

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

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

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

3. PAYMENT

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

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

4. ITEMS OF WORK AND CONSTRUCTION DETAILS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Bid Item No. 5 - "Mobilization and Demobilization"

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

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

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

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

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

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

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

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

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

2. Subsidiary Item - Sign Installation

This item shall include all labor, materials, equipment and Iowa One Call notifications to install sign provided by Iowa Department of Agriculture and Land Stewardship, as shown on the plans or on next page.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

IA-9 SUBSURFACE DRAIN INVESTIGATION, REMOVAL, AND REPAIR

1. SCOPE

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

2. INVESTIGATION AND LOCATION

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

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

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

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

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

3. TILE REPAIR

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

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

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

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

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

4. TILE REMOVAL

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

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

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

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

5. BACKFILL

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

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

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

6. MATERIALS

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

Table 1. Acceptable pipe for subsurface drain repair

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

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

[$]Pipe conforming to AASHTO M 252 (3 to 10 inch), or AASHTO M 294 (12 to 60 inch) is acceptable.

7. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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B. Items of Work and Construction Details

1. Bid Item No. 6 - “Drain Tile Investigation and Removal”

This item will consist of the excavation necessary to locate and remove all tile under the embankment and to locate and determine the tie-in locations for the tile locations shown on the plans. This item shall also include backfilling of the trenches and removal of the old tile off site.

This item does not include the additional excavation required to excavate the embankment core trench, if included in the project. Excavation of the core trench is covered under Specification IA-21, Excavation.

The extent of the tile investigation shall be as shown on the drawings. If extra work is required to locate additional tile not shown on the drawings, the Contractor can request additional compensation, but it must be first approved by the Division.

The investigation should reveal where the tile crosses the embankment footprint or where it is located if it does not cross the embankment footprint

Payment for Drainage Tile Investigation and removal shall be made as noted in the plans.

Construction Specification
000 IA-11 Removal of Water

1. SCOPE

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

2. DIVERTING SURFACE WATER

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

3. DEWATERING THE CONSTRUCTION SITE

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

4. EROSION AND POLLUTION CONTROL

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

5. REMOVAL OF TEMPORARY WORKS

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

6. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Subsidiary Item Dewatering

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

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

Construction Specification
000 IA-13 Sheet Piling

1. SCOPE

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

2. MATERIALS

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

3. DRIVING SHEET PILE

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

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

4. CUTTING OFF PILES

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

5. DEFECTIVE PILING

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

6. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Bid Item No. 7 - “Steel Sheet Piling”

Payment will be made based on the submitted unit price based on the area of sheet pile walls, acceptably placed, 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.

This item shall consist of furnishing and installing the steel sheet piling shown on the drawings. This item shall include field cutting the side slopes of the sheet piling to the specified slope shown on the drawings along with any damaged portion from driving.

The sheet piling will be installed starting from the center of the weir section and progressing away from centerline.

Sheet piling shall meet the minimum requirements specified in the plans. Note that these minimum requirements have been determined for in-place stresses. The Contractor is responsible for making sure the sheet pile provided can be adequately placed without excessive damage based on expected stresses experienced during placement.

2. Subsidiary Item - Steel c-channel

Furnishing and Installation the steel c-channel (See IA-81), including bolts, nuts, washers and steel channel.

All holes shall be field drilled. Torch, plasma cutting or other methods resulting in imperfect holes will not be permitted.

Construction Specification
000 IA-21 Excavation

1. SCOPE

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

2. USE OF EXCAVATED MATERIALS

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

3. DISPOSAL OF WASTE MATERIAL

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

4. STRUCTURE AND TRENCH EXCAVATION

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

5. BORROW EXCAVATION

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

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

6. OVER-EXCAVATION

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

7. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

The volume of excavation as provided in the bid quantities has been determined from the topographic information shown on the Drawings using a computer program. Payment will be made based on the planned quantities provided unless additional excavation is directed by the Engineer. Excavation resulting from the contractor's improper construction operations, as determined by the Engineer, is not included for measurement and payment.

B. Items of Work and Construction Details

1. Bid Item No. 8 - “Excavation (General)”

This item will consist of excavation and grading of material needed for the core trench and stream over-excavation as shown in the plans:

Excavations required for the placement of toe drain, tile exploration, new tile installation, riprap placement, are not included in this bid quantity and will not be measured for payment. The cost of excavation for these items are incidental and should be included as part of their corresponding bid items.

This item does not include the excavation for site stripping or topsoil, which is covered under Specification IA-CS-001. “Site Preparation”.

This item includes the hauling of excavated material to be used as earthfill or spoil.

See Specification IA-CS-023 for compaction method.

Payment will be based on plan quantity. If unsuitable material is found at the bottom of the core trench, the over excavation shall be measured and paid in a change order.

Payment will constitute full compensation for the following related Subsidiary items: Pollution Control; Removal of Water; and Structure Excavation.

2. Subsidiary Item - Borrow Excavation

This item will consist of excavation of the borrow area for placement of cohesive material in the embankment core and compacted clay liner, if included and as shown in the plans. The cost for excavation and transporting of borrow shall be included in corresponding bid Items listed in Specification IA-CS-023 “Earthfill”.

Borrow from any other area will not be allowed unless directed and approved by the Engineer.

The topsoil from the borrow area shall be removed to a minimum depth of 6" and stockpiled. When the borrow operations have been completed, grades shall be returned to that indicated on the plans and the topsoil shall be uniformly spread over the entire borrow area to a depth of 6". The cubic yards of topsoil anticipated for borrow are included with the quantities for Stripping in IA CS-001 Site Preparation, and respreading is included with IA CS-026 Topsoil.

No separate payment will be made for strip or respread of topsoil over borrow area not authorized or approved.

3. Subsidiary Item - Structure Excavation

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

No separate payment will be made for Structure Excavation. Compensation for this item will be included in payment with the corresponding bid items for CMP conduit; CMP water control structure; steel sheet pile; and riprap.

Construction Specification
IA-23 Earthfill

1. Scope

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

2. Materials

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

3. Foundation Preparation

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

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

4. Placement

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

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

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

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

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

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

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

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

5. Control Of Moisture Content

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

The moisture content of the fill material must be such that a ball formed with the hands does not crack or separate when struck sharply with a pencil and will easily ribbon out between the thumb and finger.

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

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

6. Compaction

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

- Method 1 – Place earthfill so that the wheels or tracks of the loaded hauling equipment, traveling in a direction parallel to the centerline of fill, pass over the entire surface of each layer being placed.

- Method 2 - Two (2) complete passes of a tamping-type roller will be made over each layer. The roller must be capable of exerting a minimum of two hundred (200) pounds per square inch.

- Method 3 - Minimum density must be 90% of the maximum density as determined by ASTM D 698 and as shown on the plans.

The maximum thickness of a lift of fill before compaction is9 inches, unless otherwise indicated on the drawings.

Place fill adjacent to structures, pipe conduits, and appurtenances in layers not more than 4 inches thick and compacted to a density equivalent to that of the surrounding fill. Methods used to obtain compaction for fine or coarse grained materials are as follows:

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

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

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

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

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

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

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

8. Specific Site Requirements

A. Measurement and Payment

For items of work which specific unit prices are established in the contract, the volume of earthfill has been determined by engineer using computer programs. No deduction in volume has been 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 provisions that earthfill 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.

Earthfill beyond the specified lines and grades to backfill excavation required for compliance with OSHA requirements will be considered subsidiary to the earthfill bid item(s).

Payment for each type and compaction class of earthfill and earth backfill is made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work.

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 subsidiary. Such items and the items to which they are made subsidiary are identified in this specific section.

B. Items of Work and Construction Details

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

1. Bid Item No. 9 - “Earthfill (General)”

This item shall consist of the earthfill necessary to construct the submerged berms and additional fill to be placed over the tile to provide adequate cover. Cohesive material found during general grading and compacted liner removal can be used for these areas. Sand and gravel found on site shall not be used for this earthfill.

Compaction shall be Method 1, unless the Plans specify to use Method 2.

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

Payment for these items shall be based on plan quantity unless additional length or location of tile varies from what is shown on the plans. The plan quantity is based on neat lines and does not account for any shrinkage.

Payment will constitute full compensation for the following related Subsidiary items: Pollution Control, Removal of Water, and Backfill Required Excavation.

2. Bid Item No. 10 - “Earthfill (General Dam)”

This item will consist of earthfill placement and compaction necessary to construct the portion of the embankment that is not considered part of the embankment core. Cohesive material found during general grading and compacted liner removal can be used for this area. Sand and gravel found on site shall not be used for fill for these items

Compaction shall be Method 1, unless the Plans specify to use Method 2.

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

Payment for this item shall be based on plan quantity. The plan quantity is based on neat lines and does not account for any shrinkage.

Payment will constitute full compensation for the following related Subsidiary items: Pollution Control, Removal of Water, and Backfill Required Excavation.

3. Bid Item No. 11 - “Earthfill (Dam Core)”

This item will consist of earthfill placement and compaction necessary to construct the portion of the embankment designated the embankment core, including the core trench. Cohesive material taken from the designated borrow area should be used for this area. Sand and gravel found on site shall not be used for fill for these items.

Compaction shall be Method 2, unless the Plans specify to use Method 3.

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

Payment for this item shall be based on plan quantity. The plan quantity does include a shrinkage value as noted in the plans.

Payment will constitute full compensation for the following related Subsidiary items: Pollution Control, Removal of Water, and Backfill Required Excavation.

4. Subsidiary Item - Backfill Required Excavation

This item shall consist of backfilling the areas excavated to install the other components related to the project such as piping or structures and to locate and remove the tile lines.

Compaction adjacent to the structures shall be as indicated above. All other compaction shall be Method 1 or equivalent.

No separate payment will be made for Backfill of Structure Excavation. Compensation for this item will be included in payment for Corrugated Metal Pipe; CMP Drawdown Structure; Riser Inlet Structure, Tile Investigation and Removal and Dual Wall HDPE.

5. Bid Item No. 12 - **“Earthfill (18” Clay Liner, Wetland Bottom, Two 9” Lifts)”:**

This item includes scarification and loosening of an 18-inch liner in two lifts the entire wetland pool. Remove an additional 9-inch of soil, scarify and re-compact 9-inch below, replace 9-inch and recompact, moisture conditioning, and compaction of the wetland bottom to form a seal.

The contractor shall remove rocks larger than 6 inches. Compaction shall be method 2.

Notify engineer immediately if sandy soils are encountered. Item will be paid based on plan quantity.

Construction Specification
000 IA-26 Topsoiling

1. SCOPE

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

2. QUALITY OF TOPSOIL

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

3. EXCAVATION

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

4. SPREADING

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

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

5. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Bid Item No. 13 - “Topsoil Placement, 6 Inch”

This item will consist of spreading salvaged and stockpiled topsoil as the surface layer of all excavations and earthfills that will be seeded. Topsoil shall be placed as final lift.

Areas to receive a minimum of 6-inch layer of topsoil include areas of the embankment that do not have riprap, borrow areas and additional fill placed over new tile and any other areas noted in the plans.

Measurement and payment for Topsoiling shall be on a plan quantity. Plan quantity listed in the proposal will be used to measure and pay for the bid.

Grading areas with less than 6 inches of cut will not require topsoil respreading unless required by engineer. Wetland pool areas with water depths greater than 3 feet such as sedimentation basins, do not require topsoil placement, unless noted otherwise on the plans.

Payment will constitute full compensation for the following related subsidiary items: Site Preparation and Pollution Control.

Construction Specification
000 IA CS-031 Concrete

1. SCOPE

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

2. MATERIALS

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

Type IS Portland blast-furnace slag cement, Type IP Portland-pozzolan cement, or Type IL Portland-limestone cement must conform with ASTM C595. Portland-limestone cement must have a limestone content more than 5% but less than or equal to 15% by mass of blended cement as designated by Type IL(5) to Type IL(10). Moderate sulfate resistance, when desired, must be specified by the suffix Type IL (MS). High sulfate resistance, when desired, must be specified by the suffix Type IL(HS).

Cement must be stored and always protected from weather, dampness, or other destructive elements. Do not use cement that is partially hydrated or otherwise damaged.

Fly ash may be used as a partial substitution for Portland cement and must be in strict compliance with ASTM C 618, Class F or C. The loss by ignition shall not exceed 4.0 percent.

Blast-furnace slag may be used as a partial substitution for Portland cement and shall be in conformance with ASTM C 989 for ground granulated blast-furnace slag (GGBF slag).

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

Coarse Aggregates must be gravel or crushed stone conforming to ASTM C 33 and must be clean, hard, durable and free from clay or coating of any character. The maximum allowable size of coarse aggregate is 1 1/2 inches or as shown on the drawings.

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

Air entraining agent must conform to ASTM C 260.

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 will not be allowed. Use only noncorrosive accelerating or water-reducing and accelerating admixtures and that conform to the requirements of ASTM C494, Types C and E. The manufacturer must provide long-term test data results from an independent laboratory verifying that the product is noncorrosive when used in concrete exposed to continuously moist conditions.

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

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

1. Reinforcing Bars - ASTM A 615 or A 996, Grade 40 or greater, deformed.
2. Welded Wire Fabric - ASTM A 185 or A 497.

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

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

3. CONCRETE DESIGN MIX

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

Mix Number	Minimum Cement, Pounds	Fly Ash, Pounds	GGBF Slag, Pounds	Maximum ** Water, Gallons
1	564	0	0	33
2	470	45-90	0	31-34
3	517	129	0	31 *
4	366	114	91	31 *
5	259	103	155	31 *

** Total of available aggregate moisture, mixing water added at the plant and mixing water added at the job site (one gallon equals 8.33 pounds).
* Requires water reducing admixture.

4. MIXTURES AND MIXING

Batch, mix, and transport ready-mixed concrete in accordance with ASTM C 94. Concrete must be uniform and thoroughly mixed when delivered to the forms. Do not add 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 to the concrete during mixing, hauling or after arrival at the point of delivery. Batch and mix the concrete 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 must obtain from the supplier a delivery ticket for each batch of concrete before unloading at the site. The following information must 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.

Add the following information 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, provide copies of all batch tickets to NRCS.

6. REINFORCING STEEL

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

Cut and bend reinforcing bars according to ACI Standard 315.

Tack welding of bars is not permitted. Accurately place reinforcement as shown on the drawings and secure in position in a manner that will prevent its displacement during placement of concrete. Use metal chairs, metal hangers, metal spacers or concrete chairs to support reinforcement. Precast concrete chairs must be

manufactured from concrete equal in quality to the concrete being placed. Precast concrete chairs must be moist at the time concrete is placed. Make splices of reinforcing bars only at the locations shown on the drawings, unless otherwise approved by the NRCS Engineer. All reinforcing splices and placement must be in accordance with ACI 318 and shown on the drawings.

After placement of the reinforcement, do not place concrete 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 must be free of woodchips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Remove any oil on the reinforcing steel or other surfaces required to be bonded to the concrete. All surfaces must be firm and damp prior to placing concrete. Placement of concrete on mud, dried earth, uncompacted fill, or frozen subgrade is not be permitted.

The forms and associated false-work must be substantial and unyielding and be constructed so that the finished concrete will conform to the specified dimensions and elevations. Forms must be mortar tight. Do not use forms with torn surfaces, worn edges, dents or other defects. Coat forms with a nonstaining form release agent before being set into place. Excess form coating material must 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, must be of a commercially manufactured type. Do not use non-fabricated wire. Construct form ties 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 structures with a total volume of concrete exceeding fifteen cubic yards must be equipped with cones or other devices that permit their removal to a depth of at least one inch without damage to the concrete. Patch the holes resulting from cones and other devices in accordance with Section 9.

Except those specifically covered by the preceding paragraph, break form ties off flush with the formed surface. Repair any surface areas which have been spalled or otherwise damaged in accordance with Section 9.

Do not start steel tying and form construction adjacent to new concrete until concrete has cured at least 12 hours.

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

Braze, weld, or overlap and bolt splices in metal waterstops. Cement or join splices in nonmetallic waterstops as recommended by the manufacturer.

8. PLACING CONCRETE

Do not place concrete until the subgrade, forms, and steel reinforcement have been inspected and approved by the NRCS Inspector. Correct any deficiencies before the concrete is delivered for placement.

Concrete must 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, discharge the concrete 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 the concrete 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 is not be permitted after placement of the load has started.

Deposit the concrete as closely as possible to its final position in the forms and work into corners and around reinforcement and other embedded items in a manner which prevents segregation. Deposit formed concrete in layers 24 inches or less in depth and must be continuously deposited so that no concrete is deposited on concrete which has hardened sufficiently to cause the formation of “cold joints”. Place concrete containing superplasticizer 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 must discontinue placing concrete and install a construction joint. Complete construction joints as shown on the drawings or by one of the following methods:

1. Construct the joint using a 6 inch wide by 1/4 inch steel plate. Prepare the surfaces of the construction joint by washing and scrubbing with a wire brush or wire broom to expose coarse aggregate. Embed the steel plate 3” in the concrete.
2. Clean the joint surface 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. Do not cut the surface of the concrete so deep as to undercut the coarse aggregate. Wash the joint to remove all loose material after cutting.

Keep the surfaces of all construction joints continuously moist for at least 1 hour prior to placement of the new concrete. Place the new concrete directly on the cleaned and washed surface. Do not place new concrete until the hardened concrete has cured at least 12 hours.

Do not drop concrete more than 5 feet vertically unless suitable equipment is used to prevent segregation. Do not drop concrete containing superplasticizer more than 12 feet vertically.

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

9. FORM REMOVAL AND FINISHING

Leave forms in place for at least 24 hours after placing concrete. Remove forms in such a way as to prevent damage to the concrete. Remove supports 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, repair or replace concrete which is honey combed, damaged or otherwise defective. Patch all cavities or depressions resulting from form tie removal 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 add enough water to produce a filling which is at the point of becoming rubbery when the material is solidly packed.

Cure all repaired and patched areas as required in Section 10.

10. CURING

Cure concrete for a period of not less than 7 consecutive days by one of the following approved methods:

1. Membrane Curing: Cure concrete with white pigmented curing compound. Spray the compound on moist concrete as soon as free water has disappeared, but do not apply it to any surface until patching, repairs and finishing of that surface are completed. Do not apply curing compound 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, reapply the curing compound in the same manner as the original application.
2. Moist Curing: Cure concrete by maintaining all surfaces continuously wet for the entire curing period.
3. 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. Place backfill against the structure in no more than 4-inch layers and compact by hand tamping or with manually directed power tampers or plate vibrators. Compact layers in this manner for a distance no 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, mix, place, and protect concrete in accordance with Title IA210 National Engineering Handbook, Part 645 “Construction Inspection”, Section IA645.1201, and 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, mix, place, and protect concrete in accordance with Title IA210 National Engineering Handbook, Part 645 “Construction Inspection”, Section IA645.1201, and ACI Standard 305, “Recommended Practice for Hot Weather Concreting.”

13. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Subsidiary Item - Concrete

This item shall consist of all necessary concrete, reinforcing steel, formwork, materials, and labor to place poured concrete and reinforced concrete as shown in the drawings including, but not limited to, the Water Control Structure foundation and concrete collars around pipe connections.

No separate payment will be made for Concrete. Compensation for this item will be included in the payment for the Water Control Structure and Tile Installation.

However, concrete structures that meet the Iowa Statewide Urban Design and Specifications (SUDAS), will be paid as discussed below.

1. Bid Item No. 15 - “24” Aluminized CMP Drawdown Riser, 12 GA”

The work shall consist of constructing the concrete base for the drawdown riser as shown and detailed in the plans.

In general, the concrete structures shall meet the requirements of SUDAS 6010, unless otherwise stated in the drawings.

2. Bid Item No. 16 - “48” CMP Water Control Structure”

The work shall consist of constructing the concrete base for the water control structure as shown and detailed in the plans.

In general, the concrete structures shall meet the requirements of SUDAS 6010, unless otherwise stated in the drawings.

Construction Specification
000 IA-046 Tile Drains for Land Drainage

1. SCOPE

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

2. MATERIALS

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

Perforated tubing shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the tubing. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

All pipe material must meet the following reference specifications:

Plastic Pipe

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

Clay and Concrete Pipe

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

3. EXCAVATION

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

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

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

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

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

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

4. PREPARING THE BEDDING

Unless otherwise specified, no filter or envelope is required. In stable soils, shape the bottom of the trench to form a semicircular, trapezoidal, or 90-degree “V” groove in its center. Shape the groove to fit the size of tile. Do not use the 90-degree “V” groove on conduits greater than 6 inches in diameter.

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

5. FILTER OR ENVELOPE MATERIAL

When a filter is specified, the shape of the bottom of the trench, gradation and the thickness of the filter or envelope material to be placed around the conduit will be as shown on the drawings. Place the envelope or filter material in the bottom of the trench just prior to the laying of the conduit. Then lay the conduit and place the envelope or filter material over the conduit.

6. PLACEMENT AND JOINT CONNECTIONS

All drains must be laid to grade.

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

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

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

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

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

7. CONNECTIONS

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

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

Make connections with the outlet pipe watertight.

8. OUTLETS

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

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

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

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

9. BLINDING

After the conduit is placed in the excavated groove, place friable material from the sides of the trench around the conduit, completely filling the trench to a depth of not less than six (6) inches over the top of the conduit. For material to be suitable it must not contain hard clods, rocks, frozen soil, or fine material which will cause a silting hazard to the drain. Blind conduit placed during any one day by the end of the day's work.

10. BACKFILLING

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

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

11. SPECIAL SPECIFICATIONS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

Note that the new tile installed at the site often connects to existing tile on site. The details described above in Section 6 "Placement and Joint Connections" do not apply to this project. All connecting joints of new tile to existing tile must be watertight and enclosed in concrete or grout.

1. Bid Item No. 14 - “6” Corrugated Profile Wall (Dual Wall, Non-Perforated) Polyethylene Pipe”:

This item will consist of furnishing and installing 6” non-perforated corrugated profile wall (Dual wall) Polyethylene pipe used as a drain tile as shown on the drawings.

Measurement and payment for the corrugated profile wall (Dual wall) Polyethylene pipe shall be on an installed linear foot basis, and shall include all necessary fittings and adapters.

Payment will also include all subsidiary items required for installation such as trench excavations, backfill, site preparation, and removal of water, and concrete collar at joint. Additional fill required to provide adequate cover as needed is included in Earthfill, General.

Construction Specification
000 IA-51 Corrugated Metal Pipe Conduits

1. SCOPE

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

2. MATERIALS

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

A. When polymer coating is specified, pipe, coupling bands and anti-seep collars shall be coated in accordance with ASTM A 762. All riveted joints shall be caulked as described in paragraph B.

B. Pipe with annular corrugations shall be furnished with caulked seams. Riveted pipe joints shall be caulked with a bituminous mastic material during fabrication to provide a watertight joint. All circumferential and longitudinal seams shall be caulked before riveting. This shall be accomplished by applying a uniform bead of the mastic compound to the inner lap surface before riveting such that when the rivets are in place, all voids are filled and a coating of mastic is between the lap surfaces. The inner surface of coupling bands shall be asphalt coated in the field prior to installation. A neoprene gasket having a minimum thickness of 3/8 inch and a minimum width of 7 inches may be used in lieu of mastic coated coupling bands.

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

D. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands, the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating off the coupling bands.

E. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. If specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

3. COUPLING BANDS

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

4. FABRICATION

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

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four	All	All
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.		

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

5. REPAIR OF DAMAGED COATINGS

The Contractor shall place the pipe without damaging the pipe or coatings. The pipe shall be transported and handled in a manner to prevent damage to the pipe or coating.

Breaks, scuffs, or other damage to the various coatings shall be repaired as follows:

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

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. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

Al joint connections to be used with pipes, culverts and structures must be watertight and as noted in the plans.

1. Bid Item No. 15 - “24” Aluminized CMP Drawdown Riser, 12 GA

This item will consist of providing and installing the Inlet Riser Structure as shown on the drawings, including the trash rack and concrete base. Riser shall be aluminized CMP and 12 gauge with 2 2/3” x ½” corrugations..

Provide detailed shop drawings of the riser inlet structure and appurtenances.

Measurement and payment for Inlet Riser Structure shall be on a lump sum basis.

Subsidiary items include concrete base, excavation and backfill, and control of water.

1. Bid Item No. 16 - “48” CMP Water Control Structure”

This item will consist of providing and installing the water control structure, stop logs, and concrete base as shown on the drawings. Riser shall be 12 gauge.

Provide detailed shop drawings of the water control structure and all appurtenances.
Contractor shall furnish two metal lifting rods with hook end and handles capable of lifting supplied stop logs while standing on the surface above the drawdown structure. The length of the lifting rod shall allow for storage in the drawdown structure while allowing for reaching the lower stop log.
Structure shall be CRCS 12GA aluminized CMP with 2 2/3” x ½” corrugations.

Measurement and payment for water control structure shall be on a lump sum basis.
Subsidiary items include concrete base, excavation and backfill, and control of water.

2. Bid Item No. 17 - “18” Aluminized CMP Wetland Drawdown Pipe. 14 GA”

This item will consist of providing and installing the CMP drawdown outlet pipe as shown on the drawings. Pipe shall be aluminized CMP and 14 gauge.

The corrugated metal outlet pipe shall be 14 gauge, closed riveted caulk seam (CRCS) round pipe with 2-2/3” and 1/2” annular corrugation and shall conform to ASTM A760.
Installation shall include anti-seep collars or filter diaphragm and filter diaphragm outlet as shown on the drawings.

Measurement and payment shall be on an installed linear foot basis.

Subsidiary items include water-tight coupling bands, anti-seep collars or drainage diaphragm, rodent guard, excavation and backfill, and control of water.

3. Bid Item No. 18 - “18” Aluminized CMP Flared End Section”

This item will consist of furnishing and installation of the flared end section and reinforced concrete footings as shown on the plans for the drawdown pipe outlet.

Payment will constitute full compensation for this lump sum bid item and related subsidiary items.

4. Bid Item No. 19 - “8” CMP Tile Outlets (20 LF Each)”

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

The corrugated metal pipe shall be 16-gauge minimum, zinc coated or aluminum coated with annular or helical corrugations.

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

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

Measurement and payment shall be on an installed foot basis and will constitute full compensation for this bid item and related subsidiary items.

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

5. Subsidiary Item - CMP Animal Guard

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

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

6. Subsidiary Item - Corrugated Metal Watertight Coupling Bands

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

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

Construction Specification
000 IA-61 Loose Rock Riprap

1. SCOPE

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

2. MATERIALS

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

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to sub rounded in shape. The least dimension of an individual rock fragment shall not be 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 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. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

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. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

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. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Bid Item No. 20 - “Rip rap, Class “E””

This item shall consist of furnishing and placing the rock riprap in the locations as shown on the drawings.

Quantity determine is based on a unit weight of 110 pounds per cubic foot,

Rock shall be Class E Revetment Stone as defined by Iowa Department of Transportation (DOT).

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.

Payment will be based on actual tonnage delivered to the site based on weight tickets to the nearest 0.1 ton, subject to the approval of the engineer.

Payment will constitute full compensation for the following related subsidiary items: Pollution Control, Removal of Water, Structure Excavation and Geotextile Fabric.

2. Bid Item No. 21 – “2” Clean Stone”

This item shall consist of installing 2” clean stone at the locations shown in the drawings.

2” clean stone must meet the Iowa DOT gradation 3 to be considered acceptable, refer to gradation table below. Quantity determination is based on a unit on a unit weight of 130 pounds per cubic foot.

Sieve Size	**Percent Passing (%)**
3 in (75 mm)	100
2½ in (63 mm)	90 – 100
2 in (50 mm)	35 – 70
1½ in (37.5 mm)	0 – 15
1 in (25 mm)	0 – 5
¾ in (19 mm)	0 – 2
No. 4 (4.75 mm)	0 – 1
No. 200 (0.075 mm)	0 – 0.5 (clean)

Weigh tickets shall be provided to the Engineer for all rock.

Payment will be based on actual tonnage delivered to the site based on weight tickets, to the nearest 0.1 ton, subject to the approval of the engineer.

3. Subsidiary Item - Geotextile Fabric

Geotextile Fabric, IA-95

Construction Specification
000 IA-62 Concrete Grout for Riprap

1. SCOPE

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

2. MATERIALS

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

3. GROUT MIX

The grout mix shall be as follows:

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

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

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

4. CONVEYING AND PLACING

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

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

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

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

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

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

5. CURING CONCRETE

Concrete shall be cured for 7 days by either:

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

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

6. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Bid Item No. 22 - “Concrete Grout”

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

The grout shall be consolidated into the voids with the use of a concrete vibrator. The average rate of grout application shall be adjusted to ensure that the voids are properly filled through the entire riprap depth. A smooth surface is not to be created by the grouting operation.

Grout shall be placed in contact with the downstream sheet pile over the full depth of riprap. There shall be no voids against the sheet pile. Grout against sheet pile upstream shall be smooth.

Grouting operation shall not be performed except in the presence of the Engineer or Engineer's Representative.

Grout unused or wasted, including any partial batch remaining at the completion of the operation, will be estimated and deducted by the Engineer from the volume for payment.

Payment will constitute full compensation for the following related subsidiary items: Wetting, Cleaning Sediment, Curing, Pollution Control; and Removal of Water.

Construction Specification
000 IA-81 Metal Fabrication and Installation

1. SCOPE

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

2. MATERIALS

Steel shall be of structural quality. Finished surfaces shall be smooth and true to assure proper fit. Bolts, nuts, washers, rods, rivets, etc., shall be of a material equal to the steel being fastened.

3. PROTECTIVE COATINGS

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

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

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

4. FABRICATION

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

5. ERECTION

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

6. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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B. Items of Work and Construction Details

1. Subsidiary Item - Steel

This item will consist of furnishings and installing the steel channel pieces used to form the crest of the sheet pile weir (waler), reinforcing, and steel used for fabrication of the stoplog channel, and steel grating used in covering the water control structure.

Bolts, nuts and washers required for installation shall be included and considered incidental.

No separate payment will be made for steel. Payment for this item will be considered subsidiary to Steel Sheet Pile and the Water Control Structure.

Construction Specification
000 IA-95 Geotextile

1. SCOPE

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

2. MATERIAL QUALITY

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

A. Woven Geotextile shall conform to the physical properties listed in Table 1. The woven geotextile shall be manufactured from monofilament yarns that are woven into a uniform pattern with distinct and measurable openings. The geotextile shall be manufactured so that the yarns will retain their relative position with regard to each other. The yarns shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.

B. Nonwoven Geotextile shall conform to the physical properties listed in Table 2. Nonwoven geotextile shall be manufactured from randomly oriented fibers that have been mechanically bonded together by the needle-punched process. In addition, one side may be slightly heat bonded. Thermally bonded, nonwoven geotextile, in addition to mechanically bonded, nonwoven geotextile, may be used for Road Stabilization. The filaments shall contain stabilizers and/or inhibitors to enhance their resistance to ultraviolet light or heat exposure.

C. The geotextile shall be shipped in rolls wrapped with a protective covering to keep out mud, dirt, dust, debris and direct sunlight. Each roll of geotextile shall be clearly marked to identify the brand, type and production run.

3. STORAGE

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

4. SURFACE PREPARATION

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

5. PLACEMENT

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 1. Requirements for Woven Geotextiles[1/]

Table 1. Requirements for Woven Geotextiles[1/]

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

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.
2/ Maximum average roll value.
3/ Note: CWO is a USACE reference.

Table 2. Requirements for Nonwoven Geotextiles[1/]

Table 2. Requirements for Nonwoven Geotextiles[1/]

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

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.
2/ Needle punched geotextiles may be used for all classes. Heat-bonded or resin-bonded geotextiles may be used for class IV only.
3/ Maximum average roll value.

6. SPECIFIC SITE REQUIREMENTS

A. Measurement and Payment

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

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

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

B. Items of Work and Construction Details

1. Subsidiary Item - Geotextile

This item shall consist of furnishing and placing geotextile on all surfaces that contact the rock riprap as shown on the drawings and at concrete aprons.

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

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

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