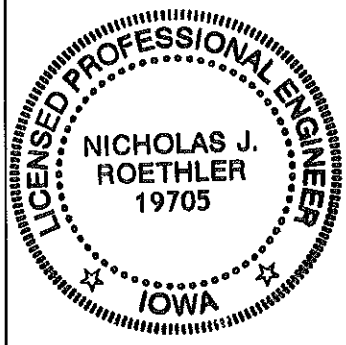
PROJECT MANUAL

FOR

POCAHONTAS COUNTY CREP SITE POC901305C
WETLAND DEVELOPMENT PROJECT

N ½ NW ¼ SECTION 5 T-90-N, R-31-W
POCAHONTAS COUNTY, IOWA

PROJECT NO. 106458



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.

Nicholas J. Roethler 7-27-2012

Nicholas J. Roethler, P.E. Date

License No.: 19705

My License Renewal Date is December 31, 2013

Pages or sheets covered by this seal:

All Construction Specifications Listed in Table of Contents

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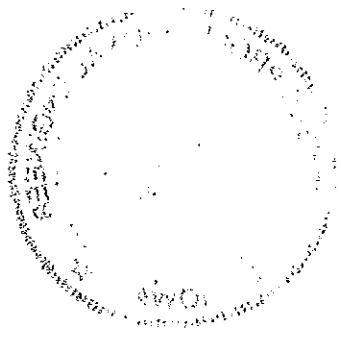

CONSTRUCTION SPECIFICATION
IA-1. SITE PREPARATION

1. SCOPE

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

2. FOUNDATION PREPARATION

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

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

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

3. STRIPPED MATERIAL DISPOSAL

Suitable soil material shall be stockpiled for use as topsoil. The other stripped materials shall be buried, removed from the site, or disposed of as directed by the owner or Engineer.

Stockpile materials around the construction site should not hinder subsequent construction operations.

4. DISPOSAL OF REFUSE MATERIALS

Waste materials from clearing and structure removal shall be burned or buried at locations approved by the owner.

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 area.

6. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of stripping will be computed to the nearest cubic yard by measuring the strip area from the site plan and multiplying this by the depth of stripping.

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 Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Stripping

(1) All excavation and fill areas outside of normal pool shall be stripped of six (6) inches of topsoil unless otherwise noted on the plans; all excavation and fill areas inside of normal pool are to be stripped of nine (9) inches of topsoil to remove vegetation.

(2) All material stripped shall be stockpiled at a location outside the wetland pool area designated by the Engineer.

(3) Any excess or unsuitable stripped material shall be disposed of as directed by the Engineer.

(4) Areas to receive a minimum four (4) inch layer of topsoil include: the upstream surface of the structure above normal pool, the downstream surface of the structure, borrow area outside of normal pool, the tops and backslopes of designated spoil piles placed adjacent to excavated channels and as also directed on the plans.

(5) Areas to receive a minimum six (6) inch layer of topsoil include: the upstream surface of the structure below normal pool, and any grading or borrow areas inside of normal pool and as also directed on the plans.

(6) Payment will constitute full compensation for related subsidiary items; Site Preparation and Removal of Water.

B. Bid Item, Clearing and Grubbing

(1) This item shall include work necessary to clear, grub, and dispose of trees and brush on site including but not limited to the borrow areas, stream channel and within 50 feet of the stream channel.

(2) Includes removing and burying on site small piles of rock and broken concrete.

(3) Includes removing sections of CMP tile outlets and CMP in stream channel and stockpiling them at the edge of the easement for the property owner if wanted. Materials not wanted by property owner shall become property of the contractor.

(4) Payment for this item will constitute full compensation for related subsidiary items Removal of Water, Structure Excavation, and Backfill of Structure Excavation.

C. Subsidiary Item, Site Preparation

(1) This item shall consist of the work necessary to begin construction including, but not limited to, mowing existing vegetation on area to be excavated or foundation areas for fill.

(2) This item shall include the post construction grading on the access lane.

(3) No separate payment will be made for this item. Compensation shall be included in payment for Item Mobilization/Demobilization.

* * * END OF DOCUMENT IA-1 * * *

CONSTRUCTION SPECIFICATION
IA-5. POLLUTION CONTROL

1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air during and as a result of 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 the smallest 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 the Engineer.

Mulching Construction areas that might have been disturbed but have no construction activity scheduled for 21 days or more shall have erosion protection measures applied by the 14th day. This erosion protection may be mulching or other approved temporary measures. Construction areas left open during a winter shutdown period shall be protected by mulching.

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

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

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

Stream Crossings Culverts or bridges where equipment must cross streams.

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

Sediment Filters Straw bale filters or geotextile sediment fences to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under them.

Waterways Waterways for the safe disposal 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 voided 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 nearly original conditions as practical.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Subsidiary Item, Pollution Control

(1) This item will consist of applying and performing all construction activities in a manner that will minimize water pollution, air pollution and soil erosion. Contractor is to install silt fence around the perimeter of all excavations and earthfills to control sediment from moving off site. This item includes approximately 1250 feet of silt fence, placed on the downstream side of the dike.

(2) No separate payment will be made for Pollution Control. Compensation for this item will be included in the payment for Bid Item Mobilization/Demobilization.

* * * END OF DOCUMENT IA-5 * * *

CONSTRUCTION SPECIFICATION
IA-6. SEEDING AND MULCHING FOR PROTECTIVE COVER

1. SCOPE

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

2. SEEDBED PREPARATION AND APPLICATION

The entire area to be seeded shall be reasonably smooth and all washes and gullies shall be filled to conform to the desired cross-section before actual seedbed preparation is begun. At this stage of the operation, the required fertilizer and lime shall be applied uniformly and incorporated into the top 3 inches of the soil with suitable tillage equipment. Contractor shall not perform seedbed preparation when ground conditions are unsuitable due to excessive moisture, snow, frost, or frozen ground, as determined by the Engineer. The seedbed shall be prepared with loose surface at least three inches thick.

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. The fertilizer shall be applied in a separate operation and prior to seed application.

3. MATERIALS

Seed delivered to the job site shall be labeled according to the U.S. Department of Agriculture Federal Seed Act and shall be furnished in containers with tags showing seed mixture, purity, germination, weed content, name of seller, and date on which seed was tested. Moldy seed or seed that has been damaged in storage shall not be used.

The seeding and fertilizing requirements are as specified in Section 6 of this specification.

Straw from cereal grains or hay will be used a 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.

Straw mulch materials shall be stabilized the same day it is applied by the use of a mulch crimper or equivalent anchoring tool or by a suitable tackifier. When the mulch crimper or equivalent crimping tool is used, it shall have straight blades

and be the type manufactured expressly for, and capable of firmly punching the mulch into the soil. On sites where equipment can be safely operated, it shall be operated on the contour. On sites where equipment can not safely operate, this work shall be done by hand. On sites where a tackifier is used to anchor mulch, the tackifier shall be uniformly applied over the mulch or injected uniformly into the mulch as it is applied. In either case the tackifier shall be applied at the rate recommended by the manufacturer for the site conditions.

5. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, each area treated is measured as specified in Section 6 and the area calculated to the nearest 0.1 acre. Payment for treatment is made at the contract price for the designated treatment, which will constitute full compensation for completion of the work.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Structure and Channel Fertilizing and Seeding

(1) This item will consist of seeding the dike except the upstream sideslope below the wave berm elevation, the open channels sideslopes above the normal water level the surface water Diversion Berm including the 20' adjacent to its fore slope, and any other disturbed areas as determined by the Engineer.

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

(3) Seeding rates are as follows:
Smooth Bromegrass 25 lbs./ac.

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

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

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

No lime is needed.

(6) Straw mulch shall be applied at the rate of 2 tons per acre on the seeded areas of the dike and open channel sideslopes.

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

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

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

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

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

B. Bid Item, Buffer Seeding

(1) This item will consist of seeding the disturbed areas above plan normal pool elevation within the easement boundary.

(2) All seed must be cleaned and weed free. All seed must be yellow tagged Iowa ecotype.

(3) Seeding mixture shall include a minimum of 5 native grasses and 10 native forbs. The mixture shall provide a minimum of 30 grass seeds per square foot and 10 forbs seeds per square foot. Number of seeds will be based on Table 3 in NRCS Standard 327 "Conservation Cover". Contractor's proposed seed mix shall be submitted to the Engineer for approval at least 2 weeks before seed is applied.

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

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

(5) Seeding may be applied directly using a no-till native seed drill or prepare a firm seedbed for all other planting methods, as follows:

(a) If the land was in soybeans, no additional tillage is required. If the land was in corn or other vegetation, till all areas to be seeded by disking or other approved method; thoroughly loosen and pulverize the soil to a depth of three (3) inches. This may require multiple passes of the disk or other approved equipment.

(b) If the land is currently pasture with a smooth surface, the preparation shall include mowing and vegetation taller than 12 inches and applying a burn down herbicide, such as Glyphosate, at the labeled rates to the emergent growth two to four (4) weeks after mowing. If the pasture has a rough surface that would impact seeding, the area shall be disked thoroughly and cultipacked. A burn down herbicide, such as Glyphosate, shall be applied to emergent growth. Seeding

shall not occur until after the existing vegetation has died, usually about one (1) week.

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

(6) No lime or fertilizer will be applied.

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

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

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

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

(11) No mulch will be applied.

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

(13) Payment will constitute full compensation for Bid Item Buffer Seeding.

* * * END OF DOCUMENT IA-6 * * *

CONSTRUCTION SPECIFICATION
IA-8. MOBILIZATION AND DEMOBILIZATION

1. SCOPE

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

The work shall not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract.

Mobilization will not be considered as work in fulfilling the contract requirement for commencement of work.

2. EQUIPMENT AND MATERIALS

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

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

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

3. PAYMENT

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

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

4. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Mobilization/Demobilization

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

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

(3) Item includes installing construction site access as detailed on the plans, and applying for a field entrance permit from the County Engineer.

(4) Any fence removed for access and/or to provide work area that is designated on the plans to be replaced shall be replaced with same or like materials as approved by the Engineer.

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

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

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

(8) Payment will constitute full compensation for Bid Item Mobilization/Demobilization and related Subsidiary Item, Pollution Control.

B. Subsidiary Item, Pollution Control

(1). See description in IA-5 Pollution Control, Section 7.

* * * END OF DOCUMENT IA-8 * * *

CONSTRUCTION SPECIFICATION
IA-9. DRAINAGE TILE INVESTIGATION AND REMOVAL

1. SCOPE

The work will consist of the investigation, location, and removal of drainage tile near the proposed dike, in tile daylight ditch locations, and where otherwise directed.

2. INVESTIGATION AND LOCATION

An inspection trench at least 30 inches wide shall be dug at the location shown on the drawings or as directed by the Engineer. The trench shall be at least 6 feet deep measured from the original ground line. The Engineer shall examine the trench and excavated material to locate tile lines. Backfilling shall not be started without approval of the Engineer. After inspection all trenches shall be backfilled.

3. TILE REMOVAL

On new facilities all tile lines located within the area bounded by the investigation trench shall be removed and disposed of. Drainage tiles found upgrade from the structure shall be rerouted as shown in the plans or as directed by the Engineer. An alternative to removing the tile is to grout the entire length of tile with concrete or Portland Cement Grout.

4. MEASUREMENT AND PAYMENT

For items of work for 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.

5. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Drainage Tile Investigation and Removal

(1) This item shall consist of excavation necessary to locate and remove field tile under and near the Dike foot print.

(2) Item shall include excavation necessary to locate field tile as indicated on the plan by bold arrows.

(3) The tile information shown on the Drawings is all that is currently known about the approximate tile locations and sizes.

(4) The extent of removal or abandonment shall be as shown on the drawings or as directed by the Engineer.

(5) Payment will constitute full compensation for this Bid Item and related Subsidiary Items; Removal of Water and Backfill of Required Excavations.

* * * END OF DOCUMENT IA-9 * * *

CONSTRUCTION SPECIFICATION
IA-11. REMOVAL OF WATER

1. SCOPE

The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the 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 the temporary works have served their purposes and before the Contractor leaves the site, they shall be removed.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Subsidiary Item, Removal of Water

(1) This item shall consist of diverting surface water and dewatering the site as needed for construction.

(2)No separate payment will be made for Removal of Water. Compensation for this item will be included in the payment for Core Trench, Channel, and Stilling Basin; Structure Excavation; Drainage Tile Investigation and Removal; Earthfill, Dike Pool; Drainfill; Water Control Structure; HDPE Pipe, CPDT Pipe; RCP; Steel Sheet Pile; Corrugated Metal Pipe Tile Outlets; Topsoil Stripping; Riprap; and Grout.

* * * END OF DOCUMENT IA-11 * * *

CONSTRUCTION SPECIFICATION
IA-13. SHEET PILING

1. SCOPE

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

2. MATERIALS

Sheet piling shall conform to the requirements of ASTM A328, A572 or A690. The sheet piling provided shall meet the required cross-section, section modulus, thickness and steel grade shown on the drawings.

3. DRIVING SHEET PILE

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

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

4. CUTTING OFF PILES

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

5. DEFECTIVE PILING

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

6. MEASUREMENT AND PAYMENT

The area of sheet pile walls, acceptably placed, will be computed to the nearest square foot within the neat lines shown on the drawings. Payment will be made at the contract unit price for each type, kind and weight of piling. Such payment will constitute full payment for all labor, materials, equipment, and all other items necessary and incidental to the completion of work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Steel Sheet Pile

(1) This item shall consist of furnishing and installing the steel sheet piling and appurtenances as shown on the drawings. This item shall include all equipment and labor to install the sheet piling, including field cutting the sheet piling to the neat line shown on the drawings.

(2) The sheet piling shall be installed starting from the center of the weir section and progressing away from centerline.

(3) The sheet piling material shall meet or exceed the requirements shown on the plans.

(4) Payment will constitute full compensation for this bid item and for related subsidiary items: C-Channel, Structure Excavation, Backfill of Structure Excavation and Removal of Water.

* * * END OF DOCUMENT IA-13 * * *

CONSTRUCTION SPECIFICATION
IA-21. EXCAVATION

1. SCOPE

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

2. USE OF EXCAVATED MATERIALS

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

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 Engineer. The waste material shall be smoothed and sloped to provide drainage.

4. STRUCTURE AND TRENCH EXCAVATION

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

5. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fills, additional materials shall be obtained from the designated borrow areas as shown on the drawing or as approved by the Engineer and the landowner.

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

6. OVER-EXCAVATION

Excavation beyond the specified lines and grades shall be corrected by filing 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. MEASUREMENT AND PAYMENT

For items of work for which cubic yard prices are established in the contract, the volume of excavation will be computed to the nearest cubic yard by computer modeling or by end area.

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 Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Excavation (Core Trench, Channel, Stilling Basin)

Core Trench Excavation Includes:

(1) This item shall consist of excavating the core trench to the neat lines shown on the drawings. Clean clay material should be kept separate for backfill of the trench. Other materials are to be mixed with borrow for construction of dike.

(2) Additional backfill shall be obtained from designated borrow areas.

(3) Backfill to be compacted in full compliance with Section 6 Compaction of Specification IA-23 and for Method 2 described therein or as otherwise specified on the plans or in IA-23.

(4) Payment will constitute full compensation for this Bid Item and related subsidiary items; Site Preparation, Removal of Water, and Backfill of Required Excavations.

Channel Excavation Includes:

(1) This item shall consist of the excavation for the Stilling Basins, Tile Daylights, Tile Daylight Pools, Tile Daylight Plunge Pools and the Water Control Structure Inlet Grading.

(2) The excavated material for the Tile Daylights shall be used for dike fill and construction of the shaped spoil piles located as directed on the sides of the channels. Excess material shall be placed in the outer slope of the dikes in areas or in the excess excavation disposal area where the leveled material will be confined to the easement.

(3) Payment will constitute full compensation for this bid item and related subsidiary items; Site Preparation and Removal of Water

Stilling Basin Excavation Includes:

(1) This item shall consist of the excavation for the stilling basin, outlet channel and removal of the sheet pile installation berm.

(2) The excavated material for the stilling basin and outlet channel shall be placed in the waste/stockpile area designated in the plans or as directed by the Engineer.

(3) Payment will constitute full compensation for this Bid Item and related subsidiary items; Site Preparation and Removal of Water.

B. Subsidiary Item, Structure Excavation

(1) This item shall consist of the excavation necessary to install the Steel Sheet Pile (includes sheet pile installation berm); Water Control Structure; HDPE Pipe, CPDT Pipe; RCP; Steel Sheet Pile; Corrugated Metal Pipe Tile Outlets; Riprap and Grout, and Trench Drains.

(2) No separate payment will be made for Structure Excavation. Compensation for this item will be included in payment for; Steel Sheet Pile (includes sheet pile installation berm); Water Control Structure; HDPE Pipe, CPDT Pipe; RCP; Steel Sheet Pile; Corrugated Metal Pipe Tile Outlets; Riprap and Grout, and Trench Drains.

C. Subsidiary Item, Borrow Excavation

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

(2) Borrow from any other area will not be allowed. No borrow is to be taken from the wetland pool other than in designated borrow areas.

(3) The topsoil from the borrow area shall be removed to a minimum depth of 9" and stockpiled. When the borrow operations have been completed the topsoil shall be uniformly spread over the entire borrow area, and scarified after the placement of topsoil.

(4) No separate payment will be made for borrow excavation. Compensation for this item will be included in the payment for Earthfill.

* * * END OF DOCUMENT IA-21 * * *

CONSTRUCTION SPECIFICATION
IA-23. EARTHFILL

1. SCOPE

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

2. MATERIALS

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

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials. Foundation surfaces shall be scarified to a minimum depth of 6 inches.

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

4. PLACEMENT

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

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

The materials used throughout the earth fill shall be essentially uniform. Selective placement shall be as shown on the drawings or approved by the Engineer.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a depth of not less than 2 inches before the next layer is placed.

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

5. CONTROL OF MOISTURE CONTENT

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

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

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

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

Plan notes and section 8 hereof may specify a range of required moisture content which will require lab testing. Contractor is responsible to secure, schedule and compensate the soil testing lab and to make all reports available to Engineer.

6. COMPACTION

Earthfill shall be compacted by one of the following methods as specified on the plans. If no method is specified, compaction will be Method 1.

Method 1 — Earthfill shall be placed so that the wheels or tracks of the loaded, rubber tired, hauling equipment traveling in a direction parallel to the centerline of fill pass over the entire surface of the layer being placed.

Method 2 — Two (2) complete passes of tamping-type roller will be made over each layer. The roller shall be capable of exerting a minimum of one hundred (100) pounds per square inch.

Method 3 — Minimum density shall be 90% of the maximum density as determined by ASTM D 698. Contractor is responsible to secure, schedule and compensate a soil testing lab and to make all reports available to Engineer. Proctor sampling shall be coordinated with Engineer and results shall be provided for Engineer's review prior to the placement of any controlled density fill.

The maximum thickness of a lift of fill before compaction shall be 8 inches, unless otherwise indicated on the drawings.

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

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

Plan notes and section 8 hereof may modify the compaction requirement provisions of this section 6.

7. MEASUREMENT AND PAYMENT

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

- Where such overexcavation 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.

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 Section 8 of this specification.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Earthfill Dike

(1) This item shall consist of the earthfill necessary to construct the wetland dike including backfill of the stripping excavation performed under the wetland dike and inlet dike footprints and placement of the sheet pile installation berm.

(2) The earthfill material shall be from the designated borrow area, unless other excavated materials or borrow areas are approved by the Engineer.

(3) Compaction shall be by Method 2.

(4) Earthfill material to be free of sod, roots, frozen soils, stones larger than 6" and other objectionable materials.

(5) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation, Removal of Water, and Borrow Excavation

B. Bid Item, Earthfill, Surface Water Diversion Berm

(1) This item shall consist of the earthfill necessary to grade and fill the surface water diversion berm as shown on the plan sheets and backfill of the stripping excavation performed prior to placement of the fill.

(2) The earthfill material shall be from the designated borrow area, unless other materials or borrow areas approved by the Engineer

(3) Earthfill material to be free of sod, roots, frozen soils, stones larger than 6", and other objectionable materials.

(4) Compaction shall be by Method 2.

(5) The fill shall be graded to maintain drainage.

(6) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation, Removal of Water and Borrow Excavation.

C. Bid Item, Earthfill, Pool

(1) This item shall consist of the earthfill necessary to grade and fill pool as shown on the drawings and backfill of the stripping excavation performed prior to placement of the pool fill.

(2) The earthfill material shall be from the designated borrow areas, unless other excavate materials or borrow areas are approved by the Engineer.

(3) Earthfill material to be free of sod, roots, frozen soils, and other objectionable materials.

(4) The Pool earthfill shall be placed in shallow lifts (max. 12"). No specific compaction is necessary, however contractor is expected to pass equipment over all areas of each lift to consolidate fill layer so as to avoid excessive settlement.

(5) The fill shall be graded to maintain drainage and scarified after topsoil is placed.

(6) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation, Removal of Water and Borrow Excavation.

C. Subsidiary Item, Sheet Piling Installation Berm

(1) This item shall consist of fill placed downstream of the sheet pile structure.

(2) Compaction of Sheet Piling Installation Berm shall be by Method 2.

(3) No separate payment will be made for Sheet Piling Installation Berm. Compensation for this item will be included in payment for Earthfill Dike.

D. Subsidiary Item, Backfill of Required Excavation

(1) This item shall consist of backfilling the areas excavated to install the Water Control Structure, pipes, sheet pile and other structures.

(2) Compaction adjacent to the water control structure and the pipes shall be as indicated above in Section 6. All other compaction shall be Method 1 or equivalent.

(3) No separate payment will be made for Backfill of Required Excavations. Compensation for this item will be included in payment for CPDT and HDPE pipe; Water Control Structure; Inlet Structure; CMP Tile Outlets, Steel Sheet Pile and Drainage Tile Investigation and Removal.

* * * END OF DOCUMENT IA-23 * * *

CONSTRUCTION SPECIFICATION
IA-24. DRAINFILL

1. SCOPE

The work shall consist of furnishing and placing drainfill required in the construction of structure drainage systems.

2. MATERIALS

Drainfill shall be sand, gravel, or crushed stone. It shall be composed of clean, hard, durable mineral particles free form organic matter, clay balls, soft particles, or other substances that would interfere with their free-draining properties. Aggregates of crushed limestone may be used only for coarse drainfill but shall be thoroughly washed and screened so that not more than 3 percent by weight is finer than a No. 4 sieve.

Coarse drainfill shall be graded as follows:

US. Sieve Designation	Percent Passing Sieve
1 1/2	100
3/4	75-100
1/2	25-80
3/8	20-60
No. 4	0-10
No. 8	0-5
No. 100	0-3

Fine drainfill shall be graded as follows:

US. Sieve Designation	Percent Passing Sieve
3/8	100
No. 4	95-100
No. 8	75-95
No. 16	50-70
No. 30	25-50
No. 50	10-20
No. 100	0-6

3. BASE PREPARTION

Foundation surfaces and trenches shall be free of organic matter, loose soil, foreign substances, and standing water when the drainfill is placed.

4. PLACEMENT

Drainfill shall not be placed until the trench excavation has been inspected and approved by Engineer. Installation of the drainage conduit shall be inspected and approved by Engineer before covering it with drainfill. No foreign materials

shall be allowed to become intermixed with or otherwise contaminate the drainfill. Drainfill material shall be placed in a manner to avoid segregation of particles by size.

5. COMPACTION

A. Foundation Trench Drain

(1) No compaction of pipe envelope will be required beyond that resulting from the placing and spreading operations.

6. MEASUREMENT AND PAYMENT

(1) For items of work for which specific unit prices are established in the contract, the volume of drainfill within the neat lines shown on the drawings will be measured and computed to the nearest cubic yard. Where the Engineer directs placement of the drainfill outside the neat lines to replace unsuitable foundation material, the volume included. The volume included will only be to the extent that the unsuitable condition is not a result of the Contractor's improper construction operation in the determination of the Engineer.

(2) Payment for drainfill will be made at the contract unit price for each type of drainfill, complete in place. Except as otherwise specified in Section 7 of this specification.

(3) Compensation for any item of work described in the contract but not included in the bid schedule will be included in the payment for the item of work that to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Drainfill, Fine

(1) This item shall consist of the work necessary to furnish and place the fine type drainfill for the foundation trench drain under the front slope of the dike as shown in the plans.

(2) Trench above drainfill shall be backfilled with earthfill in shallow 6" maximum lifts and compacted by three (3) passes of rubber tired loader or similar traveling parallel to the centerline of trench drain or otherwise approved by Engineer.

(3) Subsidiary to this item shall be all trench excavation and backfill of trench for the installation of the trench drain. Installation of the drain tile will be paid for with Bid Items, Corrugated Perforated Drain Tile, 5" Diameter and Corrugated Perforated Drain Tile, 8" Diameter.

(4) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation, and Removal of Water.

* * * END OF DOCUMENT IA-24 * * *

CONSTRUCTION SPECIFICATION
IA-26. TOPSOILING

1. SCOPE

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

2. QUALITY OF TOPSOIL

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

3. EXCAVATION

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

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 scarify 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. MEASUREMENT AND PAYMENT

For items of work for which cubic yard prices are established in the contract, the volume of excavation will be computed to the nearest cubic yard by computer modeling or by end area

For items of work for which cubic yard prices are established in the contract, the volume of stripping and topsoiling will be measured in cubic yards as computed by multiplying the surface area to be stripped by a depth of 6 inches. Payment for the item will be made at the contract cubic yard price and will constitute full compensation for completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the bid items to which they are made subsidiary are identified in Section 6 of this specification.

6. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Subsidiary Item, Topsoiling

(1) This item will consist of spreading suitable salvaged stripping materials as the surface layer of all excavations and earthfills that will be seeded.

(2) Areas to receive a minimum four (4) inch layer of topsoil include: the upstream surface of the structure above normal pool, the downstream surface of the structure, borrow area outside of normal pool, the tops and backslopes of designated spoil piles placed adjacent to excavated channels and as also directed on the plans

(3) Areas to receive a minimum six (6) inch layer of topsoil include: the upstream surface of the structure below normal pool, and any grading or borrow areas inside of normal pool.

(4) No separate payment will be made for Topsoiling. Compensation for this item will be included in the payment for Stripping.

* * * END OF DOCUMENT IA-26 * * *

CONSTRUCTION SPECIFICATION
IA – 31 CONCRETE

1. SCOPE

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

2. MATERIALS

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

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

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

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

Air entraining agent shall conform to ASTM C 260.

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

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

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

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

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

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

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

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

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

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

3. CONCRETE DESIGN MIX

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

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

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

4. MIXTURES AND MIXING

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

5. BATCH TICKET

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

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

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

6. REINFORCING STEEL

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

Reinforcing bars shall be cut and bent according to ACI Standard 315.
Tack welding of bars shall not be permitted. Reinforcement shall be accurately placed as shown on the drawings and secured in position in a manner that will prevent its displacement during placement of concrete. Metal chairs, metal hangers, metal spacers or concrete chairs shall be used to support reinforcement. Precast concrete chairs shall be manufactured from concrete equal in quality to the concrete being placed. Precast concrete chairs shall be moist at the time concrete is placed

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

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

7. PREPARATION OF FORMS AND SUBGRADE

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

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

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

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

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

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

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

8. PLACING CONCRETE

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

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

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

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

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

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

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

Concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used

to prevent segregation. Concrete containing superplasticizer shall not be dropped more than 12 feet vertically.

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

9. FORM REMOVAL AND FINISHING

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

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

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

10. CURING

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

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

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

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

11. BACKFILLING

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

12. HOT AND COLD WEATHER CONCRETING

When the atmospheric temperature may be expected to drop below 40F. at the time concrete is delivered to the work site , during placement, or at any time during curing period, concrete shall be mixed, placed and protected in accordance with ACI Standard306, "Recommended Practice for Cold Weather Concreting."

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

13. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Subsidiary Item. Concrete

1) This item will consist of all necessary concrete, reinforcing steel, formwork, materials and labor needed for supplying and constructing the Water Control Structure as shown on the plans.

2) No separate payment will be made for this item payment is included in bid item Water Control Structure.

END OF DOCUMENT IA-31

IA-32 CONCRETE FOR NONSTRUCTURAL SLABS

1. SCOPE

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

2. MATERIALS

Portland Cement shall be Type I or Type II Portland cement.

Air entraining agents shall conform to ASTM C 260.

Fly ash may be used as a partial substitution for Portland cement and shall 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).

Water-reducing admixtures shall conform to ASTM C 494 and may be of Type A, D, F or G. Type D or G admixtures may be used when the air temperature is over 80 degrees F. at the time of mixing and/or placement.

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

Coarse and Fine Aggregate shall conform to ASTM C 33 and shall be clean, hard, durable and free from clay or coating of any character. The maximum size of coarse aggregate shall be 1 ½ inches or as shown on the drawings.

Reinforcing steel shall be deformed billet-steel bars, Grade 40 or 60. Welded wire fabric shall conform to the requirements of ASTM A 185.

Water shall be clean and free of harmful chemicals.

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

3. CONCRETE MIX

The concrete mix shall provide a minimum strength of 3500 psi at 28 days. The mix shall contain not less than 6 sacks of cement per cubic yard and not more than 5.6 gallons of water per sack of cement. The water/cement ratio shall not exceed 0.50 including free water in the aggregates. Air entrainment shall range from 4% to 8%. The slump shall be 2 to 5 inches except when superplasticizer is used. The slump shall be 3 inches or less prior to the addition of superplasticizer admixture and shall not exceed 7 1/2 inches following addition and mixing.

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

4. REINFORCING STEEL

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

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

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

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

5. SUBGRADE

The subgrade shall be excavated or filled with suitable material to produce the required subgrade elevation(s). Subgrade materials shall be blended or unsuitable materials removed and replaced as required to obtain uniform materials, moisture and compaction. Fill sections shall be thoroughly compacted in layers to the specified density and shall extend a minimum of 1 foot beyond the form lines. The subgrade shall be uniformly smooth, moist, dense, and free of ruts, frost, mud and standing water prior to placement of concrete.

If the above requirements for subgrade cannot be achieved using in-place materials, a granular base shall be provided, as specified or shown on the drawings. Granular base shall be well compacted, meeting all requirements for subgrade listed in the preceding paragraph.

Grading tolerances for the finished subgrade (or granular base, if used) shall be a maximum of ¼ inch above grade to ½ inch below grade. If granular base is provided between the subgrade and the concrete, grading tolerances for the subgrade shall be plus or minus 0.1 foot.

6. FORMS FOR CONCRETE

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

7. PLACING CONCRETE

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

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

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

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

8. JOINTS

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

Control joints are required every 12.5 to 15 ft. in both directions, unless otherwise shown on the drawings. They shall be tooled or sawed to a depth of 1/4 of the slab thickness.

9. CURING CONCRETE

Concrete shall be cured for 7 days by either:

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

10. ITEMS OF WORK AND CONSTRUCITON DETAILS

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

A. Subsidiary Item, Concrete

1) This item will consist of all necessary concrete, reinforcing steel, formwork, materials and labor needed for supplying and constructing the Tile Observation Riser and Stop Log Storage as shown on the plans.
2) No separate payment will be made for this item payment is included in bid item 8" Dual Wall HDPE and bid item water control structure.

END OF DOCUMENT IA-31

CONSTRUCTION SPECIFICATION
IA-45 PLASTIC (PVC, PE) PIPE

1. SCOPE

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

2. MATERIALS

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

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

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

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

3. FITTINGS AND JOINTS

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

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

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

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

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

4. HANDLING AND STORAGE

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

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

5. LAYING AND BEDDING THE PIPE

Plastic pipe conduits and fittings shall be installed in accordance with ASTM D2321 and as shown on the drawings and specified herein. The pipe shall be laid so that there is no reversal of grade between joints, unless otherwise shown on the drawings. The pipe shall be placed with the bell end upstream, unless otherwise specified. The pipe shall be carefully placed on the bedding or into the pipe trench.

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

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

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

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

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

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

6. BACKFILL

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

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

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

7. CONNECTIONS

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

Existing tile lines not shown on the drawings but encountered during insulation shall be removed in accordance with Construction Specification IA-46 Tile Drains for Land Drainage or as otherwise directed by Engineer.

8. BLINDING

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

9. BACKFILLING

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

10. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of each kind and size of tile or tubing is determined to the nearest foot of length measured along the centerline of the installed tile or tubing. Payment for each kind and size of tile or tubing will be made at the contract unit price for that kind or size of tile or tubing. Such payment constitutes full compensation for furnishing, transporting and installing the tubing or tile including excavation, shoring, geotextile or granular fill (when specified), backfill and all fittings, appurtenances and other items required to the complete the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract lump sum price for the size and type of appurtenance listed.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the bid items to which they are made subsidiary are identified in Section 11 of the specification.

11. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Corrugated Perforated Drain Tile, 5" Diameter
B. Bid Item, Corrugated Perforated Drain Tile, 6" Diameter
C. Bid Item, Corrugated Perforated Drain Tile, 8" Diameter

(1) This item will consist of furnishing and installing the Trench Drain as shown on the plans.

(2) Item will include installing Collector Line to outlet into the Tile Daylights.

(3) This item will consist of furnishing and installing the Trench Drain as shown on the plans.

(4) Work includes compliance with plan notes regarding placement and compaction of satisfactory backfill around the pipe.

(5) All excavation and backfill will be subsidiary to the installation of the tile. Granular material used as an envelope in the installation of the trench drain tiles will be paid for with Bid Item, Drainfill.

(6) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation and Removal of Water, tile observation riser.

D. Bid Item, Dual Wall HDPE, 8" Diameter
E. Bid Item, Dual Wall HDPE, 10" Diameter
F. Bid Item, Dual Wall HDPE, 18" Diameter

(1) This item will consist of furnishing and installing the Dual Wall HDPE tiles as shown on the plans. This pipe is for extension of tile to Tile Daylights, and to the Trench Drain.

(2) Work includes compliance with plan notes regarding placement and compaction of satisfactory backfill around the pipe.

(3) All excavation and backfill will be subsidiary to the installation of the tile.

(4) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation and Removal of Water and the tile observation riser.

G. Subsidiary Item, Tile Observation Riser

(1) This item will consist of furnishing and installing the Tile Observation Riser.

(2) Item includes the 8" Dual Wall HDPE riser, the 8" steel grate and collar, the concrete slab and the necessary fitting and appurtenances to complete installation.

(3) No separate payment will be made for Tile Observation Riser. Compensation for this item will be included in the payment for Dual Wall HDPE, 8" Diameter

* * * END OF DOCUMENT IA-45 * * *

CONSTRUCTION SPECIFICATION
IA-46. TILE DRAINS FOR LAND DRAINAGE

1. SCOPE

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

2. MATERIALS

Reinforced concrete pipe shall conform to the requirements of ASTM C361 or C76.

Concrete drain tile shall conform to the requirements of ASTM C412, and clay drain tile shall conform to the requirements of ASTM C4.

Corrugated polyethylene tubing shall conform to ASTM F405 or F667, as appropriate. Perforated tubing shall have a water inlet area of at least 1 square inch per foot, provided by perforations spaced uniformly along the long axis of the tubing. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

PVC pipe shall conform to ASTM F 679 SDR 35 or equivalent) with T-1 minimum wall thickness; minimum pipe stiffness, 46 psi as per ASTM D 2412. Pipe shall be PVC plastic meeting ASTM D 1784, Cell Classification 12454. Do not exceed 10 parts by weight per 100 of PVC resin in the compound for additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc. Fittings shall be integral Integral bell and spigot type rubber gasket joint conforming to ASTM D 3212 and ASTM F 477

3. EXCAVATION

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

The trench or excavation for the tile shall be constructed to the line, depths, cross sections, and grade shown on the drawings or as directed by Engineer.

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

4. PREPARING THE BEDDING

Unless otherwise specified, no filter or envelope is required. In stable soils the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90 degree "V" groove in its center. The groove shall be shaped to fit the size of tile.

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

5. FILTER OR ENVELOPE MATERIAL

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

6. PLACEMENT AND JOINT CONNECTIONS

All drains shall be laid to grade.

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

a. Peat and muck – ¼ inch preferred, 3/8 maximum.
b. Clay – 1/8 inch preferred, ¼ inch maximum.
c. Silt and loam – 1/16 inch preferred, 1/8 inch maximum
d. Sand – tightest possible fit

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

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

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

7. CONNECTIONS

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

Existing tile lines not shown on the drawings but encountered during insulation shall be removed in accordance with Construction Specification IA-46 Tile Drains for Land Drainage or as otherwise directed by Engineer.

8. BLINDING

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

9. BACKFILLING

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

10. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of each kind and size of tile or tubing is determined to the nearest foot of length measured along the centerline of the installed tile or tubing. Payment for each kind and size of tile or tubing will be made at the contract unit price for that kind or size of tile or tubing. Such payment constitutes full compensation for furnishing, transporting and installing the tubing or tile including excavation, shoring, geotextile or granular fill (when specified), backfill and all fittings, appurtenances and other items required to the complete the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract lump sum price for the size and type of appurtenance listed.

The water control structure will be measured and paid for as a lump sum item. Such payment constitutes full compensation for furnishing, transporting and installing the control structure including excavation, shoring, geotextile or granular fill (when specified), backfill and all fittings, appurtenances, and other items required to the complete the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the bid items to which they are made subsidiary are identified in Section 11 of the specification.

11. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Tongue & Groove Gasketed Wall B or C RCP Pipe, 18" Dia.

(1) This item will consist of furnishing and installing the Tongue & Groove Wall B or C RCP Pipe and fittings as shown on the plans.

(2) Work includes compliance with plan notes regarding placement of satisfactory backfill around the pipe.

(3) All excavation and backfill will be subsidiary to the installation of the tile.

(4) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation and Removal of Water.

B. Bid Item, Water Control Structure, 18" Dia.

(1) This item will consist of furnishing and installing the water control structure as shown on the plans. The structure shall be a precast concrete box and top with a fabricated stop log channel with an aluminum access door.

(2) Top stop log elevation and structure height shall be as specified on the plans.

(3) This item includes aluminum stop logs and lifting handles which shall be provided to open and close the valve, and remove the stop logs, as shown on the plans.

(1) The structure top shall be precast concrete with the access lid integrally cast. A Halliday Products S1R3648 (or approved equal) 36" x 48" Aluminum Access Door shall be cast into the top. The access door shall include a locking mechanism and lifting handle. See the plans for details.

(2) Payment will constitute full compensation for this bid item and the following related subsidiary items: Removal of Water, Required Excavation, and Backfill of Required Excavation.

C. Subsidiary Item, Apron Section and Apron Guard

(1) This item will consist of furnishing and installing the Apron Section and Apron guard on the inlet end of the water control structure pipe. The Apron Section and Apron Guard shall be compatible with the supplied pipe.

(2) This item will be subsidiary to the furnishing and installing of the Tongue & Groove Gasketed Wall B or C RCP Pipe.

(3) Payment will constitute full compensation for this bid item and the following related subsidiary items: Removal of Water, Required Excavation, and Backfill of Required Excavation.

D. Subsidiary Item, Stop Log Storage

(1) This item will consist of furnishing and installing the stop log storage as detailed on the plans.

(2) This item will be subsidiary to the furnishing and installing of the Water Control Structure.

(3) Payment will constitute full compensation for this bid item and the following related subsidiary items: Removal of Water, Required Excavation, Concrete, and Backfill of Required Excavation.

E. Subsidiary Item, Anti-Seep Collar

(1) This item will consist of furnishing and installing the eight (8) foot by eight (8) foot anti-seep collars shown on the draw down structure. The anti-seep collar shall be a corrugated steel diaphragm as specified, or approved equal.

(2) This item will be subsidiary to the furnishing and installing of the Tongue & Groove Gasketed Wall B or C RCP Pipe.

(3) Payment will constitute full compensation for this bid item and the following related subsidiary items: Removal of Water, Required Excavation, Concrete, and Backfill of Required Excavation.

* * * END OF DOCUMENT IA-46 * * *

CONSTRUCTION SPECIFICATION
IA-51. CORRUGATED METAL PIPE CONDUITS

1. SCOPE

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

2. MATERIALS

Conduits shall be corrugated iron or steel. Minimum thickness is 16 gauge. Must meet requirements of AASHTO M36 for riveted, resistance spot welded, lock or welded seams.

Coupling bands shall be of the same material as the pipe, be fully compatible with the pipe, and comply with AASHTO M36. Pipes of twenty (20) feet of less are to be fabricated and furnished in one continuous piece without coupling bands.

3. 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 painting two coats of one of the following paints:

   (1) Zinc Dust – Zinc Oxide Primer conforming to ASTM D79 and D520
   (2) Singles package, moisture cured urethane prime in silver metallic color.
   (3) Zinc-rich cold galvanized compound, brush, or aerosol applications.

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

4. 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.

5. 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 and shall extend a minimum of 2 feet over the pipe before earth embankment with earth moving equipment over the pipe is started.

6. MEASUREMENT AND PAYMENT

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

For items of work for which lump sum prices are established in the contract, payment for corrugated metal pipe structures is made at the contract lump sum price. Such payment constitutes full compensation for transporting and installing the pipe structure complete with metal pipe, fittings and appurtenances, and all other items necessary and incidental to the completion of the work, which includes required excavation, dewatering and earth backfill.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the bid items to which they are made subsidiary are identified in Section 7 of this specification.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Corrugated Metal Tile Outlet Pipe, 6" Diameter.
B. Bid Item, Corrugated Metal Tile Outlet Pipe, 8" Diameter.
C. Bid Item, Corrugated Metal Tile Outlet Pipe, 10" Diameter.
D. Bid Item, Corrugated Metal Tile Outlet Pipe, 12" Diameter.
E. Bid Item, Corrugated metal Tile Outlet Pipe, 24" Diameter.

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

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

(3) The connection with the drain tile shall be encased in a minimum 12-inch long by 6-inch thick Portland Cement Concrete Collar.

(4) Payment will constitute full compensation for this bid item and the following related subsidiary items: Removal of Water, Structure Excavation, and Backfill of Structure Excavation.

* * * END OF DOCUMENT IA-51 * * *

CONSTRUCTION SPECIFICATION
IA-61. LOOSE ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of loose rock riprap revetments 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 the Engineer. The rock shall be excavated, selected and handled as necessary to meet the quality and grading requirements of this specification and the construction drawings.

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

3. SUBGRADE PREPARATION

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

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

4. EQUIPMENT-PLACED ROCK RIPRAP

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

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

5. HAND-PLACED RIPRAP

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

6. FILTER LAYERS OR BEDDING

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

7. MEASUREMENT AND PAYMENT

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

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8.

8. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Riprap, IDOT Class E

(1) This item shall consist of furnishing and placing the rock riprap in the stilling basin downstream of the steel sheet pile structure, the rock check dams and other areas as shown on the drawings.

(2) Rock shall be Class E Revetment Stone as defined by Section 4130 of the IDOT Standard Specifications for Highway and Bridge Construction. (Maximum stone weight = 250 lbs.)

(3) All riprap shall be screened by running the stone over a grizzly or plate screen with a minimum opening of 8 inches. This operation shall be done at the quarry. The portion of the stone that is removed by the screening operation will not be acceptable for use as riprap.

(4) Measurement shall not include riprap rejected by engineer as not in compliance with specifications. The Engineer will estimate the volume of rejected rock for adjustment of quantity.

(5) Payment will constitute full compensation for this bid item and the following related subsidiary items: Site Preparation and Removal of Water.

* * * END OF DOCUMENT IA-61 * * *

CONSTRUCTION SPECIFICATION
IA-62. CONCRETE GROUT FOR RIPRAP

1. SCOPE

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

2. MATERIALS

Cement shall be Type I or Type II Portland cement (ASTM C 150). Fly ash conforming to Section 4108 of the IDOT Standard Specifications for Highway and Bridge Construction may be substituted for equivalent amount of Portland cement for amounts not to exceed 20 percent of the total amount of cementitious material in the grout. Aggregate shall meet Iowa Department of Transportation requirements for Fine Aggregate for Concrete, Section 4110 of IDOT Standard Specifications for Highway and Bridge Construction. Water shall be clean and free of harmful chemicals. Air entraining admixtures shall conform with ASTM C 260.

3. GROUT MIX

The grout mix shall be as follows:

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

When ready-mixed grout is furnished, the contractor shall furnish to Engineer 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 1½ 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 brooming, spading and mechanical vibration. The grout shall not be forced to flow laterally to its final location. Excess grout shall be broomed off the exposed surfaces of the riprap.

The average rate of grout application shall be 5.4 cubic feet per square yard of riprap (1.0 cubic yard per 45 square feet).

8. CURING GROUT

Grout shall be cured for 7 days by either:

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

Grout mix shall not be placed when daily minimum temperatures are expected to be lower than 40°F unless facilities are provided to maintain the temperature of the materials at 50° F to 90° F for at least 24 hours prior to placing grout.

9. MEASUREMENT AND PAYMENT

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

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Concrete Grout

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

(2) The grout shall be consolidated into the voids with the use of a concrete vibrator. Broom excess from surfaces of exposed riprap. A smooth surface is NOT to be created by the grouting operation.

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

(4) Payment will constitute full compensation for this bid item, and the following related subsidiary items: Site Preparation and Removal of Water.

* * * END OF DOCUMENT IA-62 * * *

CONSTRUCTION SPECIFICATION
IA-81. METAL FABRICATION AND INSTALLATION

1. SCOPE

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

2. MATERIALS

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

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

3. PROTECTIVE COATINGS

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

Galvanizing shall consist of a zinc coating by the hot dip process, except that bolts, nuts, and washers may have 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 thickness of 8.0 mills.

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. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Subsidiary Item, C-Channel

(1) This item will consist of furnishing and installing the C-Channel walers on the sheet pile weir structures as shown in the drawings.

(2) All steel shall meet ASTM A36 standards.

(3) No protective coatings will be required on the C-Channel

(4) This item will be subsidiary to the installation of the sheet pile weir structure.

B. Subsidiary Item, Stop Log Channel, Stop Log Storage

(1) This item will consist of furnishing and installing the Stop Log Channel for the Water Control Structure as shown in the drawings.

(2) This item will also include furnishing and installing necessary items for the stop log storage.

(3) All steel shall meet ASTM A36 standards.

(4) Galvanized protective coating will be required on the Stop Log Channel and Stop Log Storage pieces which are not supplied with a painted or powder coated finish.

(5) This item will be subsidiary to the installation of the Water Control Structure.

* * * END OF DOCUMENT IA-81 * * *

CONSTRUCTION SPECIFICATION
IA-95. GEOTEXTILE

1. SCOPE

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

2. MATERIAL QUALITY

Geotextiles shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns, having a composition of at least 95 percent, by weight, of polypropylene, polyester or polyvinylidene-chloride. The geotextile shall be formed into a stable network of filaments or yarns that retain their relative position to each other are inert to commonly encountered chemicals and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents and insects. Unless otherwise specified, the class and type of geotextile shall be 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 salvaged or otherwise finished to prevent the outer yarn from unraveling.

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

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

3. STORAGE

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

4. SURFACE PREPARATION

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

5. PLACEMENT

Prior to placement of the geotextile, the soil surface will be inspected for quality assurance of design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings and specified. The geotextile shall be unrolled along the placement area and loosely lay (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 contains "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 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.

The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height greater than 3 feet. 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.

6. MEASURE AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of geotextile placed within the specified limits will be measured to the nearest square yard as computed from the plan. Payment will be made at the contract unit price for geotextile fabric and will be considered full compensation for completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7.

7. ITEMS OF WORK AND CONSTRUCTION DETAILS

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

A. Bid Item, Geotextile Fabric

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

(2) Geotextile shall meet the requirements for a Class I woven fabric as shown in Table 1.

(3) Geotextiles shall conform to the requirements as defined by Section 4196 of the IDOT Standard Specifications for Highway and Bridge Construction.

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

(5) Payment will constitute full compensation for this bid item and for Subsidiary Items: Site Preparation and Removal of Water.

TABLE 1. REQUIREMENTS FOR WOVEN GEOTEXTILES

Property	Test Method	Class I	Class II & III	Class IV
Tensile strength (pounds) 1/	ASTM D 4632 grab test	200 minimum in any principal direction	120 minimum in any principal direction	180 minimum in any principal direction
Elongation at failure (percent) 1/	ASTM D 4632 grab test	<50	<50	< 50
Puncture (pounds) 1/	ASTM D 4833	90 minimum	60 minimum	60 minimum
Ultraviolet light (% residual tensile strength)	ASTM D 4355 150-hr exposure	70 minimum	70 minimum	70 minimum
Apparent opening size – AOS	ASTM D 4751	As specified, but no smaller than 0.212 mm (#70) 2/	As specified, but no smaller than 0.212 mm (#70) 2/	As specified, but non smaller than 0.212 mm (#70) 2/
Percent open area (percent)	CWO-02215-86	4.0 minimum	4.0 minimum	1.0 minimum
Permittivity sec^{-1}	ASTM D 4491	0.10 minimum	0.10 minimum	0.10 minimum

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

TABLE 2. REQUIREMENTS FOR NONWOVEN GEOTEXTILES

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

1/ Minimum average roll value (weakest principal direction).

2/ U.S. standard sieve size

3/ Heat-bonded or resin bonded geotextile may be used for classes III and IV. They are particularly well suited to class IV. Needle punched geotextiles are required for all other classes.

* * * END OF DOCUMENT IA-95 * * *