



**JEO CONSULTING GROUP INC**  
**JEO ARCHITECTURE INC**

**PLANS, SPECIFICATIONS  
FOR  
AG DRAIN WELL CLOSURE  
WRIGHT COUNTY, IOWA  
IOWA AGRICULTURAL MITIGATION, INC**

**Engineering**  
**Architecture**  
**Surveying**  
**Planning**  
**Funding**

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FOR  
AG DRAIN WELL CLOSURE  
WRIGHT COUNTY, IOWA  
IOWA AGRICULTURAL MITIGATION, INC

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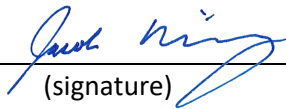
Ag Drain Well Data Sheets  
Iowa DOT Standard Road Plan DR-103 – Pipe Culvert  
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**CONSTRUCTION PLANS**

**PROJECT MANUAL  
FOR  
AG DRAIN WELL CLOSURE  
WRIGHT COUNTY, IOWA  
IOWA AGRICULTURAL MITIGATION, INC**



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.

  
(signature)

1/9/2024

(date)

Printed or typed name: Jacob T. Miriovsky, PE

License Number: 24242

My license renewal date is December 31, 2024.

Pages or sheets covered by this seal:

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**Construction Specification  
000 IA-1 Site Preparation**

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**1. SCOPE**

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

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

**2. FOUNDATION PREPARATION**

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

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

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

All soils required for select subgrade must be approved by the Engineer. The Engineer may authorize a change in select subgrade materials subject to materials available locally at time of construction.

**3. STRIPPED MATERIAL DISPOSAL**

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

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

**4. DISPOSAL OF REFUSE MATERIALS**

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

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

**5. SALVAGE**

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

## 6. SPECIFIC SITE REQUIREMENTS

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

### A. Bid Item 1: Clearing and Grubbing

#### (1) Measurement:

- a. Lump sum item; no field measurement will be made.
- b. Contractor is responsible to satisfy themselves of associated work at the time of bidding.

#### (2) Payment:

- a. Payment will be on a lump sum basis. Partial payment to be made based on agreed percentage of work completed.

#### (3) Includes:

- (1) Item consists of all work necessary to prepare the site for construction by removing and disposing of vegetation not otherwise described within the project.
- (2) Item consists of, but is not limited to, placement of backfill in area where roots have been removed, and removal and disposal of all materials.

### B. Bid Item 2: Strip, Stockpile, & Respread, Road Surfacing

#### (1) Measurement:

- a. No measurements will be made for this item. It will be based on the Plan quantity for stripping, stockpiling, and resspreading of the road surfacing in units of tons. No field measurements to be taken. Final quantity shall not exceed plan quantities.

#### (2) Payment:

- a. Payments will be based on the stripping, stockpiling, and resspreading of the road surfacing in units of tons to the nearest one (1) ton. Partial payment to be made only based on individual plan quantities.

#### (3) Inclusions:

- a. Unit price includes, but is not limited to, removal, hauling, stockpiling, and resspreading the road surfacing as a base under the Class A road topdressing.
- b. Unit price includes removal of clods, roots, stones, and other undesirable materials.

### C. Bid Item 3: Remove and Dispose Pipe Culverts

#### (1) Measurement:

- a. Measurements will be based on the removal and disposal of culverts by the linear foot.

#### (2) Payment:

- a. Payments will be based on the removal and disposal of culverts by the linear foot.

#### (3) Inclusions:

- a. Unit price includes, but is not limited to, removal and disposal of pipe culverts under in the secondary road right-of-way (ROW).

#### (4) Exclusions:

- a. Does not include subsurface drainage tile removal and disposal either in the secondary road right-of-way or in the wetland easement areas.

D. Bid Item 4: Fence Removal

(1) Measurement:

- a. Measurements will be based on the removal and disposal of fences by the linear foot.

(2) Payment:

- a. Payments will be based on the removal and disposal of fences by the linear foot.

(3) Inclusions:

- a. Includes removal and disposal of fences in the work area with three (3) or more wire strands.

(4) Exclusions:

- a. Fences with less than three (3) wire strands are considered incidental to Bid Item No. 1.



Construction Specification  
000 000 IA CS-005 Pollution Control 2011

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## 1. SCOPE

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

## 2. MATERIALS

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

## 3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

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

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

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

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

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

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

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

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

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

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

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

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

## 4. CHEMICAL POLLUTION

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

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

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

## **5. AIR POLLUTION**

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

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

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

## **6. MAINTENANCE, REMOVAL, AND RESTORATION**

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

## **7. SPECIFIC SITE REQUIREMENTS**

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

### **A. Bid Item 5: Straw Wattles, 12" Dia.**

#### **(1) Measurement:**

- a. Measurement will be in linear feet for straw wattles, 12" Dia. to the nearest one (1.) foot.

#### **(2) Payment:**

- a. Payment will be in linear feet for straw wattles, 12" Dia.

#### **(3) Include:**

- a. Unit price includes, but is not limited to, all labor, transportation and materials including anchoring stakes, socks, and staples.





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

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### 1. SCOPE

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

### 2. SEEDBED PREPARATION AND APPLICATION

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

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

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

### 3. MATERIALS

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

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

### 4. MULCH APPLICATION

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

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

### 5. SPECIFIC SITE REQUIREMENTS

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

#### A. Bid Item 6: Seeding, Buffer Mix

##### (1) Measurement:

- a. Measurement will be based on the area successfully seeded to the nearest 0.1 acres. Item consists of all work necessary to prepare the site for construction by removing and disposing of vegetation not otherwise described within the project.

##### (2) Payment:

- a. Payment will be based on the area successfully seeded to the nearest 0.1 acres. Item consists of all work necessary to prepare the site for construction by removing and disposing of vegetation not otherwise described within the project.

(3) Include:

- a. Unit price includes, but is not limited to, removal of rock and other debris from the area; repairing rills and washes; preparing the seedbed; furnishing and placing seed, including any treatment required; furnishing and placing fertilizer and mulch; and furnishing water and other care period, unless these items are bid separately.
- b. This item will consist of seeding the remainder of the project area. Treat vegetated areas within the buffer seeding areas with herbicide, with Engineer's approval, prior to final seeding.
- c. All seed must be clean and free of weeds. All seed must be yellow tagged Iowa ecotype.
- d. 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. 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 a minimum of two weeks prior to seeding.
- e. Seed may be applied directly using a no-till native seed drill or prepare a firm seedbed for all other planting methods, as follows:
  - (1) 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 inches. This may require multiple passes of the disk or other approved equipment.
- f. No lime or fertilizer is needed.
- g. No mulch will be applied, except where indicated on the plans. Mulched areas shall have an application rate of 2 tons per acre.
- h. Seeding will be completed during the following periods:
  - Spring ..... March 1 to July 1
  - Late Summer ..... Not recommended
  - Fall ..... November 15 to Freeze up
- i. If construction is completed during any other time of the year, the seeding shall be performed at the next seeding period.
- j. Sow seed with 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.
- k. 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 on quarter inch by means of hand rakes or other approved methods.
- l. 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.

(4) Excludes:

- a. Item does not include watering of seeded area during recommended seeding periods.
- b. Seeding areas located within the secondary road right-of-way (ROW).

B. Bid Item 7: Hydroseeding and Mulching, IDOT Type 3 Seed Mixture

(1) Measurement:

- c. Measurement will be based on the secondary road right-of-way (ROW) area successfully seeded to the nearest 0.1 acres. Item consists of all work necessary to prepare the site for construction by removing and disposing of vegetation not otherwise described within the project.

(2) Payment:

- a. Payment will be based on the area successfully seeded to the nearest 0.1 acres. Item consists of all work necessary to prepare the site for construction by removing and disposing of vegetation not otherwise described within the project.

(1) Include:

- a. Unit price includes, but is not limited to, removal of rock and other debris from the area; repairing rills and washes; preparing the seedbed; furnishing and placing seed, including any treatment required; furnishing and placing seed, fertilizer, and mulch; and furnishing water, tackifier, and other products necessary for hydroseed application.

- b. Seeding mixture and rates shall conform to the table below:

Common Name	Application Rate lb/acre
Big bluestem*	3 PLS
Grain rye	40
Indiangrass*	4 PLS
Little bluestem*	3 PLS
Oats	16
Sideoats grama*	5 PLS
Switchgrass*	1 PLS

- c. Application of hydraulic seeding shall include:

- (1) Add 50 pounds of Wood Cellulose Fiber complying with (a)-(d) below, as a tracer for each 500 gallons of water in hydraulic seeder tank.
- (a) Natural or cooked cellulose fiber processed from whole wood chips, or a combination of (50%-50%) cellulose fiber produced from whole wood chips and recycled fiber from sawdust, recycled paper, chipboard, or corrugated cardboard.
- (b) Contains a colloidal polysaccharide tackifier adhered to the fiber to prevent separation during shipment and avoid chemical coagglomeration during mixing.
- (c) Forms a homogeneous slurry of fibers, tackifier, and water that can be applied with standard hydraulic mulching equipment and be dyed green to facilitate visual metering during application.
- (d) Contains no growth or germination inhibiting factors, and has a minimum pH of 4.8.
- (2) Use of Bonded fiber mix and mechanically bonded fiber mix to be in conformance with Iowa DOT Specification Section 9010.
- (3) Use flood type nozzles and manufacture's recommended water volume to apply mixture.
- (4) Once seed has been added to tank mixture, a 1 hour time limit is set for spreading mixture on soil. Once 1 hour time limit has expired, discard remaining mixture.
- (5) Use hydraulic seeding equipment with a pump rated at no less than 100 gallons per minute. Inoculant, seed, and fertilizer may be applied in a single operation. The equipment must have a suitable working pressure and a nozzle adapted to the type of work. Supply tanks must have a means of agitation. Calibrate tanks and provide them with a calibration stick or other approved device to indicate the volume used or remaining in the tank.

- d. Seeding will be completed during the following periods:

Spring .....March 1 to May 15

Late Summer .....August 1 to September 15

Fall.....November 15 to Freeze up

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

## **Construction Specification 000 IA-08 Mobilization**

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### **1. SCOPE**

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

### **2. EQUIPMENT AND MATERIALS**

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

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

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

### **3. PAYMENT**

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

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

### **4. SPECIAL SPECIFICATIONS**

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

#### **A. Bid Item 8: Mobilization**

##### **(1) Measurement:**

- a. Lump sum item; no measurement will be made.

##### **(2) Payment:**

- a. Payment will be on a lump sum basis. Partial payment to be made on percent complete basis as project progresses.

(3) Include:

- a. This item shall consist of mobilizing and demobilizing personnel and equipment in preparation to perform the work within the scope of this contract.
- b. Any work that is necessary to provide access to the site including, but not limited to, grading, temporary culverts, rock installation and removal, 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.
- c. The Contractor shall exercise caution to minimize the amount of damage caused by the grading and clearing operations.
- d. Portable toilets shall be provided at the construction site and used for the sanitary facilities.
- e. Spill response kits and Petroleum-oils-lubricant (POL) area controls.

(4) Exclude:

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

B. Bid Item 9: Traffic Control

(1) Measurement:

- a. Lump sum item, no measurement will be made.

(2) Payment:

- a. Payment will be on a lump sum basis.
- b. Lump sum price includes, but is not limited to, installation, maintenance, and removal of temporary traffic control; total roadway closures with installation and removal of detour signing as shown in the contract documents; removal and reinstallation or covering of permanent traffic control devices that conflict with the temporary traffic control plan; monitoring and documenting traffic control conditions; and flaggers. When required in the contract documents, the following are also included in traffic control unless a separate bid item is provided: portable dynamic message signs, temporary barrier rail, temporary flood lighting, and pilot cars.
- c. Includes maintaining one granular access route to residences throughout the project.

(3) Excludes:

- a. Removal, salvage, and reinstallation of existing roadway signs.

C. Bid Item 35: Electrical Line Relocation

(1) Measurement:

- a. Lump sum item, no measurement will be made.

(2) Payment:

- a. Payment will be on a lump sum basis and paid out when complete.

(3) Includes:

- a. Contractor shall contact Prairie Energy Coop who will relocate the line and power poles that extend north of 190<sup>th</sup> Street and in the 190<sup>th</sup> Street ROW as shown on the plans. Contractor shall include any payment/contract arrangement with Prairie Energy Coop.

**Construction Specification  
000 IA-09 Subsurface Drain Investigation,  
Removal, and Repair**

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**1. SCOPE**

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

**2. INVESTIGATION AND LOCATION**

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

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

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

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

**3. TILE REPAIR**

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

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

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

Using selected soil free of hard clods, rocks, or frozen soil, hand tamp the backfill material around the haunch of the pipe in layers not over four inches thick to provide support. Hold the conduit in place mechanically while placing excavated material around and over the conduit to ensure proper alignment and grade is maintained. Complete the backfill operation according to Section 5.

**4. TILE REMOVAL**

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

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

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

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

## 5. BACKFILL

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

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

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

## 6. MATERIALS

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

**Table 1. Acceptable pipe for subsurface drain repair**

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

#Pipe sizes are nominal, and the ranges are inclusive

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

## 7. Specific Site Requirements

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

- A. Bid Item 10: Tile Exploration
  - (1) Measurement:
    - a. Measurement will be in hours of tile exploration to the nearest tenth (0.1) of an hour.
  - (2) Payment:
    - a. Payment will be based on hourly time. Prior approval is needed to exceed plan quantities.
  - (3) Includes:

- a. This item shall consist of all material and labor necessary to excavate and locate subsurface tile as shown on the plans.
  - b. Trace found tiles to the upstream inlet or wetland boundary and disclose to the engineer.
  - c. Repairs of tile whose diameter are indicated on the plans or do not exceed 12 inches, not totaling more than 5 lineal feet per tile.
- (4) Excludes:
  - a. Exploration efforts for the purpose of tile abandonment or removal noted in bid items 13 and 14.
- B. Bid Item 11: Crush and Bury Tile
  - (1) Measurement:
    - a. Each tile line crushed and buried will be measured in linear feet from end to end.
  - (2) Payment:
    - a. Payment will be at the unit price per linear foot for each tile line crushed and buried.
  - (3) Inclusions:
    - a. Includes, but is not limited to, excavation, demolition, and backfill involved in crush and bury tile.
- C. Bid Item 12: Abandon Tile & Risers
  - (1) Measurement:
    - a. Lump sum item; no measurement will be made.
  - (2) Payment
    - a. Payment will be on a lump sum basis. Partial payment to be made on a percentage basis agreed upon by the engineer and contractor.
  - (3) Inclusions:
    - a. Includes, but is not limited to, all work necessary for excavation, tile and riser demolition, earthfill, compaction, and minor grading associated with removals.





## Construction Specification 000 IA-11 Removal of Water

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### 1. SCOPE

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

### 2. DIVERTING SURFACE WATER

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

### 3. DEWATERING THE CONSTRUCTION SITE

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

### 4. EROSION AND POLLUTION CONTROL

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

### 5. REMOVAL OF TEMPORARY WORKS

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

### 6. SPECIFIC SITE REQUIREMENTS

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

A. Subsidiary Item: Removal of Water

(1) Measurement:

- a. No separate measurement will be made for removal of water.

(2) Payment:

- a. No separate payment will be made for removal of water.

(3) Includes:

- a. This item shall consist of diverting surface water and dewatering the site as needed for construction. Groundwater levels shall be maintained at least 2 feet below the trench bottom for installations of the drawdown pipe and water control structure.
- b. Pumped or removed water shall not flow uncontrolled or be laden with sediment and reach Elm Lake.



## Construction Specification 000 IA-21 Excavation

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### 1. SCOPE

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

### 2. USE OF EXCAVATED MATERIALS

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

### 3. DISPOSAL OF WASTE MATERIAL

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

### 4. STRUCTURE AND TRENCH EXCAVATION

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

### 5. BORROW EXCAVATION

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

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

### 6. OVER-EXCAVATION

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

### 7. Specific Site Requirement

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

#### A. Bid Item 13: Excavation, East ADW Auxiliary Spillway

##### (1) Measurement:

- a. Measurement will be based on cubic yards from plan quantities to the nearest one (1.) cubic yard.

##### (2) Payment:

- a. Payment will be based on unit price of cubic yards from plan quantities. Bidders shall satisfy themselves for site and soil conditions, quality, and quantity of excavation necessary to complete the project as shown in the plans.

##### (3) Includes:

- a. Includes, but is not limited to, all work necessary for excavation and finish grading of the auxiliary spillway.
- b. Item includes hauling excavated material to be used as earthfill or spoiled on site in designated areas.
- c. Suitable excavated material of sufficient quality, as determined by the Engineer, shall be used as earthfill material.

- d. Over-excavation for final topsoil placement as shown in the plans is included in this bid item.
    - e. Excess excavated materials shall be disposed of in the designated spoil and borrow areas shown in the plans.
  - (4) Excludes:
    - a. Topsoil stripping, salvaging, stockpiling, and resspreading.
- B. Bid Item 14: Excavation, West ADW Borrow
  - (1) Measurement:
    - a. Measurement will be based on cubic yards from plan quantities to the nearest one (1.) cubic yard.
  - (2) Payment:
    - a. Payment will be based on cubic yards from plan quantities. Bidders shall satisfy themselves for site and soil conditions, quality, and quantity of excavation necessary to complete the project as shown in the plans.
  - (3) Includes:
    - a. Includes, but is not limited to, all work necessary for excavation and final grading of borrow site.
    - b. Items includes hauling excavated material to be used as earthfill or spoiled on site in designated areas.
    - c. Suitable excavated material of sufficient quality, as determined by the Engineer, shall be used as earthfill material.
    - d. Over-excavation for final topsoil placement as shown in the plans is included in this bid item.
    - e. Excess excavated materials shall be disposed of in the designated spoil and borrow areas shown in the plans.
  - (4) Excludes:
    - a. Topsoil stripping, salvaging, stockpiling, and resspreading.
- C. Subsidiary Item: Excavation for structure and pipe installation
  - (1) No separate measure or payment to be made for excavation and backfill of materials necessary for the installation of structures, culverts, and pipes. Displaced material from these items is not included in the earthwork shrinkage factor.

**Construction Specification  
000 IA-23 Earthfill**

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**1. SCOPE**

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

**2. MATERIALS**

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

**3. FOUNDATION PREPARATION**

Foundations for earthfill shall be stripped a minimum of 6 inches to remove vegetation and other unsuitable materials. Foundation surfaces shall be scarified to a minimum depth of 2 inches prior to placing fill material.

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

**4. PLACEMENT**

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

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

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

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

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

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

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

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

**5. CONTROL OF MOISTURE CONTENT**

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

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

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

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

## **6. COMPACTION**

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

- Method 1 - Earthfill shall be placed so that the wheels or tracks of the loaded hauling equipment, traveling in a direction parallel to the centerline of fill, pass over the entire surface of each layer being placed. Low ground pressure vehicles shall not be used for this purpose.
- Method 2 - Two (2) complete passes of a tamping-type roller will be made over each layer. The roller shall be capable of exerting a minimum force of two hundred (200) pounds per square inch.
- Method 3 - Minimum density shall be 90% of the maximum density as determined by ASTM D 698 and as shown on the plans.

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

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

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

In all cases, follow manufacturer instructions for the specific compaction equipment being used. Heavy equipment shall not be operated within 2 feet of any structure or pipe.

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

## **7. ISLANDS, MOUNDS, AND LOAFING AREAS ON WETLAND RESTORATION, ENHANCEMENT, OR CREATION PROJECTS**

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

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

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

Organic soils shall not be used to construct islands, loafing areas, dikes, or embankments.

## 8. Specific Site Requirements

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

### A. Bid Item 15: Earthfill, East ADW Berms & 16: Earthfill, East ADW Outlet

#### (1) Measurement:

- a. Measurement will be based on cubic yards from plan quantities to the nearest one (1.) cubic yard.

#### (2) Payment:

- a. Payment will be based on cubic yards from plan quantities. Bidders shall satisfy themselves for site and soil conditions, quality, and quantity of earthfill necessary to complete the project as shown in the plans.

#### (3) Includes:

- a. Includes, but is not limited to, all work necessary to construct the wetland berm, including the backfill of stripping excavation and core trench, along with final grading and shaping of disturbed areas.
- b. Earthfill material shall be from the designated borrow source unless otherwise approved by Engineer.
- c. Compaction shall be made in 9-inch loose lifts per method 1, unless otherwise directed by the Engineer based on soil conditions or available compaction equipment. A 1.21 shrinkage factor (Total Cut/total Fill) is assumed for both sites.
- d. The quantities shown on the plans reflect the constructed, in-place compacted volumes.

#### (4) Excludes:

- a. Respreding topsoil over finish graded areas.

### B. Bid Item 17: Earthfill, WEST ADW Roadway

#### (1) Measurement:

- a. Measurement will be based on cubic yards from plan quantities to the nearest one (1.) cubic yard.

#### (2) Payment:

- a. Payment will be based on cubic yards from plan quantities. Bidders shall satisfy themselves for site and soil conditions, quality, and quantity of earthfill necessary to complete the project as shown in the plans.

#### (3) Includes:

- a. Includes, but is not limited to, all work necessary to construct the wetland berm, including the backfill of stripping excavation and core trench, along with final grading and shaping of disturbed areas.
- b. Earthfill material shall be from the designated borrow source unless otherwise approved by Engineer.
- c. Compaction shall be made in 9-inch loose lifts per method 3 as indicated in the drawings, unless otherwise directed by the Engineer based on soil conditions or available compaction equipment. A 1.21 shrinkage factor (Total Cut/total Fill) is assumed for both sites.
- d. The quantities shown on the plans reflect the constructed, in-place compacted volumes.

#### (4) Excludes:

- a. Respreding topsoil over finish graded areas.

### C. Subsidiary Item: Backfill of Required Excavation

#### (1) Measurement:

- a. No separate measurement will be made for backfill of structure excavation. Measurement for this item will be included in the measurement for other direct bid items.

#### (2) Payment:

- a. No separate payment will be made for backfill of structure excavation. Compensation for this item will be included in the payment for other direct bid items.

#### (3) Includes:

- a. This item shall consist of backfilling the areas excavated to install the corrugated metal pipe, drawdown structure, and backfill of tile work.
- b. Compaction adjacent to the structures shall be as indicated above. All other compaction shall be Method 1 or equivalent.



## Construction Specification 000 IA-24 Drainfill

### 1. SCOPE

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

### 2. MATERIALS

Drainfill shall be sand, gravel, or crushed stone. It shall be composed of clean, hard, durable mineral particles free from 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:

<u>U.S. Sieve Designation</u>	<u>Percent Passing Sieve</u>
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:

<u>U.S. Sieve Designation</u>	<u>Percent Passing Sieve</u>
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
No.200	0-3

### 3. BASE PREPARATION

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 NRCS. Installation of the drainage conduit shall be inspected and approved by NRCS 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

1. Foundation Trench Drain
  - a. No compaction will be required beyond that resulting from the placing and spreading operations.
2. Filter Diaphragm

- a. Each layer of sand material shall be flooded with clean water prior to compaction.
  - b. Compaction shall be accomplished while the material is wet from step (1) above.
  - c. Each layer shall be compacted by a minimum of 2 passes of a hand directed vibratory plate compactor over the entire layer surface.
  - d. Layer thickness shall not exceed 12 inches after compaction.
3. Filter Diaphragm Outlet
- a. Sand material shall be placed so the layer thickness does not exceed 4 inches after compaction.
  - b. Each layer shall be compacted by a minimum of 2 passes of a hand directed vibratory plate compactor over the entire layer surface.

## **6. Specific Site Requirements**

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

### **A. Bid Item 18: Coarse Drainfill, Granular Bedding**

#### **(1) Measurement:**

- a. Measurement for drainfill will be in tons to the nearest tenth (0.1) based on weight tickets supplied. Material to be supplied is only where indicated on the plans. Notify engineer of suspect areas prior to placing additional bedding material.

#### **(2) Payment:**

- a. Payment for drainfill will be in tons as verified by weight tickets.

#### **(3) Inclusions:**

- a. Item consists of all materials, labor, and equipment necessary to place the coarse drain fill as shown in the plans.
- b. Crushed concrete will not be approved for use as bedding material for plastic pipe without use of a rock guard.





## Construction Specification 000 IA-26 Topsoiling

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### 1. SCOPE

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

### 2. QUALITY OF TOPSOIL

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

### 3. EXCAVATION

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

### 4. SPREADING

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

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

### 5. Specific Site Requirements

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

- A. Bid Item 19: Topsoil, Strip, Stockpile, Respread, 9"
  - (1) Measurement:
    - a. Measurement for topsoil will be in cubic yards based on plan quantity to the nearest one (1.) cubic yard. No separate field measurement will be taken.
  - (2) Payment:
    - a. Payment for topsoil will be based on plan quantity. Bidders shall satisfy themselves for site and soil conditions, quality, and quantity of topsoil necessary to complete the project as shown in the plans.
  - (3) Inclusions:
    - a. Item consists of all work necessary to strip, salvage, stockpile, and respreads a minimum of six inches of topsoil as the final surface layer to meet grades shown in the plans that will receive seeding.
    - b. Maximum allowable topsoil stockpile height shall be five feet or otherwise a manageable height based on pollution prevention measures. Topsoil stripping beneath stockpile is not required.
  - (4) Excludes:
    - a. Excavation and fill required for borrow and earthen structures or roadways.



## Construction Specification 000 IA-31 Concrete

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### 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 or as shown on the drawings.

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.

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

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

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

### 3. CONCRETE DESIGN MIX

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

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

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

\* Requires water reducing admixture.

### 4. MIXTURES AND MIXING

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

### 5. BATCH TICKET

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

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

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

## **6. REINFORCING STEEL**

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

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

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

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

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

## **7. PREPARATION OF FORMS AND SUBGRADE**

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

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

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

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

Form ties except those specifically covered by the preceding paragraph shall be broken off flush with the formed surface. Any surface areas which have been spalled or otherwise damaged shall be repaired in accordance with Section 9.

Steel tying and form construction adjacent to new concrete shall not be started until concrete has cured at least 12 hours.

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

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

## **8. PLACING CONCRETE**

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

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

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

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

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.

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 ensure a monolithic bond with the preceding layer. The use of vibrators to transport concrete in the forms or conveying equipment will not be permitted.

## **9. FORM REMOVAL AND FINISHING**

Forms shall be left in place for at least 24 hours after placing concrete. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will

permit concrete to take the stresses due to its own weight uniformly and gradually.

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

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

## **10. CURING**

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

- A. Membrane Curing: Concrete shall be cured with white pigmented curing compound. The compound shall be sprayed on moist concrete as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed. Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete, such as construction joints, shear plates, reinforcing steel, and other embedded items. Surfaces subjected to heavy rainfall or running water within 3 hours after curing compound has been applied or surfaces damaged by subsequent construction operations during the curing period, shall be reapplied in the same manner as the original application.
- B. Moist Curing: Concrete shall be cured by maintaining all surfaces continuously wet for the entire curing period.
- C. Cover: Adequately cover an exposed structure with burlap mats, or other material and continually soak with water.

## **11. BACKFILLING**

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

## **12. HOT AND COLD WEATHER CONCRETING**

When the atmospheric temperature may be expected to drop below 40<sup>0</sup> F. at the time concrete is delivered to the work site, during placement, or at any time during curing period, concrete shall be mixed, placed and protected in accordance with ACI Standard 306, "Recommended Practice for Cold Weather Concreting." When climatic or other conditions are such that the temperature of the concrete may reasonably be expected to exceed 90<sup>0</sup> F. at the time of delivery to the work site, during placement or during the first 24 hours after placement, concrete shall be mixed, placed and protected in accordance with ACI Standard 305, "Recommended Practice for Hot Weather Concreting."

### 13. SPECIAL SPECIFICATIONS

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

- A. Bid Item 20: SW-513 Intake Structure with SW-604 Type 6 Inlet
  - (1) Measurement:
    - a. Measurement will be based on each SW-513 intake w/ SW-604 type 6 inlet installed.
  - (2) Payment:
    - a. Payment will be based on each SW-513 intake w/ SW-604 type 6 inlet installed.
  - (3) Includes:
    - a. Unit price includes, but is not limited to, excavation, furnishing and installing structure; lining (if specified); furnishing, placing, and compacting bedding and backfill material; base; structural concrete; reinforcing steel' precast units (if used); concrete fillets; pipe connections; castings; and adjustment rings.
- B. Bid Item 21: RCP Culvert, 30" Dia.
  - (1) Measurement:
    - a. RCP Culvert, 30" Dia. installed in a trench will be measured in linear feet from end of pipe to end of pipe along the centerline of pipe, exclusive of aprons. Lengths of elbows and tees will be included in the length of pipe measured.
  - (2) Payment:
    - a. Payments will be made at the unit price of RCP Culvert, 30" Dia.
  - (3) Includes:
    - a. Unit price includes, but is not limited to, trench excavation, dewatering; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; connectors; testing; and inspection.
- C. Bid Item 22: Concrete Pipe Apron, 30" Dia.
  - (1) Measurement:
    - a. Each concrete pipe apron installed, 30" Dia. will be counted.
  - (2) Payment:
    - a. Payment will be made at the unit price of each concrete pipe apron 30" Dia.
  - (3) Includes:
    - a. Unit price includes, but is not limited to, trench excavation; dewatering; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; connectors; and other appurtenances.
    - b. Furnishing and installation of bar guard and apron footing is incidental to this item.
- D. Subsidiary Item: Concrete for Minor Structures
  - (1) This item shall consist of furnishing and placing poured concrete and reinforced concrete as shown on the plans.
  - (2) No separate payment will be made for concrete, forms, and reinforcing bars. Compensation for this item will be included in the payment for the drawdown structure, slotted intake riser, CMP tile extension pipe, and where ever concrete is required as a component of another item.

## Construction Specification 000 IA-45 Plastic (PVC, PE) Pipe

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### 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:

<u>Kind of Pipe</u>	<u>Specification</u>
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Corrugated Polyethylene(PE) Tubing and Fittings,

Nominal Sizes 3 to 6 inch, inclusive.....	ASTM F 405
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Large Diameter Corrugated Polyethylene Tubing and Fittings,

Nominal Sizes 8 to 24 inch, inclusive.....	ASTM F 667
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Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.....	ASTMF 894
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Poly(Vinyl Chloride) (PVC) Plastic Pipe. PVC pipe and fittings shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
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PVC Plastic Pipe, Schedules 40, 80 and 120.....	ASTM D 1785
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PVC Pressure-Rated Pipe (SDR Series).....	ASTM D 2241
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PVC Pressure Pipe, 4 in. through 12 in., for Water Distribution.....	AWWA C900
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PVC Water Transmission Pipe, Nominal Diameters 14 in through 36 in.....	AWWA C905
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PVC and PE Plastic Pipe. Plastic pipes meant for non-potable, livestock water supply shall conform to the requirements of the applicable specification listed below:

<u>Kind of Pipe</u>	<u>Specification</u>
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Polyethylene (PE) Plastic Pipe, (SIDR-PR) Based on

Controlled Inside Diameter.....	ASTM D 2239
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PVC Pressure-Rated Pipe (SDR Series).....	ASTM D 2241
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### 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. Gaskets shall conform to ASTM D 1869. Solvent cemented joints shall not be used for pond spillway pipes. 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.



A special case of livestock water supply involves pipes through a dam or embankment. Only PE pipe meeting the above specification may be used. PE pipe, of 1 ¼, 1 ½, or 2-inch diameter shall be installed so that there are no joints within the embankment area.

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 fitting 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

#### Specification

Threaded PVC Plastic Pipe Fittings, Schedule 80.....	ASTM D 2464
PVC Plastic Pipe Fittings, Schedule 40.....	ASTM D 2466
PVC Plastic Pipe Fittings, Schedule 80.....	ASTM D 2467
Butt Heat Fusion (PE) Plastic Fittings for PE Plastic Pipe and Tubing.....	ASTM D 3261
Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.....	ASTM D 3139
PVC Pressure Pipe, 4 in. through 12 in., for Water Distribution.....	AWWA C900
PVC Water Transmission Pipe, Nominal Diameters 14 in through 36 in.....	AWWA C905

### **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 degrees F (4.4 degrees 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. TRENCHING**

Plastic pipe conduits shall be installed in trenches or plowed in according to the following methods:

1. **Trencher Constructed** - When conditions permit, trenching for pipelines, which are buried from 5 to 6 feet deep, are usually done with a narrow 4 to 6 inch wide chain trencher. Where there is little gravel and the ground is not too wet, these trenchers bring up well pulverized soil that makes good backfill material. Where rocks are not present, any of this material may be backfilled directly around the pipe. There is no practical way to compact the fill in these narrow trenches. The owner must be made aware that this material normally consolidates to its maximum extent in two to five years, but depressions or low spots can be hazards to livestock, humans and equipment.
2. **Backhoe Constructed Trench** – Backhoe trenches are usually a minimum of 12 inches wide. The material frequently comes out of the trench as clods, large chunks, and rocks. Immediately backfill over the pipe with 4 to 6 inches of soil that is free of these clods, large chunks, and rocks. If adequate excavated material is not available, then material such as sand or fine gravel should be imported and placed around the pipe to a depth of 4 to 6 inches over the top of the pipe. Fill the trench with the remaining excavated material.
3. **Plowing** – Plowing, or ripping, is a trenchless method for installing plastic pipe. It is a multi-stage process consisting of positioning a vibrating or static (non-vibrating) plow equipped with a trailing product guide which feeds pipe to the depth setting of the plow as it moves forward. The pipe is inserted into the ground continuously along a predetermined path and depth. The vertical depth of installation is controlled by hydraulic adjustment of the plow shear head and the surface contours. The depth of insertion must be continually adjusted to compensate for changes in terrain.

## 6. LAYING AND BEDDING THE PIPE

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

Care shall be taken to prevent distortion and damage during unusually hot (over 90 degrees F) or cold weather (under 40 degrees 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.

1. 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.
2. 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.

A few installations of above ground pipelines have been noted. These installations are normally laid directly on the ground and very close to an existing fence line for protection. Only those pipelines designed to withstand exposure to ultraviolet radiation may be utilized for these installations.

Adequate thrust control shall be incorporated in these installations.

## 7. 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.

## 8. Specific Site Requirements

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

### A. Bid Item 23: Perforated CPT, 6" Dia.

- (1) Measurement:
  - a. Measurement will be based on linear feet of Perforated CPT, 6" Dia. installed in the field measured to the nearest one (1.) foot.
- (2) Payment:
  - a. Payment will be based on linear feet of Perforated CPT, 6" Dia. installed in the field. Unit price shall include all necessary appurtenances, fittings, adapters, and connections to dissimilar pipe.
- (3) Includes:
  - a. Item consists of all work necessary to furnish and install Perforated CPT, 6" Dia. as shown on the plans.
  - b. Unit price includes, but is not limited to, trench excavation, furnishing and placing bedding and backfill material, engineering fabric (when specified), connectors, and elbows and tees.
  - c. Installation and execution subject to specification IA-46.

### B. Bid Item 24 & 25: Dual Wall HDPE Pipe, 18" & 30"

- (1) Measurement:
  - a. Measurement will be based on linear feet of Dual Wall HDPE Pipe, 18" & 30" installed in the field to the nearest one (1.) foot.
- (2) Payment:
  - a. Payment will be based on linear feet of Dual Wall HDPE Pipe, 18" & 30" installed in the field. Unit price shall include all necessary appurtenances, fittings, adapters, and connections to dissimilar pipe.
- (3) Includes:
  - a. Item consists of all work necessary to furnish and install Dual Wall HDPE Pipe, 18" & 30" as shown on the plans.
  - b. Unit price includes, but is not limited to, trench excavation, furnishing and placing bedding and backfill material, engineering fabric (when specified), connectors, elbows and tees, testing, and inspection.
  - c. Installation and execution subject to specification IA-46.
  - d. Alternate use of dual wall polypropylene pipe of equivalent size, roughness and joint construction may be approved for use with prior approval. Only one material of pipe shall be used for each pipe run.
- (4) Excludes:
  - a. Coarse drainfill granular bedding to be paid separately.

### C. Bid Item 26: HDPE Surface Inlet, 6" Dia.

- (1) Measurement:
  - a. Each HDPE surface inlet, 6" Dia. will be counted.
- (2) Payment:
  - a. Payment will be at the unit price for each HDPE surface inlet, 6" Dia.
- (3) Includes:
  - a. Unit price includes, but is not limited to, excavation; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; base, orifice, and pipe connections.
  - b. Installation and execution subject to specification IA-46.

## **Construction Specification 000 IA-46 Tile Drains for Land Drainage**

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### **1. SCOPE**

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

### **2. MATERIALS**

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

Corrugated polyethylene (PE pipe (tubing) and fittings shall conform to ASTM F 405 (3" to 6") or F 667 (3" to 24"), as appropriate. Corrugated profile wall (dual wall) polyethylene (PE) pipe shall meet or exceed the requirements of ASTM F 2648 (2" to 60") or ASTM F 2306 (12" to 60"). Pipe conforming to AASHTO M 252 (3" to 10"), or AASHTO M 294 (12" to 60") is acceptable. Perforated tubing shall have a water inlet area of at least one square inch per foot, provided by perforations spaced uniformly along the long axis of the tubing. The perforations shall be circular or slots. Circular perforations shall not exceed 3/16 inch in diameter. Slots shall not be more than 1/8 inch wide.

### **3. EXCAVATION**

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

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

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

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

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

### **4. PREPARING THE BEDDING**

Unless otherwise specified, no filter or envelope is required. In stable soils, the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. The groove shall be shaped to fit the size of the tile. The 90-degree "V" groove shall not be used on conduits greater than 6 inches in diameter.

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

## **5. FILTER OR ENVELOPE MATERIAL**

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

## **6. PLACEMENT AND JOINT CONNECTIONS**

All drains shall be laid to grade.

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

- a. Peat and muck – ¼ inch preferred, 3/8 inch 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 fit possible

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

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

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

## **7. CONNECTIONS**

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

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

Connections with the outlet pipe shall be made watertight.

## **8. OUTLETS**

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

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

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

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

## **9. BLINDING**

After the conduit is placed in the excavated ditch, friable material from the sides of the trench shall be placed around the conduit, completely filling the trench to a depth of not less than six inches over the top of the conduit. For material to be suitable it must not contain hard clods, rocks, frozen soil, or fine material which will cause a silting hazard to the drain. Conduit placed during any one day shall be

blinded by the end of the day's work.

#### **10. BACKFILLING**

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

Unless otherwise shown on the plans, in mineral soils, the minimum depth of cover over subsurface drains shall be 2.5 feet. In organic soils, the minimum depth of cover after initial subsidence shall be 3.0 feet.

#### **11. SPECIFIC SITE REQUIREMENTS**

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

A. None.

## Construction Specification

### 000 IA-51 Corrugated Metal Pipe Conduits

#### 1. SCOPE

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

#### 2. MATERIALS

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

1. When polymer coating is specified, pipe, coupling bands and anti-seep collars shall be coated in accordance with ASTM A 762. All riveted joints shall be caulked as described in paragraph B.
2. Pipe with annular corrugations shall be furnished with caulked seams. Riveted pipe joints shall be caulked with a bituminous mastic material during fabrication to provide a watertight joint. All circumferential and longitudinal seams shall be caulked before riveting. This shall be accomplished by applying a uniform bead of the mastic compound to the inner lap surface before riveting such that when the rivets are in place, all voids are filled and a coating of mastic is between the lap surfaces. The inner surface of coupling bands shall be asphalt coated in the field prior to installation. A neoprene gasket having a minimum thickness of 3/8 inch and a minimum width of 7 inches may be used in lieu of mastic coated coupling bands.
3. Welded or lock seams in helical corrugated pipe are considered to be watertight.
4. When close riveted pipe is specified: (1) the pipe shall be fabricated so that the rivet spacing in the circumferential seams shall not exceed 3 inches, except that 12 rivets will be sufficient to secure the circumferential seams in 12-inch pipe, and (2) in those portions of the longitudinal seams that will be covered by the coupling bands, the rivets shall have finished flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating off the coupling bands.
5. Double riveting or double spot welding of pipe less than 42 inches in diameter may be required. If specified, the riveting or welding shall be done in the manner specified for pipe 42 inches or greater in diameter.

#### 3. COUPLING BANDS

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

#### 4. FABRICATION

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

Description of Coupling Band	Maximum Fill Height, Ft.	Maximum Pipe Diam., In.
24-inch wide coupling band with four 1/2-inch Diam. galvanized rods with tank lugs for annular or helical corrugated metal pipe. Bands shall have a minimum lap of 3 inches.	All	All

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

## 5. REPAIR OF DAMAGED COATINGS

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

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

1. Metallic Coating - by thoroughly wire brushing the damaged area and cleaning with solvent, and then painting two coats of one of the following paints:
  - a. Zinc Dust - Zinc Oxide Primer conforming to ASTM D 79 and D 520.
  - b. Single package, moisture cured urethane prime in silver metallic color.
  - c. Zinc-rich cold galvanized compound, brush, or aerosol applications.
2. Polymer Coating - apply two coats of polymer material similar to and compatible with the durability, adhesion and appearance of the original polymer coating. The repair coating shall be a minimum thickness of 0.010 (10 mils) after drying and shall bond securely to the pipe.

## 6. LAYING AND BEDDING THE PIPE

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

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

## 7. BACKFILLING

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

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

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

Each layer of backfill shall be compacted with power tampers, hand tampers, or plate vibrators to the same density requirements as specified for the adjacent embankment. Backfill over and around the pipe



shall be brought up uniformly on all sides. The passage of earth moving equipment will not be allowed over the pipe until backfill has been placed above the top of the pipe surface to a depth of two (2) feet.

## **8. SPECIFIC SITE REQUIREMENTS**

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

**A. Bid Item 27 & 28: CMP Tile Extension, 20'x42" Dia. and CMP Apron with Apron Guard**

**(1) Measurement:**

- a. Measurement will be based on each CMP tile extension and apron installed.

**(2) Payment:**

- a. Payment will be based on each CMP tile extension and apron.
- b. Unit price shall include all necessary appurtenances, fittings, adapters, animal guards, and connections to dissimilar pipes.

**(3) Includes**

- a. Unit price includes, but is not limited to, all necessary work to provide and install the CMP tile extension and apron with guard.

**B. Bid Item 29: CMP Pipe Culvert, 15" Dia.**

**(1) Measurement:**

- a. Each CMP pipe culvert, 15" Dia. installed in a trench will be measured in linear feet from end of pipe to end of pipe along the centerline of pipe, exclusive of aprons. Lengths of elbows and tees will be included in length of pipe measured. Length to be measured to the nearest one (1.) foot. No field measurement to be taken.

**(2) Payment:**

- a. Payment will be made at the unit price in linear feet for CMP pipe culvert, 15" Dia based on plan quantities.

**(3) Includes**

- a. Unit price includes, but is not limited to, furnishing and installing pipe; furnishing, placing, and compacting backfill material; pipe connections; testing; and inspection.
- b. Item includes repairing damage to coatings, water tight joints, and fittings.

**C. Bid Item 30: CMP Perforated Riser w/ Bar Guard, 24" Dia.**

**(1) Measurement:**

- a. Each CMP perforated riser w/ bar guard, 24" Dia installed.

**(2) Payment:**

- a. Payment will be at the unit price for each CMP perforated riser w/ bar guard, 24" Dia installed

**(3) Includes:**

- a. Unit price includes, but is not limited to, excavation; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; base and pipe connections.

**D. Bid Item 31: CMP Water Control Structure w/Grate & Storage Structure**

**(1) Measurement:**

- a. Lump sum item, no measurement will be made.

**(2) Payment:**

- a. Payment will be on a lump sum basis. No partial payment to be made.

(3) Includes:

- a. Unit price includes, but is not limited to, excavation; furnishing and installing pipe; furnishing, placing, and compacting bedding and backfill material; concrete base and pipe connections.
- b. Provide detailed shop drawings of the water control structure and appurtenances. Water control structure to include the following:
  1. 48" diameter riser pipe with 15" diameter stubs. Riser pipe to be CRCS pipe with 2-2/3" x 1/2" annular corrugations. Stub pipe to be 16 gage CRCS pipe of the same corrugations, 2' minimum length.
  2. Embed riser pipe 4" minimum into poured concrete base. Concrete base shall have a minimum thickness of 8" and extend a minimum of 12" horizontally around edge of riser. No separate payment for concrete will be made for the concrete base and should be included in the cost of the water control structure.
  3. Stop logs shall have a tongue-and-groove, interlocking configuration, 1-1/2" thick x 6" high (max) PVC. Embed lowest stoplog into concrete base.
  4. Hook tool for stoplog removal and lockable lid.

(4) Stop log storage structure to include the following

- a. Granular base, 30" diameter dual wall PE pipe or solid wall SDR-26 pipe, in a continuous 4.5 feet section with impermeable, removable lid and base.
- b. Includes all materials, labor, and appurtenances.

E. Subsidiary Items:

(1) Measurement:

- a. No separate measurement will be made for these items.

(2) Payment:

- a. No separate payment will be made for these items.

(3) Includes:

- a. CMP Bends, Water Tight Coupling Bands, and stop log storage structure. Install water tight coupling bands for all pipe connections and structure stub-outs. Install stop log storage structure and appurtenances as part of Bid Item 33.
- b. Install animal guards on all drain tile pipe outlets and drawdown pipe outlet, Agridrain Mild Steel Rat Guard or equal.

## **Construction Specification 000 IA-61 Loose Rock Riprap**

---

### **1. SCOPE**

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

### **2. MATERIALS**

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

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

### **3. SUBGRADE PREPARATION**

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

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

### **4. EQUIPMENT-PLACED ROCK RIPRAP**

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

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

### **5. HAND-PLACED RIPRAP**

Rock shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact, one to another. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge unless otherwise specified. Placement of rock shall begin at the bottom of the slope or downstream end of the structure.

### **6. FILTER LAYERS OR BEDDING**

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

## 7. Specific Site Requirements

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

### A. Bid Item 32: Revetment, IDOT Class E

#### (1) Measurement:

- a. Measurement will be to the nearest 0.1 tons. Provide weight tickets to the Engineer. Plan quantity shall not be grossly exceeded without prior written approval from Owner and Engineer.

#### (2) Payment:

- a. Payment will be based on tons of riprap delivered and placed on site as measured by certified weight tickets. Provide weight tickets to the Engineer. Plan quantity shall not be exceeded without prior written approval from Owner and Engineer.

#### (3) Includes:

- a. This item shall consist of furnishing and placing the rock riprap where indicated on the drawings, including minor excavation necessary to meet desired revetment thickness and plan neat lines.
- b. Rock shall be Class E Revetment Stone as defined by Iowa Department of Transportation Section 4130.

#### (4) Excludes:

- a. Installation of geotextile fabric, which is paid separately.

### B. Bid Item 33: Road Surfacing, IDOT Class A Crushed Stone

#### (1) Measurement:

- a. Measurement will be to the nearest 0.1 tons. Provide weight tickets to the Engineer. Plan quantity shall not be exceeded without prior written approval from Owner and Engineer.

#### (2) Payment:

- a. Payment will be based on tons of riprap delivered and placed on site as measured by certified weight tickets. Provide weight tickets to the Engineer. Plan quantity shall not be exceeded without prior written approval from Owner and Engineer.

#### (3) Includes:

- a. Unit price includes, but is not limited to, engineering fabric.
- b. This item consists of furnishing and placing the road surfacing, IDOT class A crushed stone as shown in the plans at a rate of 1,500 tons per mile. Plan quantity shall not be exceeded without prior written approval from Owner and Engineer.
- c. Road stone material shall meet the requirements of Iowa Department of Transportation Section 2315.02 B.

#### (4) Excludes:

- a. Rock used in the construction of temporary access locations and stabilization material for structures and pipe.



## Construction Specification 000 IA-81 Metal Fabrication and Installation

---

### 1. SCOPE

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

### 2. MATERIALS

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

### 3. PROTECTIVE COATINGS

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

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

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

### 4. FABRICATION

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

### 5. ERECTION

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

### 6. SPECIFIC SITE REQUIREMENTS

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

A. None



## Construction Specification 000 IA-95 Geotextile

---

### 1. SCOPE

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

### 2. MATERIAL QUALITY

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

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

### 3. STORAGE

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

### 4. SURFACE PREPARATION

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

### 5. PLACEMENT

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

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

Securing pins shall be placed along a line approximately 2 inches in from edge of the of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate, to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to be left in place unless otherwise specified.

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

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

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

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

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

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

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

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

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

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

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



Table 1. Requirements for Woven Geotextiles<sup>1/</sup>

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

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

2/ Maximum average roll value.

3/ Note: CWO is a USACE reference.

Table 2. Requirements for Nonwoven Geotextiles<sup>1/</sup>

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

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

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

3/ Maximum average roll value.



## 6. Specific Site Requirements

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

### A. Bid Item 34: Geotextile Fabric

#### (1) Measurement:

- a. Measurement for the geotextile fabric will be based on square yards installed to the nearest one (1.) yard.

#### (2) Payment:

- a. Payment for the geotextile fabric will be based on square yards of coverage. This does not account for overlap.

#### (3) Includes:

- a. This item shall consist of furnishing and placing geotextile on all earth surfaces that contact the rock riprap as shown on the drawings. No fabric shall be used in the construction of the slotted intake riser.
- b. Geotextiles shall be Class I or IV nonwoven as described herein.
- c. The geotextile shall be placed with the long dimension parallel to the channel or longest lineal dimension.

**THIS PAGE CONCLUDES  
THE SPECIFICATIONS  
FOR THE  
AG DRAIN WELL CLOSURE  
WRIGHT COUNTY, IOWA  
IOWA AGRICULTURAL MITIGATION, INC**

## **SUPPORTING DOCUMENTS**

**AGRICULTURAL DRAINAGE WELL  
DATA****ADW OWNER:**

Name: Donald Tice  
Street, Box or RR: 1891 Page Ave  
City, State & Zip: Clarion IA 50525  
Phone Number: (515) 532-3874

**AGENT:**

Name: same  
Street, Box or RR: \_\_\_\_\_  
City, State & Zip: \_\_\_\_\_  
Phone Number: (\_\_\_\_) \_\_\_\_\_

**ADW LOCATION:**

SE 1/4, of the SE 1/4, Section 16, T 92 N, R 24 W

**Well Head**

Location: 350' N of SE corner of Section 16, well near

Coordinates: fence line

General Condition: Cistern in need of repair

Cistern Dimensions: 6'x6' Cistern Depth: 8'

Well Diameter: 6" Well Depth: 254'

Cistern cover (padlock no) Yes X <sup>need of repair</sup> or No \_\_\_\_\_

Side walls above high pond Yes \_\_\_\_\_ or No ✓

Side walls sealed Yes \_\_\_\_\_ or No ✓

Mounded/graded to drain away Yes \_\_\_\_\_ or No ✓

**Surface Intakes**

Yes ✓ or No \_\_\_\_\_ Number of Intakes 10

**Drains Land of  
Others**

Yes ✓ or No \_\_\_\_\_ Stanberry tile

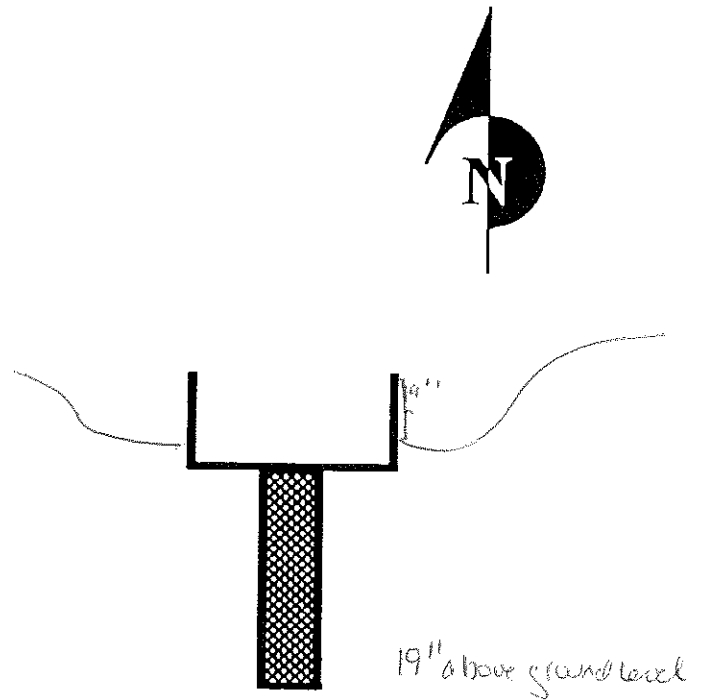
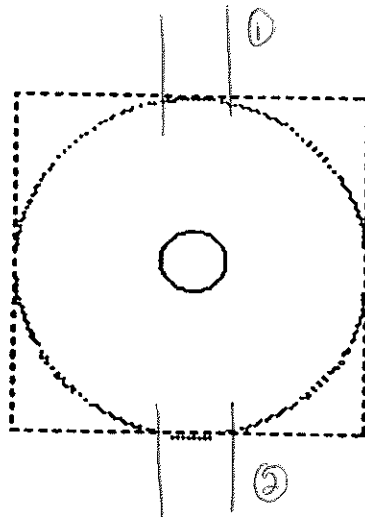
**Other Contaminant  
Sources**

Septic Discharge: no Manure Runoff: no Other: \_\_\_\_\_

**Comments**

In severe situation surface water can enter the well.

## WELL HEAD SKETCH



Surface water can enter this well  
and del in 93' - but only in  
extreme situations!

## TILE DATA

Line #	Diameter	Entry Depth
1.	12'	7'
2.	8"	7'
3.		
4.		

## CISTERN

Shape Square  
 Dimensions 6' x 6'  
 Depth 8'

## WELL BORE

Diameter 6"  
 Depth 254'

ADW No. 9224 W16 D001  
 Well #1 SE.

# DRAINAGE SKETCH

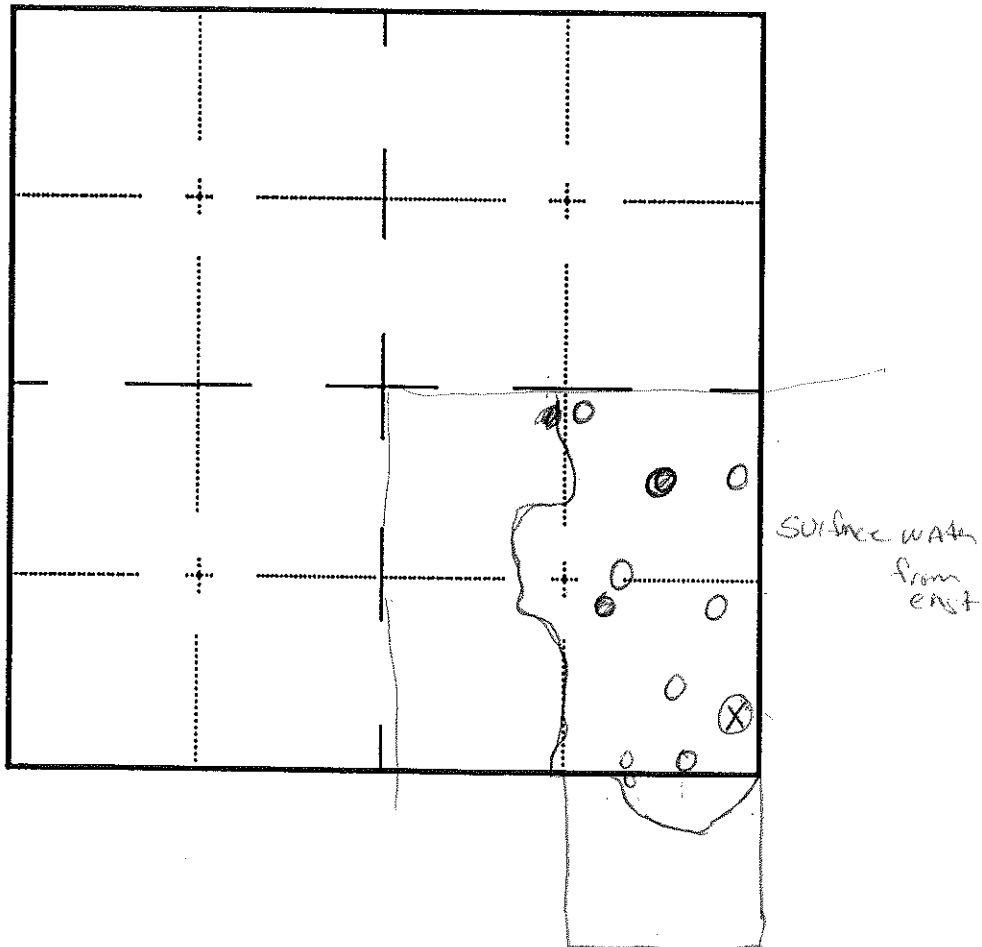
		B	A
B		A	
		C	D
C			D

EXAMPLE  
 QQ Section Coding

Well ⊗

Surface Intake ○

Drainage - - - - -



92 24W 16 CD 01  
92 24W 16 DD 01

Agricultural Drainage Well Registration Form  
(Please print in ink or type)

EE Ake 2/2

- 1) LOCATION OF DRAINAGE WELL (Attach aerial photo if necessary-see instructions)

no. 1 ~~SE~~ SW 16 92N 24 W 94+  
no. 2 SE 1/4 of the SE 1/4, Section 16, T92N, R24, Wright County

- 2) NAME AND ADDRESS OF DRAINAGE WELL OWNER

Name Donald Tice  
Street, RR or Box RR 2  
City and State Clarion, Iowa  
Zip Code 50525  
Phone (515) 532-3874

- 3) NAME AND ADDRESS OF AUTHORIZED AGENT  
(leave blank if not appropriate)

Name \_\_\_\_\_  
Street, RR or Box \_\_\_\_\_  
City and State \_\_\_\_\_  
Zip Code \_\_\_\_\_  
Phone ( ) \_\_\_\_\_

- 4) INDICATE BELOW THE AMOUNT OF LAND DRAINED BY THE DRAINAGE WELL

LAND OWNED BY THE WELL OWNER 165 ACRES  
LAND NOT OWNED BY THE WELL OWNER 110 ACRES  
TOTAL AMOUNT OF LAND DRAINED 275 ACRES ) these are  
Purely Grasses

- 5) OF THE LAND DRAINED BY THE DRAINAGE WELL, GENERALLY WHAT PERCENTAGE IS IN CONTINUOUS ROW CROP (Include any set-aside acres that normally would be in row crop production) 99 % ?

- 6) WHAT TYPE OF DRAINAGE WATER ENTERS THE DRAINAGE WELL? CHECK ONE



TILE DRAINAGE  
ONLY



SURFACE WATER  
ONLY



BOTH TILE AND  
SURFACE WATER

7) TO YOUR KNOWLEDGE, HOW CLOSE IS THE NEAREST WATER SUPPLY WELL FOR HUMAN CONSUMPTION TO THE DRAINAGE WELL? CHECK ONE.

☐

1/8 mile  
or less

☐

1/8 to  
1/4 mile

☒

1/4 to  
1/2 mile

☐

1/2 to  
1 mile

☐

1 mile  
or more

8) HOW DEEP IS THE DRAINAGE WELL? no. 1 244 ft.

no. 2 254

COMMENTS:

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Donald C. Tice  
Signature of ☒ owner ☐ agent  
(check one)

Dec 10, 1987  
Date

DEPARTMENT OF  
NATURAL RESOURCES

1987 DEC 28 AM 10 04



# EPA Region VII - Injection Well Tracking System

Facility I.D. Number: IAS197500014

## SITE INFORMATION

### Facility Name:

Contact Name: DONALD TICE

Address:

P.O. Box: RR. 2

City: CLARION

State: IA Zip: 50525

Phone: (515)532-3874

County FIPS Code: 197 County: WRIGHT

## OWNER INFORMATION

### Company Name:

Owner Name: DONALD TICE

Address:

P.O. Box: RR. 2

City: CLARION

State: IA Zip: 50525

Phone: (515)532-3874

Ownership: Private

## INJECTION WELL INFORMATION AS OF 02/18/91

WELL NUMBER	TYPE	OPERATING STATUS	LOCATION	SURFACE INLETS	TILE SYSTEM	TOTAL DEPTH	CASING DIAMETER	CASING LENGTH	AREA DRAINED	PRIMARY QUADRANGLE
001	01	AC	T92N, R24W, Section 16, SE	N	Y	254	6	0	0	HUMBOLDT, IOWA 1:100,000
002	01	AC	T92N, R24W, Section 16, SE	N	Y	244	7	0	0	HUMBOLDT, IOWA 1:100,000

## KEY:

TYPE - 01 = Agricultural Drainage Well

11 = Septic Tank

28 = Automotive Service Waste Disposal Well

OPERATING STATUS - AC = Active

TA = Temporarily Abandoned

PA = Permanently Abandoned

N.R.

495  
T-754

1 108.8

NHEL

498  
T-753

2911  
T-747

CRP

11A 6.0  
NHEL

1B 158.2 NHEL

N.C.

2 24.5

NHEL

2 64.2

NHEL

1 131.6

NHEL

512  
T-745

N.C.

2791  
T-760

Stantery

NOT TO SCALE ( 1990 FLIGHT ) WRIGHT COUNTY - CROP YEAR

J-5

# 498

T 72 R 24

ADW No. 9224W16C001

## AGRICULTURAL DRAINAGE WELL DATA

**ADW OWNER:**

Name: Donald Tice  
Street, Box or RR: 1891 Page Ave  
City, State & Zip: Clarion PA 15025  
Phone Number: (515) 532-3874

**AGENT:**

Name: \_\_\_\_\_  
Street, Box or RR: \_\_\_\_\_  
City, State & Zip: \_\_\_\_\_  
Phone Number: (\_\_\_\_) \_\_\_\_\_

**ADW LOCATION:**

SE 1/4, of the SW 1/4, Section 16, T 92 N, R 24 W

**Well Head**

Location: 2100' W of the SW corner of section 16 and 850' N

Coordinates: \_\_\_\_\_

General Condition: Good shape.  
Cement cistern covered with wood planks

Cistern Dimensions: 5' x 5' Cistern Depth: 10'

Well Diameter: 7" Well Depth: 244

Cistern cover (padlock no) Yes ☒ or No ☐

Side walls above high pond Yes ☒ or No ☐

Side walls sealed Yes ☐ or No ☒

Mounded/graded to drain away Yes ☐ or No ☒

**Surface Intakes**

Yes ☒ or No ☐ Number of Intakes 11

**Drains Land of  
Others**

Yes ☐ or No ☐ surface intakes

**Other Contaminant  
Sources**

Septic Discharge: no Manure Runoff: no Other: \_\_\_\_\_

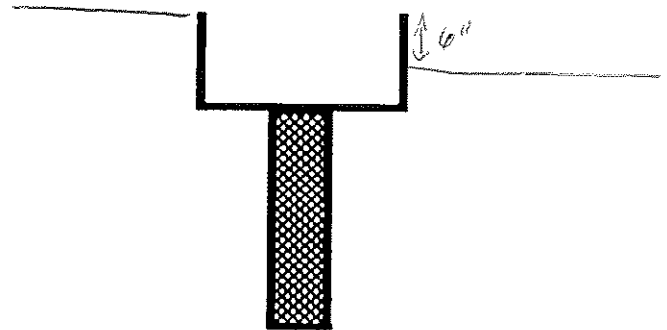
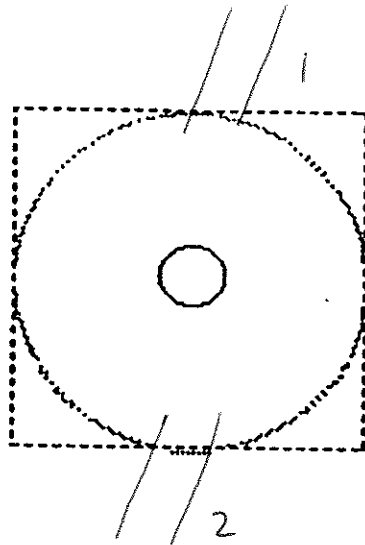
**Comments**

\_\_\_\_\_  
\_\_\_\_\_

ADW No. 9224W/62001

Well #2 SW

# WELL HEAD SKETCH



no surface with  
Cement cistern w/wood planks

## TILE DATA

Line #	Diameter	Entry Depth
1.	12"	8'
2.	10"	9'
3.		
4.		

## CISTERN

Shape Square  
 Dimensions 5' x 5'  
 Depth 10'

## WELL BORE

Diameter 7"  
 Depth 244'

# DRAINAGE SKETCH

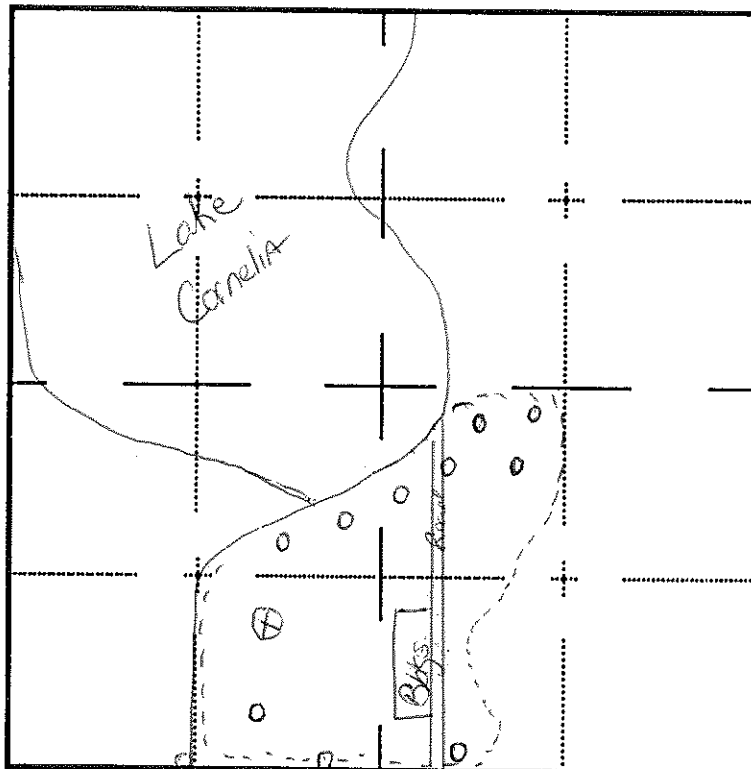
		B	A
B		A	
		C	D
C		D	

EXAMPLE  
QQ Section Coding

Well ⊗

Surface Intake ○

Drainage - - - - -



Agricultural Drainage Well Registration Form  
(Please print in ink or type)

92 24W 16DD 01

EE Ack 2/2

- 1) LOCATION OF DRAINAGE WELL (Attach aerial photo if necessary-see instructions)

no, 1 ~~SE~~ SW 16 92N 24 W right  
no, 2 SE 1/4 of the SE 1/4, Section 16, T92N, R24, Wright County

- 2) NAME AND ADDRESS OF DRAINAGE WELL OWNER

Name Donald Tice  
Street, RR or Box RR 2  
City and State Clarion, Iowa  
Zip Code 50525  
Phone (515) 532-3874

- 3) NAME AND ADDRESS OF AUTHORIZED AGENT  
(leave blank if not appropriate)

Name \_\_\_\_\_  
Street, RR or Box \_\_\_\_\_  
City and State \_\_\_\_\_  
Zip Code \_\_\_\_\_  
Phone ( ) \_\_\_\_\_

- 4) INDICATE BELOW THE AMOUNT OF LAND DRAINED BY THE DRAINAGE WELL

LAND OWNED BY THE WELL OWNER 165 ACRES  
LAND NOT OWNED BY THE WELL OWNER 110 ACRES  
TOTAL AMOUNT OF LAND DRAINED 275 ACRES ) these are  
Purely Grasses

- 5) OF THE LAND DRAINED BY THE DRAINAGE WELL, GENERALLY WHAT PERCENTAGE IS IN CONTINUOUS ROW CROP (Include any set-aside acres that normally would be in row crop production) 99 % ?

- 6) WHAT TYPE OF DRAINAGE WATER ENTERS THE DRAINAGE WELL? CHECK ONE



TILE DRAINAGE  
ONLY



SURFACE WATER  
ONLY



BOTH TILE AND  
SURFACE WATER

7) TO YOUR KNOWLEDGE, HOW CLOSE IS THE NEAREST WATER SUPPLY WELL FOR HUMAN CONSUMPTION TO THE DRAINAGE WELL? CHECK ONE.

☐

1/8 mile  
or less

☐

1/8 to  
1/4 mile

☒

1/4 to  
1/2 mile

☐

1/2 to  
1 mile

☐

1 mile  
or more

8) HOW DEEP IS THE DRAINAGE WELL? no. 1 244 ft.

no. 2 254

COMMENTS:

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Donald C. Fine  
Signature of ☒ owner ☐ agent  
(check one)

Dec 10, 1987  
Date

DEPARTMENT OF  
NATURAL RESOURCES

DEC 28 AM 10 04

# EPA Region VII - Injection Well Tracking System

Facility I.D. Number: IAS197500014

## SITE INFORMATION

Facility Name:

Contact Name: DONALD TICE

Address:

P.O. Box: RR. 2

City: CLARION

State: IA

Zip: 50525

Phone: (515)532-3874

County FIPS Code: 197 County: WRIGHT

## OWNER INFORMATION

Company Name:

Owner Name: DONALD TICE

Address:

P.O. Box: RR. 2

City: CLARION

State: IA

Zip: 50525

Phone: (515)532-3874

Ownership: Private

## INJECTION WELL INFORMATION AS OF 02/18/91

WELL NUMBER	TYPE	OPERATING STATUS	LOCATION	SURFACE INLETS	TILE SYSTEM	TOTAL DEPTH	CASING DIAMETER	CASING LENGTH	AREA DRAINED	PRIMARY QUADRANGLE
001	01	AC	T92N, R24W, Section 16, SE	N	Y	254	6	0	0	HUMBOLDT, IOWA 1:100,000
002	01	AC	T92N, R24W, Section 16, SE	N	Y	254	7	0	0	HUMBOLDT, IOWA 1:100,000

KEY: TYPE - 01 = Agricultural Drainage Well

11 = Septic Tank

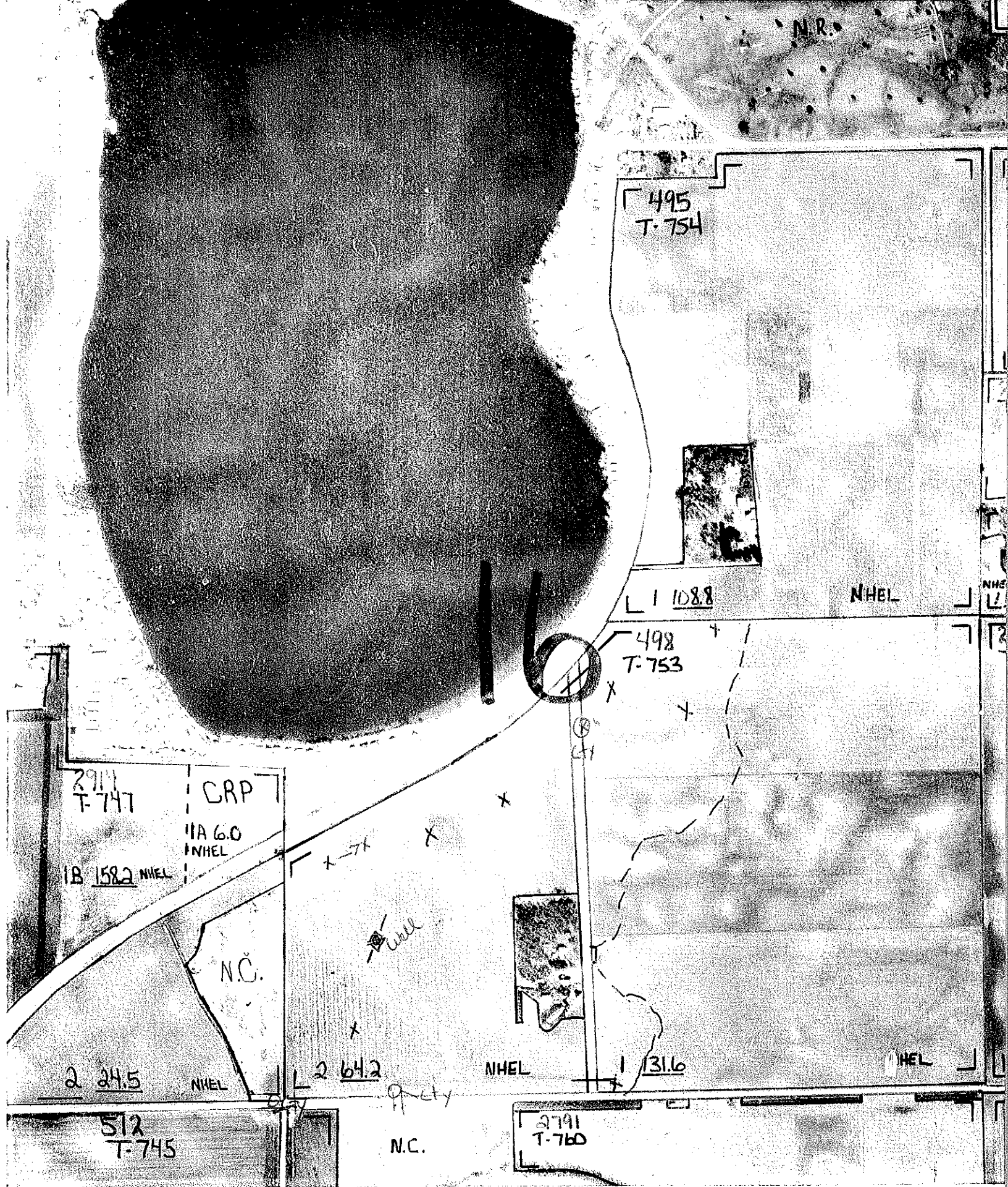
28 = Automotive Service Waste Disposal Well

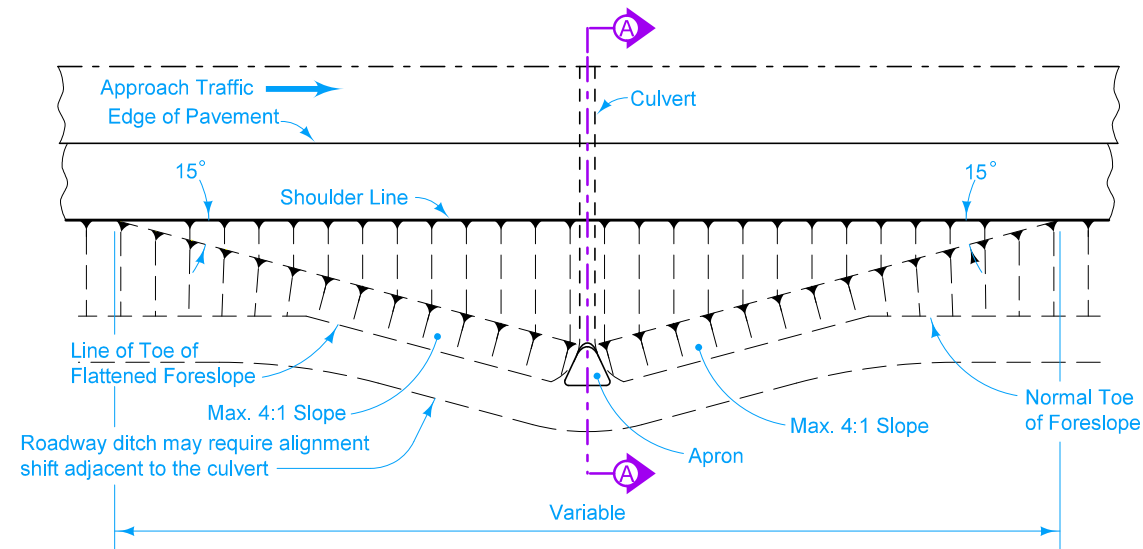
OPERATING STATUS - AC = Active

TA = Temporarily Abandoned

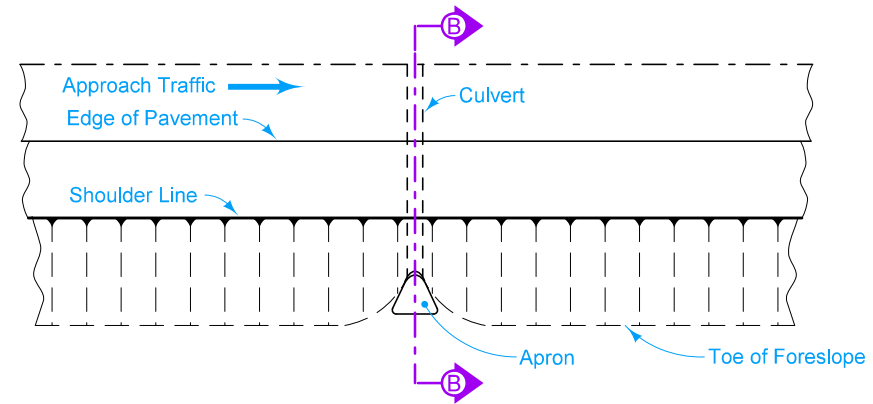
PA = Permanently Abandoned



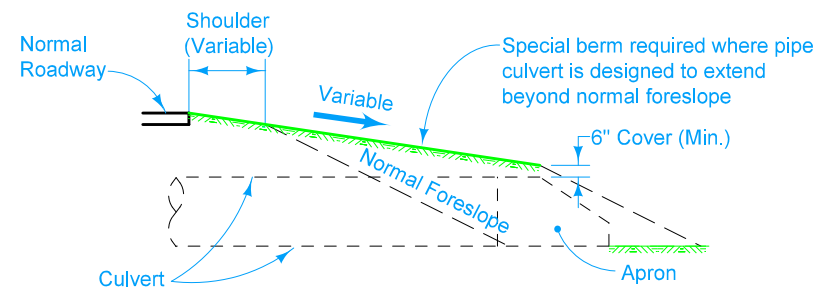




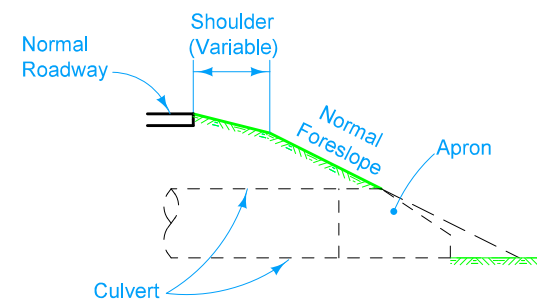
TYPICAL INSTALLATION PLAN  
WHERE SPECIAL BERM IS REQUIRED



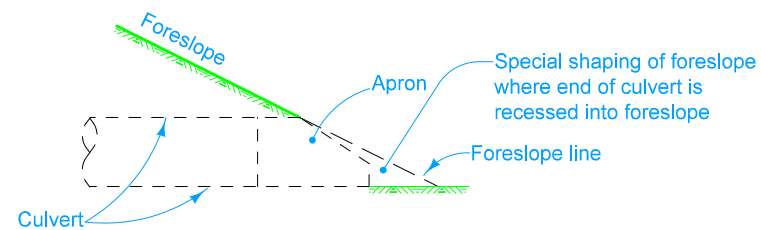
TYPICAL INSTALLATION PLAN  
WHERE CULVERT MATCHES NORMAL FORESLOPE




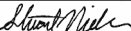
SECTION A-A

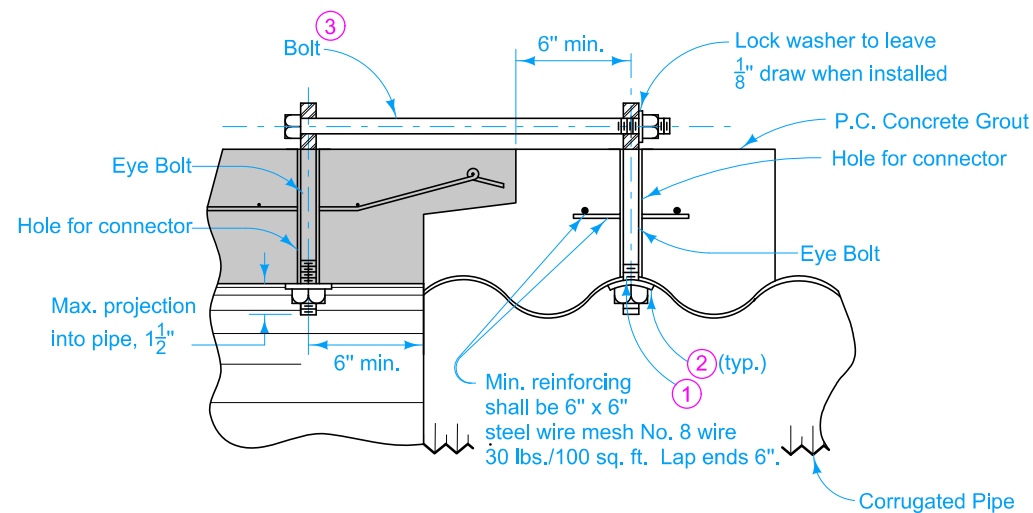


SECTION B-B

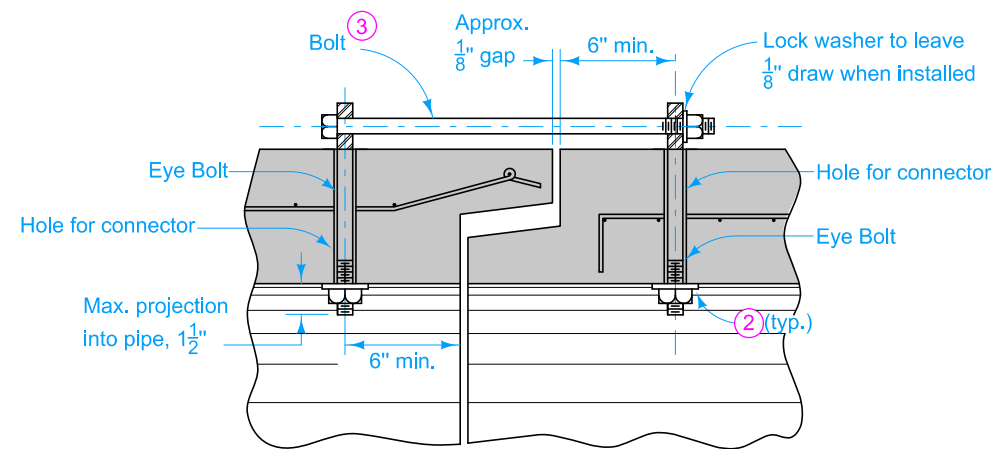


DETAIL OF SHAPING EARTH FORESLOPE  
AT CULVERT END

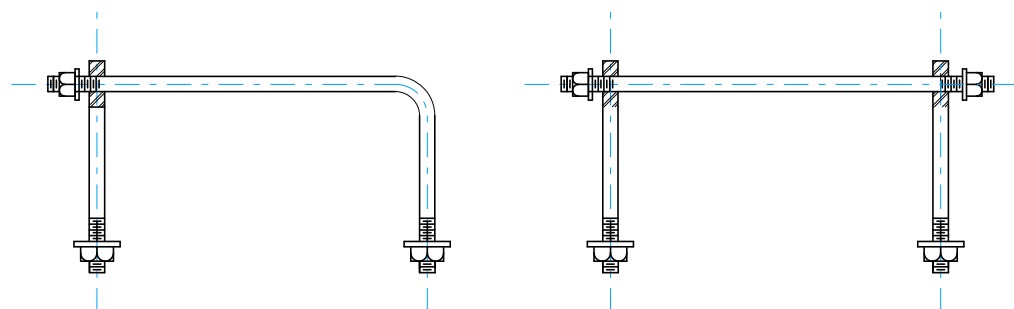
 <b>IOWA DOT</b>	REVISION	
	New	04-21-15
	<b>DR-103</b>	
SHEET 1 of 1		
<b>STANDARD ROAD PLAN</b>		
REVISIONS:      New. Replaces RF-30C.		
		
APPROVED BY DESIGN METHODS ENGINEER		
<div><b>PIPE CULVERT</b> <b>(INSTALLATION DETAILS)</b></div>		



SECTION OF PIPE CONNECTOR  
(Concrete Pipe to Corrugated Pipe)



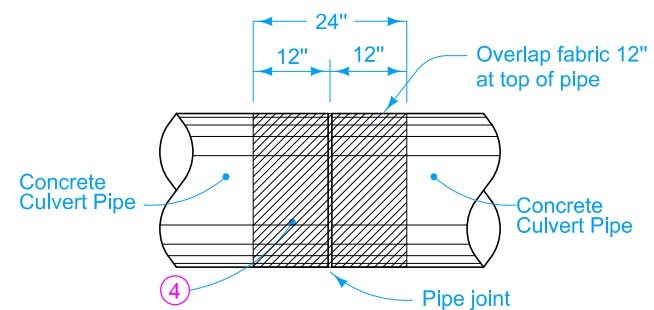
SECTION OF PIPE CONNECTOR  
(Concrete Pipe to Concrete Pipe)



ONE BEND END

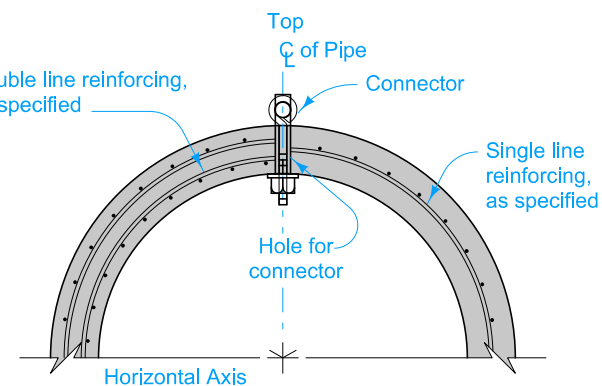
THREADED AT BOTH ENDS

OPTIONAL BOLTS/CONNECTORS

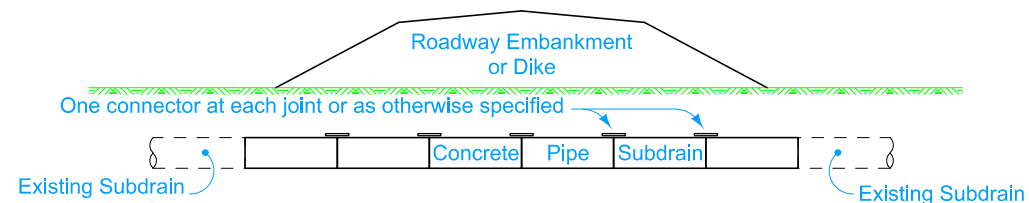


PIPE JOINT WRAPPING

PIPE SIZE (in)	CONNECTOR AND BOLT SIZE (in.)	HOLE FOR CONNECTOR (in.)
12 to 27	5/8	7/8
30 to 60	3/4	1.0
66 to 132	1.0	1 1/4



TYPICAL SECTION  
(Non-Sealed Joint)



TYPICAL INSTALLATION

TYPE 1 CONNECTION

Wrap all joints on concrete roadway pipe culverts.

Use Type 3 Connections on all culvert pipes, unless specified otherwise. Refer to Materials I.M. 445.01 for Connector requirements.

Minimum 2 threads showing at all threaded ends.

Connections not required on pipe sections installed by trenchless methods.

For belled concrete pipe joints, connectors may be installed on the inside of the pipe.

#### TYPE 1

One connector at the top of the pipe section.

#### TYPE 2 (Sealed Joint)

Two connectors near the top of the pipe section. For details of reinforcement, refer to AASHTO M 170 for the class of pipe required. Refer to Materials I.M. 491.09 for seal requirements.

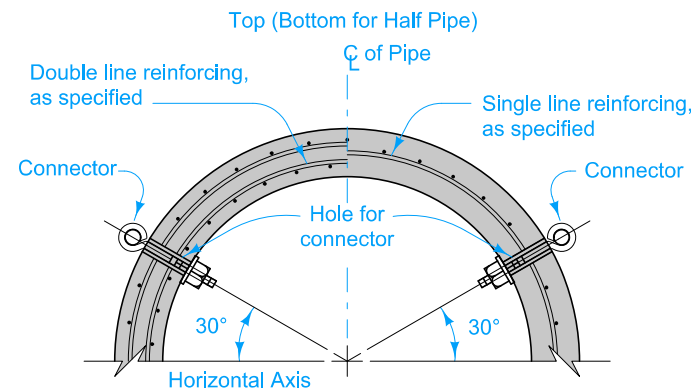
#### TYPE 3 (Non - Sealed Joint)

Two connectors near the top of the pipe section. For details of reinforcement, refer to AASHTO M 170 for the class of pipe required.

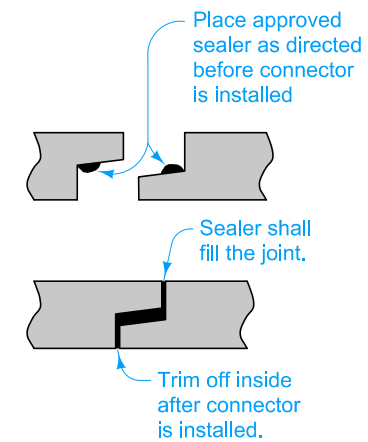
- If holes are field drilled, place a ribbon of butyl sealant around bolts before placing 3 in. x 3 in. x 1/4 in. plate on bolts through corrugated metal pipe and tightening nuts.
- 1 3/4 inch round x 9/64 inch thick washer or 3 in. x 3 in. x 1/4 in. square plate (shaped to pipe radius).
- Connectors with One Bend End and Bell End spacers allowed per Materials I.M. 451. Refer to Optional Bolts detail.
- Engineering fabric for embankment erosion control.

Possible Tabulations:  
104-3  
104-5B

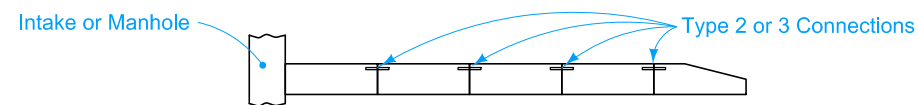
IOWA DOT	REVISION	
	4	04-18-23
STANDARD ROAD PLAN		DR-121
REVISIONS:		SHEET 1 of 2
Corrected title.		
APPROVED BY DESIGN METHODS ENGINEER		
CONNECTED PIPE JOINTS		



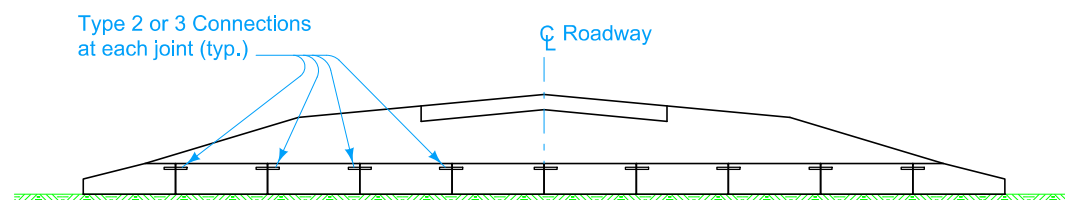
**TYPICAL SECTION  
TYPE 2 CONNECTION  
TYPE 3 CONNECTION**



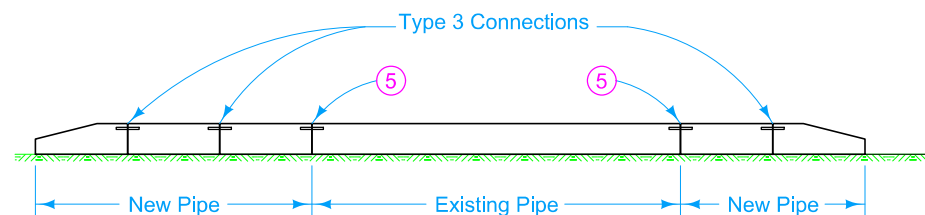
**SEALED JOINT  
TYPE 2 CONNECTION**



**TYPICAL INSTALLATION  
STORM SEWER OUTLET - TYPE 2 OR TYPE 3 CONNECTION**




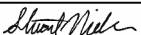
**TYPICAL INSTALLATION  
NEW CONSTRUCTION - TYPE 2 or 3 CONNECTION**

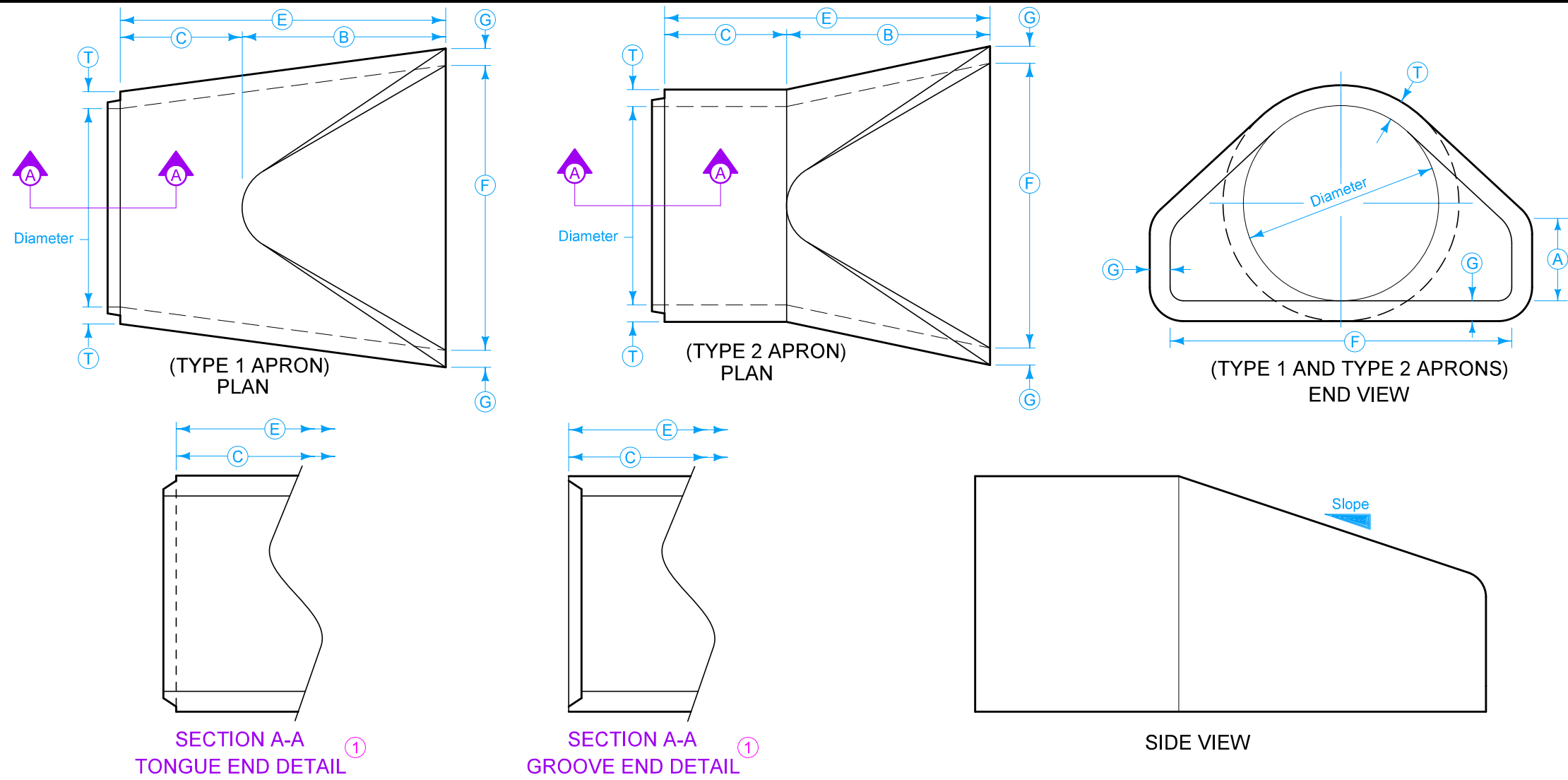


**TYPICAL INSTALLATION  
PIPE EXTENSION - TYPE 3 CONNECTION**

TYPE 2 AND TYPE 3 CONNECTIONS

- ⑤ On culvert extensions, connect all new joints including the joint between the old and new culvert pipe. Holes may need to be drilled into existing pipes.

 <b>IOWA DOT</b>	REVISION	
	4	04-18-23
	<b>DR-121</b>	
	SHEET 2 of 2	
<b>STANDARD ROAD PLAN</b>		
REVISIONS:      Corrected title.		
		
APPROVED BY DESIGN METHODS ENGINEER		
<b>CONNECTED PIPE JOINTS</b>		



Dimension 'E' shown is the minimum and is considered the design length. Adjust for any difference between the actual length of concrete apron installed and the length indicated hereon within the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on [DR-121](#).

When specified in the contract documents, install pipe apron guards as shown on [DR-213](#). Pipe apron guards are incidental to "Concrete Aprons".



① Tongue end used on inlet end section. Groove end used on outlet end section.

TYPE 1 APRONS								
DIAM.	SLOPE	A	B	MINIMUM		F	G	T
				C	E			
12"	2.4:1	4"	2'-0"	4'- $\frac{7}{8}$ "	6'- $\frac{7}{8}$ "	2'-0"	2"	2"
15"	2.4:1	6"	2'-3"	3'-10"	6'-1"	2'-6"	2 $\frac{1}{4}$ "	2 $\frac{1}{4}$ "
18"	2.3:1	9"	2'-3"	3'-10"	6'-1"	3'-0"	2 $\frac{1}{2}$ "	2 $\frac{1}{2}$ "
21"	2.4:1	9"	3'-0"	3'-1 $\frac{1}{2}$ "	6'-1 $\frac{1}{2}$ "	3'-5"	3"	3"
24"	2.5:1	9 $\frac{1}{2}$ "	3'-7 $\frac{1}{2}$ "	2'-6"	6'-1 $\frac{1}{2}$ "	4'-0"	3"	3"
27"	2.5:1	10 $\frac{1}{2}$ "	4'-1"	2'-0"	6'-1 $\frac{1}{2}$ "	4'-4"	3 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "
30"	2.5:1	12"	4'-6"	1'-7 $\frac{3}{4}$ "	6'-1 $\frac{3}{4}$ "	5'-0"	3 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "
36"	2.5:1	15"	5'-3"	2'-9"	8'-0"	6'-0"	4"	4"
42"	2.5:1	21"	5'-3"	2'-9"	8'-0"	6'-6"	4 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "
48"	2.5:1	24"	6'-0"	2'-0"	8'-0"	7'-0"	5"	5"
54"	1.8:1	27"	5'-0"	3'-0"	8'-0"	7'-6"	5 $\frac{1}{2}$ "	5 $\frac{1}{2}$ "
60"	1.6:1	29 $\frac{1}{2}$ "	5'-0"	3'-0"	8'-0"	8'-0"	5 $\frac{1}{2}$ "	6"
66"	1.7:1	30"	6'-0"	2'-3"	8'-3"	8'-0"	5 $\frac{1}{2}$ "	6"
72"	1.6:1	30"	6'-6"	1'-9"	8'-3"	9'-0"	6"	7"
78"	1.8:1	36"	7'-6"	1'-9"	9'-3"	9'-6"	6 $\frac{1}{2}$ "	7 $\frac{1}{2}$ "
84"	1.3:1	29 $\frac{1}{2}$ "	6'-9"	2'-6 $\frac{1}{2}$ "	9'-3 $\frac{1}{2}$ "	10'-0"	6 $\frac{1}{2}$ "	8"

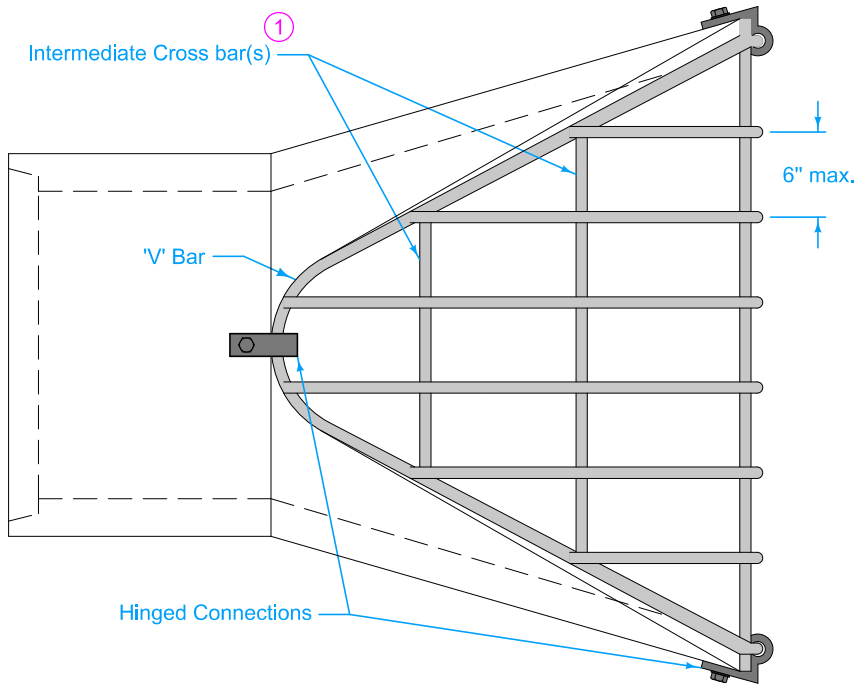
TYPE 2 APRONS								
DIAM.	SLOPE	A	B	MINIMUM		F	G	T
				C	E			
12"	2.4:1	4"	2'-0"	4'- $\frac{7}{8}$ "	6'- $\frac{7}{8}$ "	2'-0"	2"	2"
15"	2.4:1	6"	2'-3"	3'-10"	6'-1"	2'-6"	2 $\frac{1}{4}$ "	2 $\frac{1}{4}$ "
18"	2.3:1	9"	2'-3"	3'-10"	6'-1"	3'-0"	2 $\frac{1}{2}$ "	2 $\frac{1}{2}$ "
21"	2.4:1	9"	3'-0"	3'-1 $\frac{1}{2}$ "	6'-1 $\frac{1}{2}$ "	3'-5"	3"	3"
24"	2.5:1	9 $\frac{1}{2}$ "	3'-7 $\frac{1}{2}$ "	2'-6"	6'-1 $\frac{1}{2}$ "	4'-0"	3"	3"
27"	2.5:1	10 $\frac{1}{2}$ "	4'-1"	2'-0"	6'-1 $\frac{1}{2}$ "	4'-4"	3 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "
30"	2.5:1	12"	4'-6"	1'-7 $\frac{3}{4}$ "	6'-1 $\frac{3}{4}$ "	5'-0"	3 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "
36"	2.5:1	15"	5'-3"	2'-9"	8'-0"	6'-0"	4"	4"
42"	2.5:1	21"	5'-3"	2'-9"	8'-0"	6'-6"	4 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "
48"	2.5:1	24"	6'-0"	2'-0"	8'-0"	7'-0"	5"	5"
54"	1.9:1	24 $\frac{1}{2}$ "	5'-5"	2'-7"	8'-0"	7'-6"	5 $\frac{1}{2}$ "	5 $\frac{1}{2}$ "
60"	1.4:1	24 $\frac{1}{2}$ "	5'-0"	3'-0"	8'-0"	8'-0"	5 $\frac{1}{2}$ "	6"
66"	1.7:1	30"	6'-0"	2'-3"	8'-3"	8'-0"	5 $\frac{1}{2}$ "	6"
72"	1.4:1	24"	6'-6"	1'-9"	8'-3"	9'-0"	6"	7"
78"	1.8:1	36"	7'-6"	1'-9"	9'-3"	9'-6"	6 $\frac{1}{2}$ "	7 $\frac{1}{2}$ "
84"	1.5:1	23 $\frac{1}{2}$ "	7'-6 $\frac{1}{2}$ "	1'-9"	9'-3 $\frac{1}{2}$ "	10'-0"	6 $\frac{1}{2}$ "	8"

Contract Item:  
Apron, Concrete

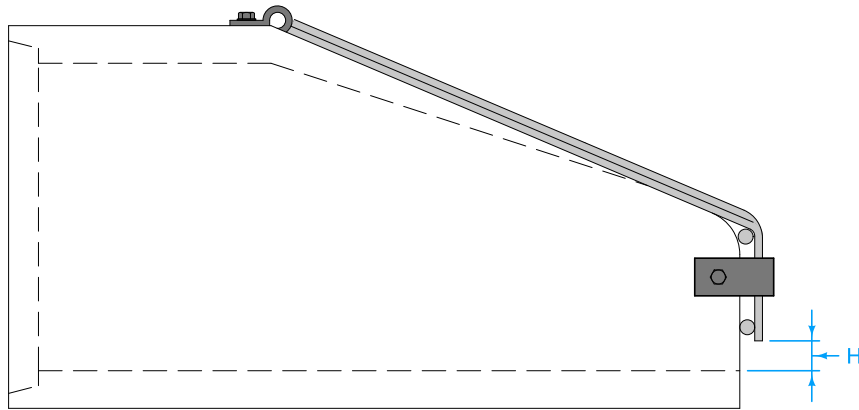
Tabulations:  
[104-3](#)  
[104-5C](#)

 <b>IOWA DOT</b>	REVISION	
	2	04-21-20
	<b>DR-201</b>	
	SHEET 1 of 1	
REVISIONS:      Added Designer Info button.		
		
APPROVED BY DESIGN METHODS ENGINEER		
<b>CONCRETE APRONS</b>		

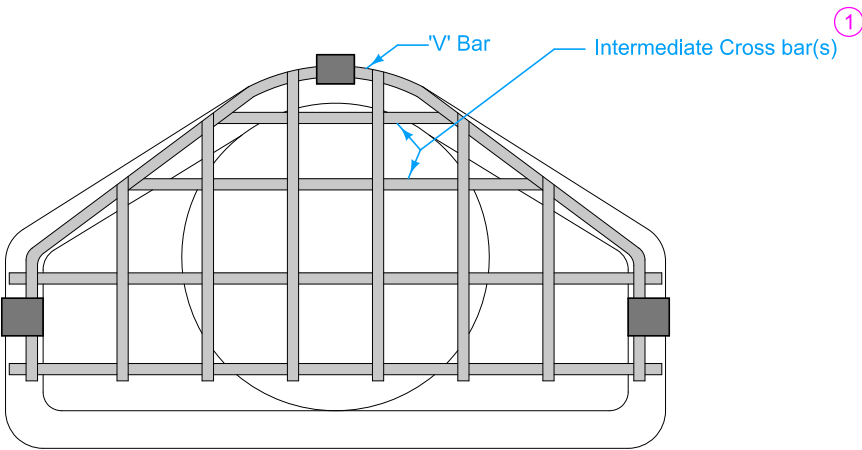




PLAN



PROFILE



FRONT (Round Shown)

ROUND		ARCH		ELLIPTICAL	
PIPE SIZE	H	PIPE SIZE	H	PIPE SIZE	H
12"	2½"	22" x 14" to 29" x 18"	4"	23" x 14" to 30" x 19"	4"
15"	3"	37" x 23" to 44" x 27"	5"	38" x 24" to 45" x 29"	5"
18" - 24"	4"	52" x 32" to 65" x 40"	6"	53" x 34" to 68" x 43"	6"
27" - 36"	5"	73" x 45" to 88" x 54"	7"	76" x 48" to 91" x 58"	7"
42" - 54"	6"				
60" - 72"	7"				
78" - 90"	8"				

BAR SIZES				
	PIPE SIZE	HOLE DIA. REQ'D.	BOLT DIA.	BAR SIZE
ROUND	12" - 24"	¾"	⅝"	¾"
	27" - 48"	⅞"	¾"	1"
	54" - 90"	1⅛"	1"	1¼"
ARCH	up to 29" x 18"	¾"	⅝"	¾"
	37" x 23" to 59" x 36"	⅞"	¾"	1"
	65" x 40" to 88" x 54"	1⅛"	1"	1¼"
ELLIPTICAL	up to 30" x 19"	¾"	⅝"	¾"
	38" x 24" to 60" x 38"	⅞"	¾"	1"
	68" x 43" to 91" x 58"	1⅛"	1"	1¼"
BOLT LENGTH = PIPE WALL THICKNESS + 2½"				

Provide guard dimensions to fit with Type of apron provided (DR-201, DR-202, DR-205, or DR-206). 'V' Bar is to completely rest on apron.


Use Grade 40, Grade 60 or merchant quality, smoothed or deformed steel bars in construction of the guard. Comply with fabrication requirements of Section 2404 of the Standard Specifications.

Hot-dip galvanize the completed apron guard according to ASTM A123.

Use bolts, nuts, washers, and fasteners complying with Article 4153.06 of the Standard Specifications.

- ① All guards are to have at least one intermediate cross bar. If pipe size is 60 inches or greater, use two intermediate cross bars equally spaced.

Possible Tabulation:  
104-3



STANDARD ROAD PLAN

REVISIONS: Modified note about grade of steel.

APPROVED BY DESIGN METHODS ENGINEER

REVISION

310-18-22

DR-213

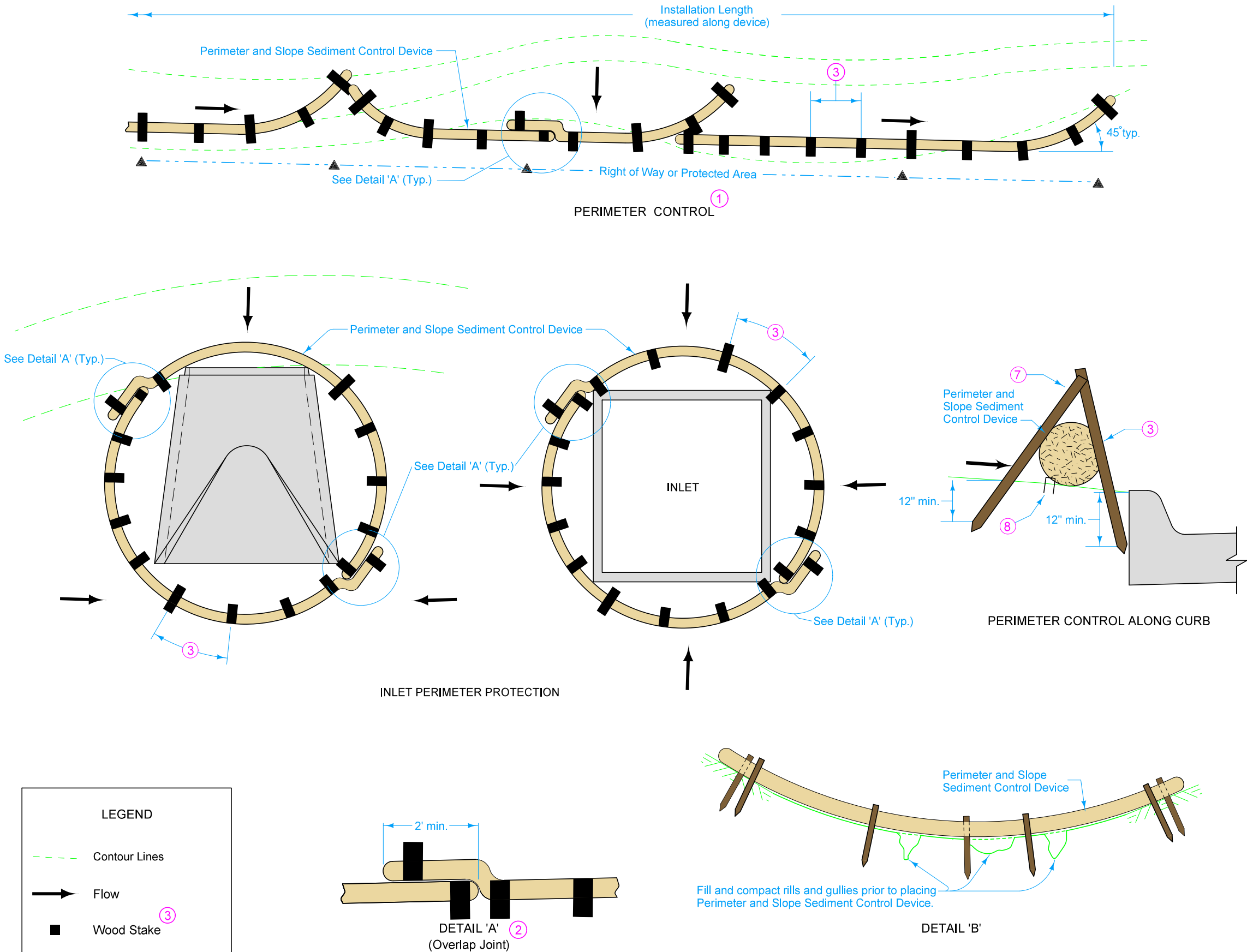
SHEET 1 of 1

PIPE APRON GUARD

Not intended for use in perennial or intermittent streams.



Fill and compact rills and gullies (see Detail 'B') prior to placing Perimeter and Slope Sediment Control Device. Ensure ground surface is smooth in order to provide continuous contact with Perimeter and Slope Sediment Control Device. Minor ground shaping may be required. Filling and compacting rills and gullies, and minor ground shaping, is incidental to Perimeter and Slope Sediment Control Device.

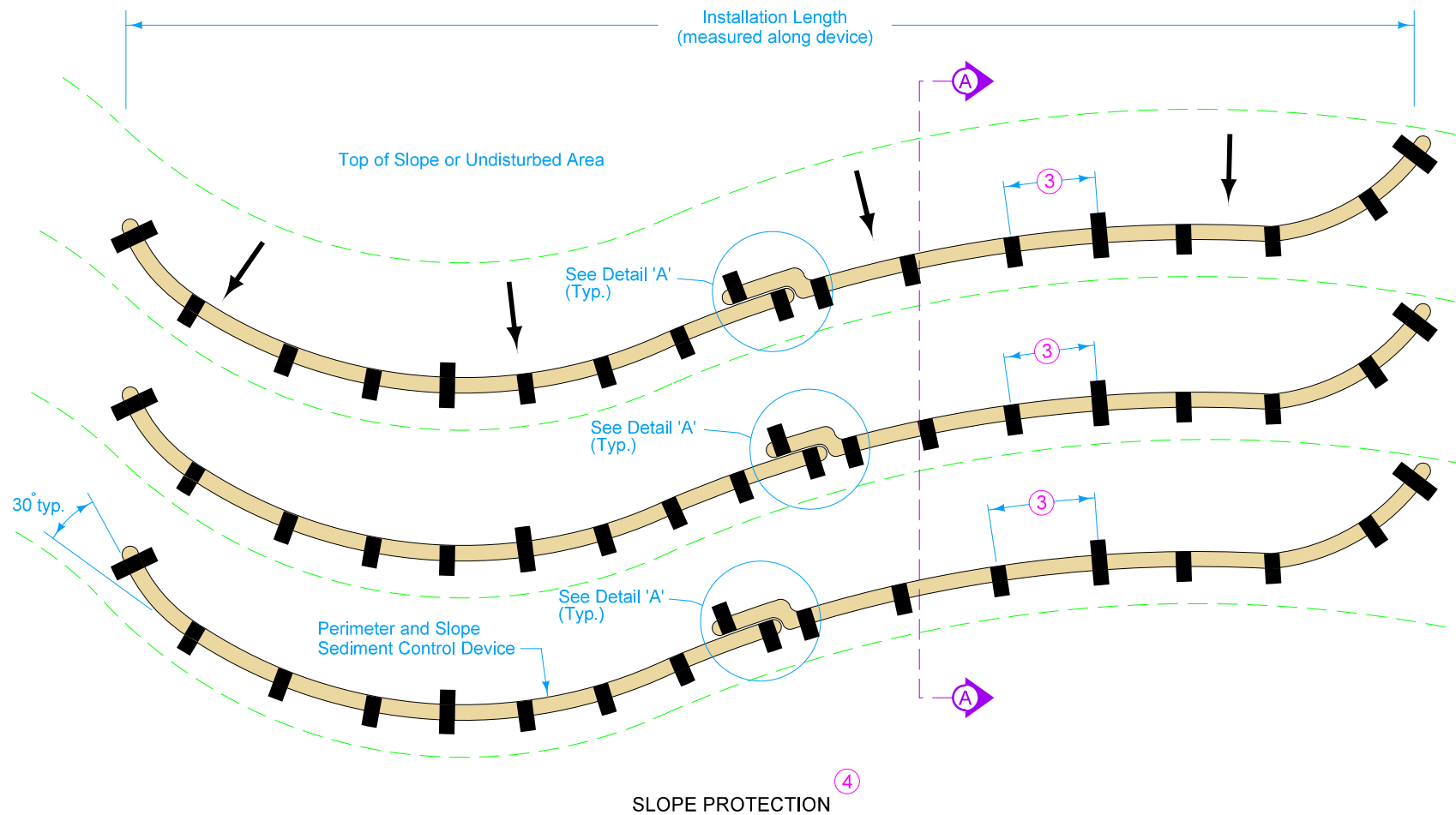
- 1 Overlap joints per Detail 'A'. Turn the lower 10 feet of each run up the slope to help contain runoff. When placed such that runoff is conveyed along the device, additional run-ups and/or means may be required to reduce erosion along the device. Run-ups will be included in the installation length.
- 2 Extra material required to install overlaps will not be included in the installation length.
- 3 Install downslope stakes at 4 foot maximum spacing. Upslope stakes spaced at ends and middle of device. Use minimum actual stake size 3/4" x 3/4" wood stakes.
- 7 All stakes to be placed at approximately 45 degree angle to ground.
- 8 Install staples every 2 feet on upslope side.



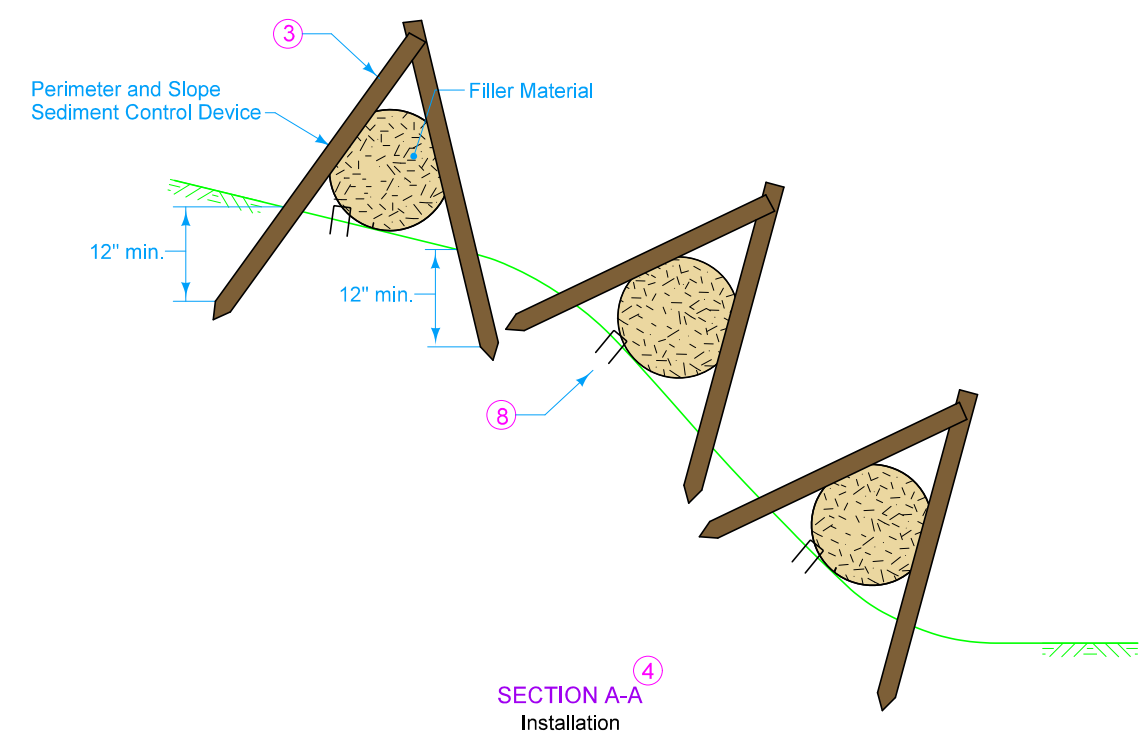
Possible Contract Item:  
Perimeter and Slope Sediment Control Device  
Ditch Check Sediment Control Device

Possible Tabulation:  
100-19

 <b>IOWA DOT</b>	REVISION	
	6	10-19-21
	<b>EC-204</b>	
<b>STANDARD ROAD PLAN</b>		SHEET 1 of 3
REVISIONS:      Changed labeling on Sheet 3.		
		
APPROVED BY DESIGN METHODS ENGINEER		
<b>PERIMETER, SLOPE AND DITCH CHECK SEDIMENT CONTROL DEVICES</b>		



- ③ Install downslope stakes at 4 foot maximum spacing. Upslope stakes spaced at ends and middle of device. Use minimum actual stake size 3/4" x 3/4" wood stakes. Install staples every 2 feet on upslope side.
- ④ Install Slope Protection perpendicular to slope (parallel to contours). Overlap joints per Detail 'A'. Run the last 10 feet of each device up the slope to prevent flow runaround. Run-ups will be included in the installation length.
- ⑧ Install staples every 2 feet on upslope side.



LEGEND

--- Contour Lines

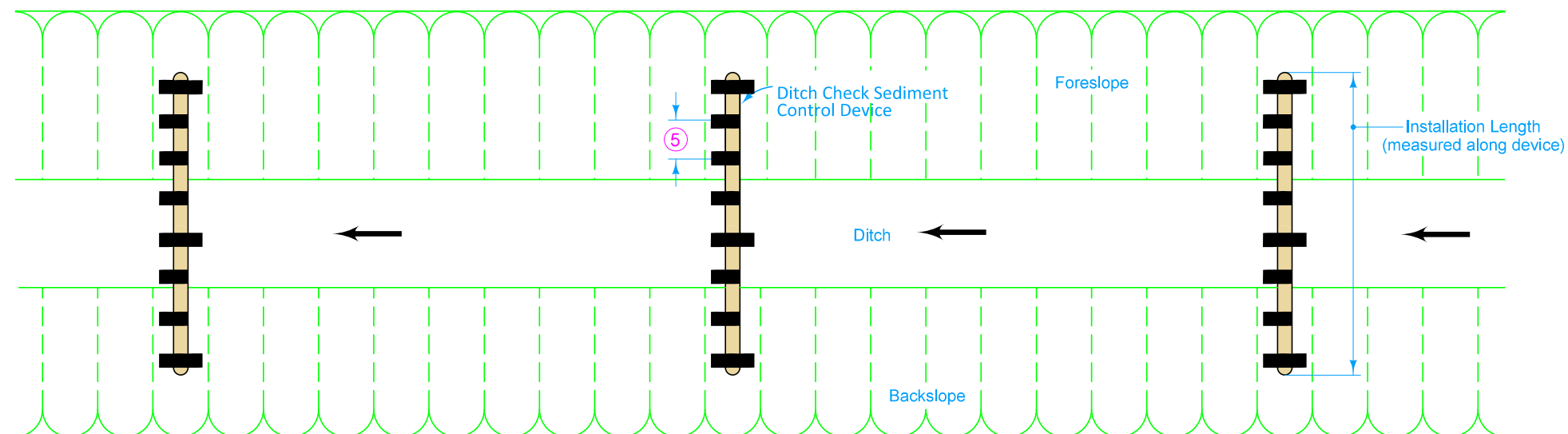
→ Flow

■ Wood Stake

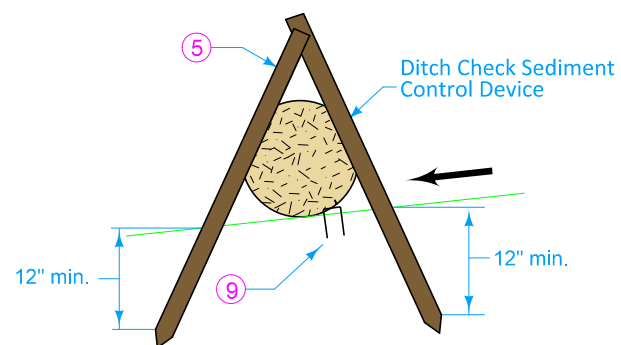
③

	REVISION	
	6	10-19-21
	<div>EC-204</div> <div>SHEET 2 of 3</div>	
REVISIONS:    Changed labeling on Sheet 3.		
<div> </div> <div>APPROVED BY DESIGN METHODS ENGINEER</div>		
<div>PERIMETER, SLOPE AND DITCH CHECK</div> <div>SEDIMENT CONTROL DEVICES</div>		






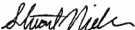
DITCH PROTECTION <sup>6</sup>



INSTALLATION IN DITCH

LEGEND	
<span style="color: green;">---</span>	Contour Lines
<span style="font-size: 2em;">←</span>	Flow
<span style="display: inline-block; width: 10px; height: 10px; background-color: black; margin-right: 5px;"></span>	Wood Stake <sup>5</sup>

- <sup>5</sup> Install downslope stakes at 2 foot maximum spacing. Upslope stakes spaced at ends and middle of device. Use minimum actual stake size 3/4" x 3/4" wood stakes.
- <sup>6</sup> Install Ditch Protection perpendicular to ditch. Overlap joints per Detail 'A'.
- <sup>9</sup> Install staples every 1 foot on upslope side.

 <b>IOWA DOT</b>	REVISION	
	6	10-19-21
	<b>EC-204</b>	
<b>STANDARD ROAD PLAN</b>		SHEET 3 of 3
REVISIONS:      Changed labeling on Sheet 3.		
		
APPROVED BY DESIGN METHODS ENGINEER		
<b>PERIMETER, SLOPE AND DITCH CHECK SEDIMENT CONTROL DEVICES</b>		

SIGN PLACEMENT ON  
TYPE III BARRICADES




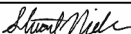
Typical Sign Placement



Sign Placement with  
Supplemental Sign

Possible Contract Items:  
Traffic Control  
Safety Closures  
Portable Dynamic Message Sign

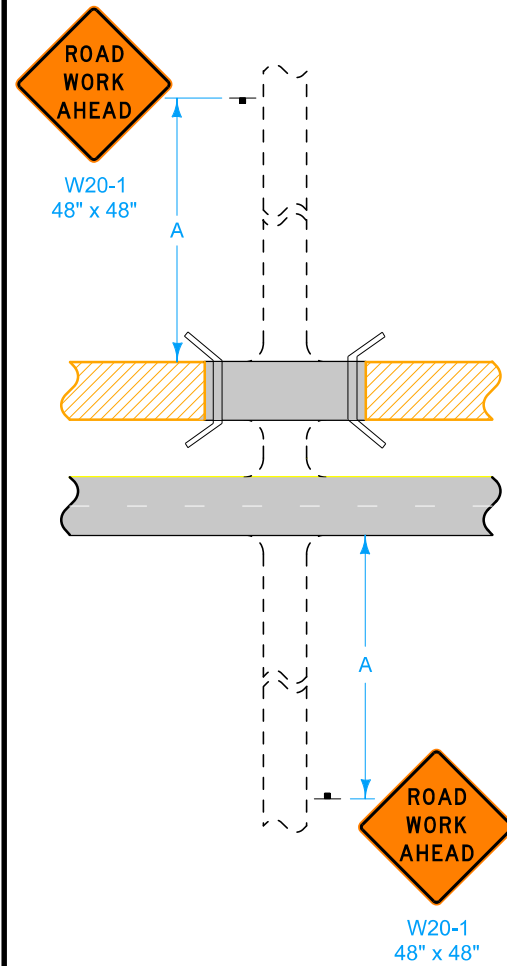
Possible Tabulation:  
[108-13A](#)

 <b>IOWA DOT</b>	REVISION	
	6	04-21-20
	<b>TC-252</b>	
<b>STANDARD ROAD PLAN</b>		SHEET 1 of 3
REVISIONS:      Added Portable Dynamic Message Sign and new note 4 on Sheet 2.		
		
APPROVED BY DESIGN METHODS ENGINEER		
   <		



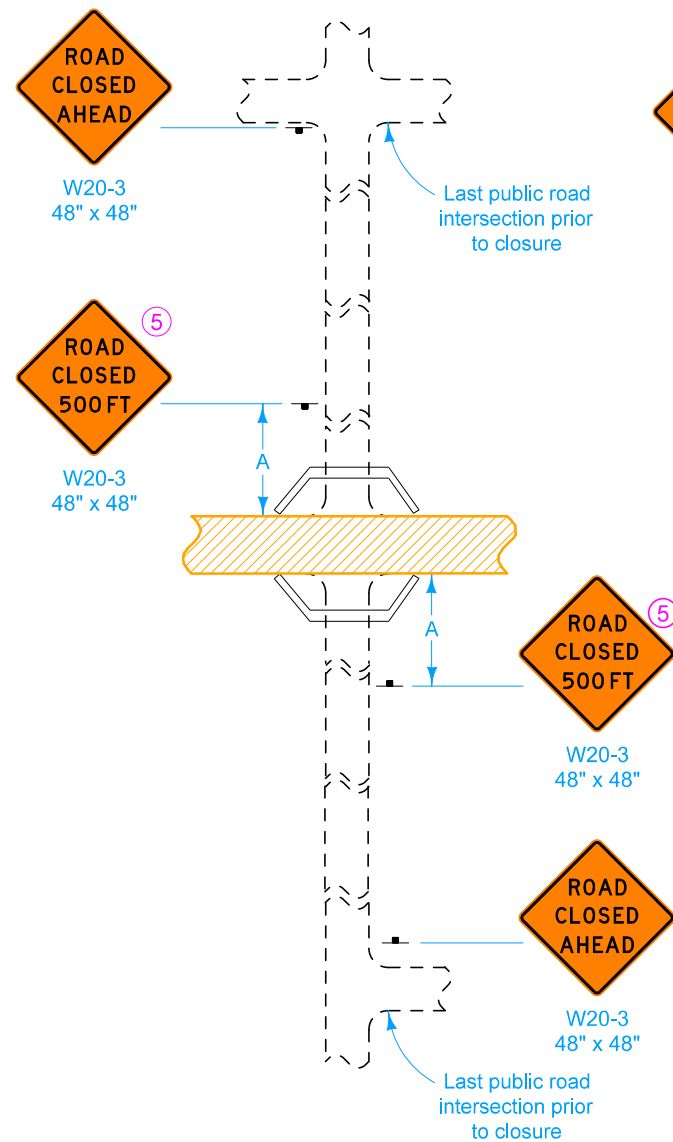
## SITUATION 2

Public cross-traffic maintained.  
No access to project.



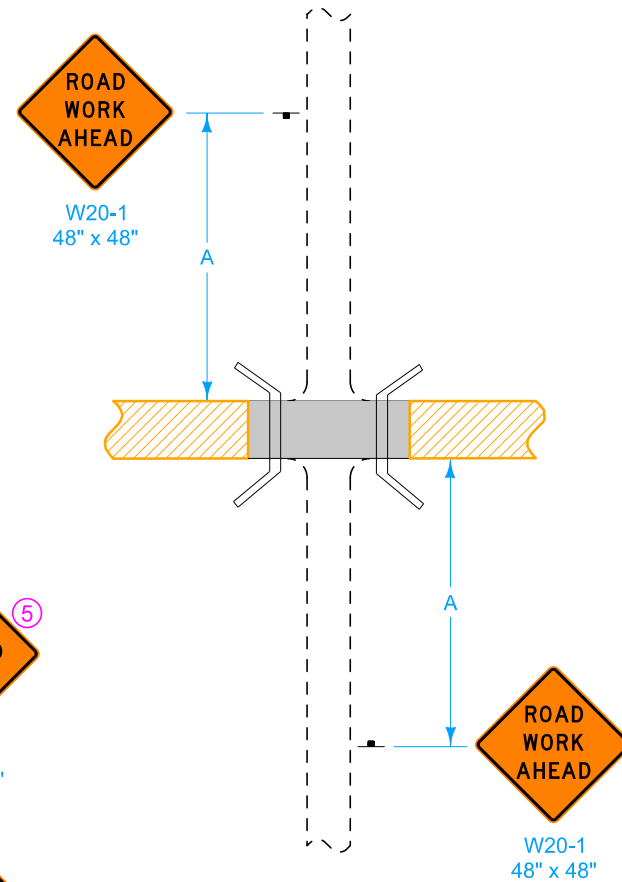
## SITUATION 3

No access to project  
(Applicable to T-intersections)



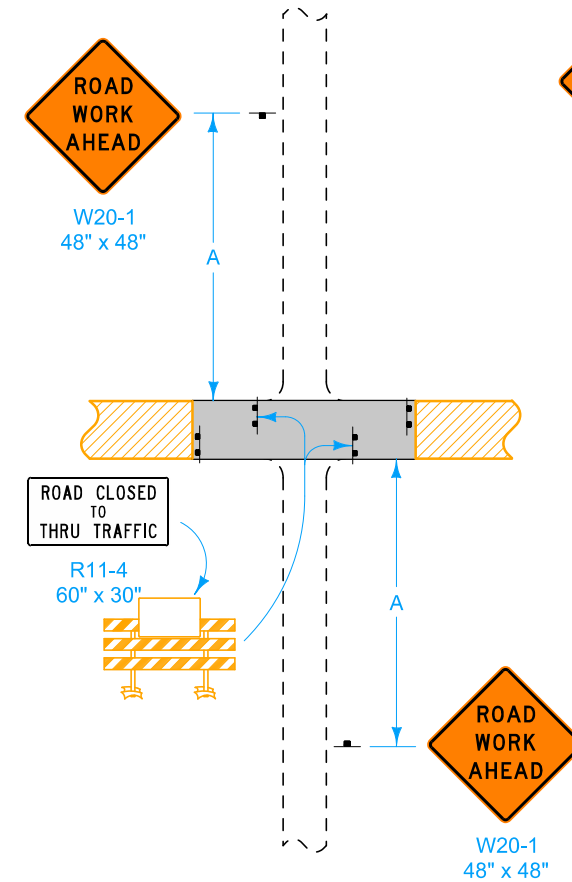
## SITUATION 4

Public cross-traffic maintained.  
No access to project.



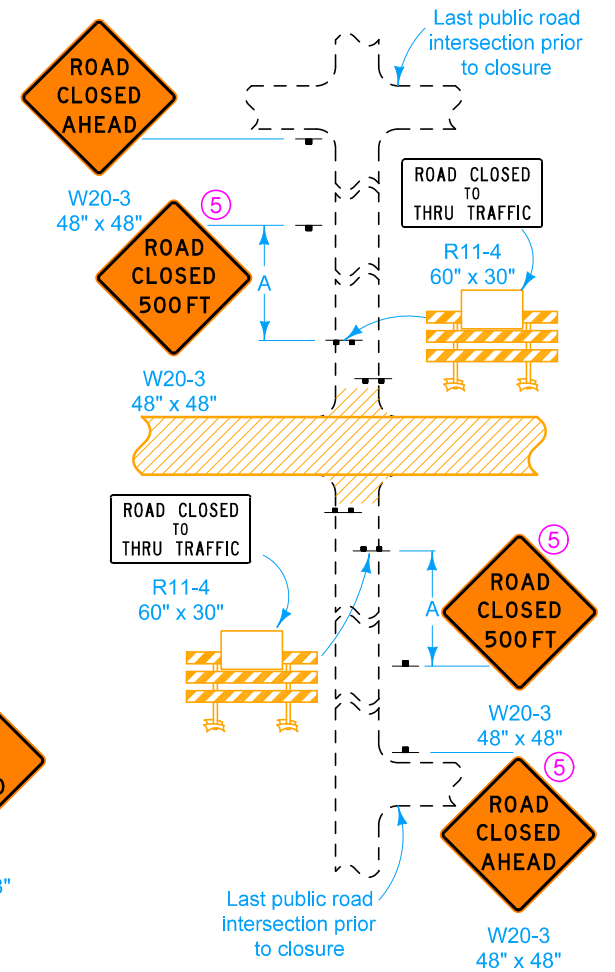
## SITUATION 5

Public cross-traffic maintained.  
Contractor and resident access.



## SITUATION 6

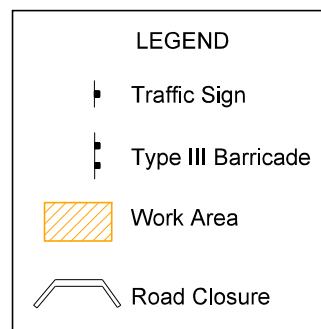
No public access. Contractor and resident access only.  
(Applicable to T-intersections)



During suspension of work, (such as over winter):

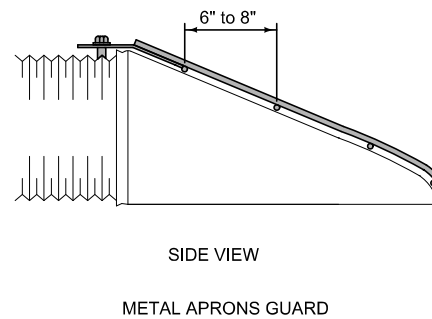
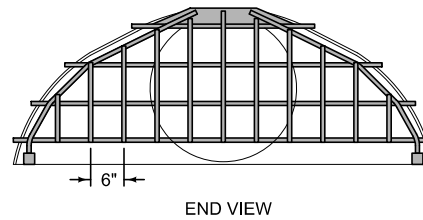
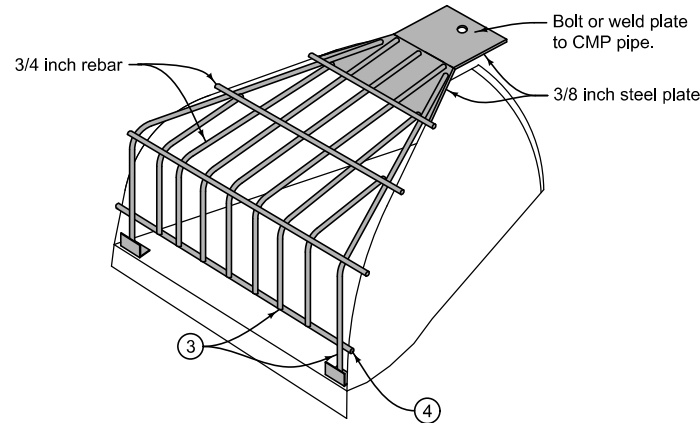
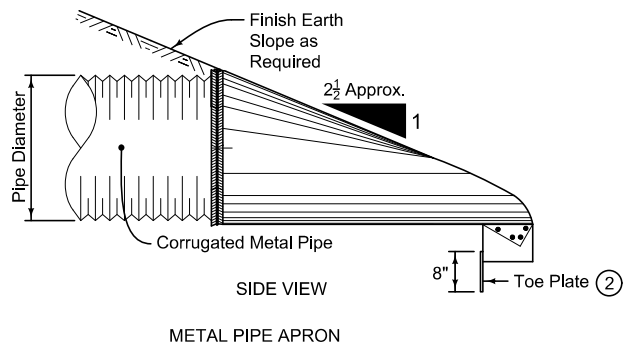
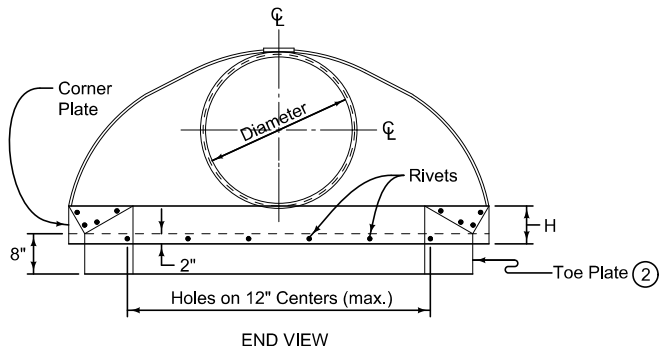
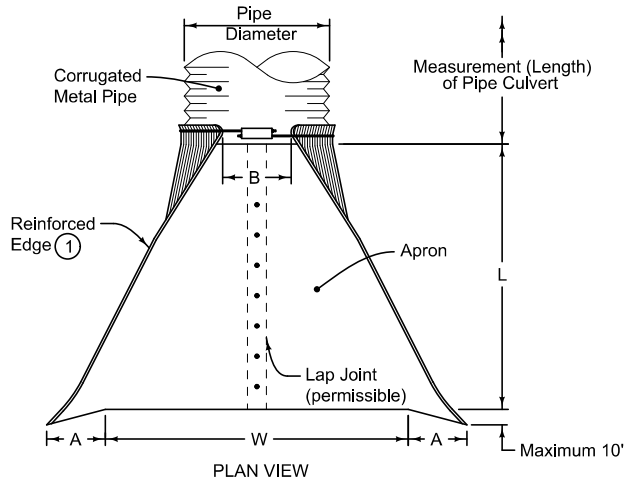
- Use Situation 2 on two-lane to four-lane projects.
- Situation 5 is preferred where cross-traffic is maintained.

⑤ When the distance between the last public road intersection and the ROAD CLOSED or ROAD CLOSED TO THRU TRAFFIC barricade is less than 1,000 feet, omit the ROAD CLOSED 500 FT sign.



Location	A
Urban	200'
Rural	500'

	REVISION	
	6	04-21-20
	<b>TC-252</b>	
SHEET 3 of 3		
REVISIONS: Added Portable Dynamic Message Sign and new note 4 on Sheet 2.		
APPROVED BY DESIGN METHODS ENGINEER		
<b>ROUTES CLOSED TO TRAFFIC</b>		



- ① On sizes 60 inches and larger, supplement the reinforced edge with a galvanized stiffener angle attached with bolts.
- ② Install a galvanized toe plate (of the same gage metal as apron) on all aprons 24 inch diameter and larger.
- ③ Hold inside bars up 3 inches off bottom of apron. Extend outside bars to bottom of apron and attach to 2 inch by 2 inch by 1/4 inch steel angle.
- ④ When specified, extend bottom cross bar through apron.

DIMENSIONS					
PIPE DIAM.	A (±1")	B MAX.	H (±1")	L (±1 1/2")	W (±2")
6"	4 1/2"	1"	3"	8 3/4"	12"
8"	5 7/8"	3"	4"	14 1/4"	16"
10"	7 1/2"	6"	6"	21"	24"
12"	4 3/4"	6"	6"	21"	24"
15"	6"	8"	6"	26"	30"
18"	7"	9"	6"	31"	36"
21"	8 1/4"	11"	6"	36"	42"
24"	9 1/2"	12"	6"	42"	48"
30"	12"	15"	7 1/2"	52 1/2"	60"
36"	14"	18"	9"	63"	72"
42"	16"	21"	10 1/2"	73 1/2"	84"
48"	18"	27"	12"	84"	90"
54"	18"	30"	12"	84"	102"
60"	18"	33"	12"	87"	114"
66"	18"	36"	12"	87"	120"
72"	18"	39"	12"	87"	126"
78"	18"	42"	12"	87"	132"
84"	18"	45"	12"	87"	138"
90"	24"	37"	11"	87"	144"
96"	25"	35"	12"	87"	150"



**SUDAS**

REVISION  
New 10-18-16  
**4030.225**  
SHEET 1 of 1

SUDAS Standard Specifications

METAL PIPE APRONS  
AND APRON GUARDS

## CONSTRUCTION PLANS