



| CMP SIZE AND FOOTING DETAILS     |                                    |                                    |  |                       |
|----------------------------------|------------------------------------|------------------------------------|--|-----------------------|
| (A) RISER PIPE DIAMETER (INCHES) | (E) CMP RISER SLEEVE DIA. (INCHES) | (F) CONCRETE FOOTING SIZE (INCHES) | (G) CONCRETE FOR FOOTING (CUBIC YARDS) | (H) REBAR (LIN. FEET) |
| 12                               | 24                                 | 54 X 54                            | .75                                    | 40                    |
| 15                               | 30                                 | 54 X 54                            | .75                                    | 40                    |
| 18                               | 36                                 | 66 X 66                            | 1.15                                   | 60                    |
| 24                               | 42                                 | 66 X 66                            | 1.15                                   | 60                    |

| (A) RISER PIPE DIAMETER (INCHES) | (I) CONCRETE BETWEEN HDPE RISER & CMP SLEEVE                      |     |     |      |      |      |      |      |  |  |
|----------------------------------|---|-----|-----|------|------|------|------|------|--|--|
|                                  | CONCRETE NEEDED BASED ON RISER HEIGHT ABOVE FOOTING (CUBIC YARDS) |     |     |      |      |      |      |      |  |  |
| 12                               | .21   | .28 | .35 | .42  | .49  | .56  | .63  | .70  |  |  |
| 15                               | .36   | .48 | .60 | .72  | .84  | .96  | 1.08 | 1.2  |  |  |
| 18                               | .51   | .68 | .85 | 1.02 | 1.19 | 1.36 | 1.53 | 1.70 |  |  |
| 24                               | .57   | .76 | .95 | 1.14 | 1.33 | 1.52 | 1.71 | 1.90 |  |  |

**CONSTRUCTION SPECIFICATIONS (CONCRETE):**

**DESCRIPTION**  
The work shall consist of furnishing, forming, placing, finishing and curing Portland cement concrete as shown on the drawings or as specified by the Project Technician.

**MATERIALS (PORTLAND CEMENT)**  
Portland cement shall conform to the requirements of ASTM Specification C-150 or C-595. Unless otherwise specified, cement shall be Type I or I-A. Cement shall be measured in bags of 94 pounds each.

Aggregates shall conform to the requirements of ASTM Specification C-33. The grading of coarse aggregates shall be size 57 or 67.

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

Concrete class shall be 3000 pounds per square inch. It shall include a minimum cement content mix of 5 bags Portland cement per cubic yard of concrete and a maximum net water content of 7 gallons of water per bag of cement.

**MATERIALS (STEEL REINFORCEMENT BARS)**

Steel bars for reinforcement shall be of the size specified and be deformed billet-steel bars conforming to ASTM specification A-615 grade 40 or grade 60. Steel reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. Tack welding of steel reinforcement bars will not be permitted. Metal, high density or structural plastic, or concrete accessories may be used as chairs, hangers, or spacers to support the steel reinforcement bars. Accessories shall be placed in such a manner that they will have a minimum of 3/4 inch of concrete over them. Precast concrete chairs shall be manufactured of the same class as that specified for the structure. Metal accessories shall not be used to separate the steel reinforcement from any metal water control structure, which is required to be embedded in the concrete.

Before steel reinforcement bars are placed, the surface of the bars and any metal supports shall be clean of any loose, flaky rust, mill scale, oil, grease or other coatings or foreign substances. After placement, the steel reinforcement bars shall be maintained in a clean condition until it is completely embedded in the concrete. Concrete shall not be placed until the steel reinforcement bars have been inspected and approved by the Engineer.

**HANDLING AND MIXING**

Concrete shall be uniform and thoroughly mixed when delivered to the work. No additional water in excess of the amount called for by the job mix shall be added to the concrete during mixing, hauling, or after arrival at the delivery point.

**FORMS AND SUBGRADE PREPARATION**

Forms shall be of wood, plywood, steel or other approved material and shall be mortar tight. Prior to placement of concrete, the forms and subgrade shall be free of sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings and the temperature of all surfaces to be in contact with the new concrete shall be no colder than 35° F. Forms shall be coated with a nonstaining form release agent before being set into place. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth or non compacted fill or frozen subgrade will not be permitted.

**CONVEYING AND PLACING**

Concrete shall be delivered to the site and/or discharged into the forms within 1-2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.

The slump shall be 2 to 5 inches. At the time of placement, the air content (by volume) of the concrete shall be 5 to 8 percent.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. Concrete shall not be dropped more than three feet vertically and measures shall be taken to prevent displacement of the water control structure during the placement.

Immediately after the concrete is placed in the forms, it shall be consolidated by spading, hand tamping or vibration as necessary to insure smooth surfaces and dense concrete. After proper curing, forms shall be removed in such a manner as to prevent damage to the concrete.

**CURING**

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period unless a curing compound is applied.

Concrete may be coated with an approved curing compound in lieu of continued application of moisture, except as otherwise specified in construction details. The compound shall be sprayed on the moist concrete surfaces 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. The compound shall be applied at a uniform rate of not less than one gallon per 150 square feet of surface and shall form a continuous adherent membrane over the entire surface.

**CONCRETING IN COLD WEATHER**

Concrete shall not be mixed nor placed when the minimum atmospheric temperature is less than 40° F unless facilities are provided to prevent the concrete from freezing. The use of accelerators or antifreeze compounds will not be allowed.

**CONCRETING IN HOT WEATHER**

The Contractor shall apply effective means to maintain the temperature of the concrete below 90° F during the mixing, conveying and placing.

**DEWATERING**

The work shall consist of constructing cofferdams and dewatering as necessary to permit construction and inspection of the work required by the drawings and specifications. Cofferdam material and methods of construction must be approved by the Project Technician.

Pumping from the interior of any enclosure shall be done in such a manner as to prevent the disturbance of or damage to subsols or any of the construction materials. The pumping method must be approved by the Project Technician. Dewatering is considered incidental to the contract.

Cofferdams shall be entirely removed upon completion of the project without disturbing any portion of the completed work. Cofferdam material may be utilized for fill materials in other construction areas, if approved by the Project Technician; any excess material shall be removed from the site as directed by the Project Technician.

**OTHER:**

**(E) CMP SLEEVE DETAILS**

| (J) OUTLET PIPE DIAMETER (INCHES) | (K) OPENING RADIUS (INCHES) | (L) OPENING HEIGHT (INCHES) |
|-----------------------------------|-----------------------------|-----------------------------|
| 6                                 | 9.1                         | 22.2                        |
| 8                                 | 9.1                         | 22.2                        |
| 12                                | 9.1                         | 22.2                        |
| 15                                | 10.9                        | 25.7                        |
| 18                                | 12.75                       | 29.5                        |

**BILL OF MATERIALS**

| ITEM DESCRIPTION                             | UNIT     | QTY. |
|--|----------|------|
| (A) HDPE RISER PIPE DIAMETER                 | INCHES   |      |
| (B) HDPE RISER PIPE HEIGHT                   | LIN. FT. |      |
| (C) HDPE STUB PIPE DIAMETER                  | INCHES   |      |
| (D) HDPE STUB PIPE LENGTH                    | LIN. FT. |      |
| (E) CMP RISER SLEEVE DIAMETER                | INCHES   |      |
| (B) CMP RISER SLEEVE HEIGHT                  | LIN. FT. |      |
| (G) CONCRETE FOR FOOTING                     | C.Y.     |      |
| (H) REBAR FOR FOOTING                        | LIN. FT. |      |
| (I) CONCRETE BETWEEN HDPE RISER & CMP SLEEVE | C.Y.     |      |

|                             |       |
|-----------------------------|-------|
| Project Name:               |       |
| <b>HDPE RISER STRUCTURE</b> |       |
| Approved By:                | Date: |
| <b>BWSR</b>                 |       |
| <b>NRCs</b>                 |       |
| <b>USFWS</b>                |       |

|  |            |    |                 |
|--|------------|----|-----------------|
| Estimate OR Project No.  | Plan Sheet | of | DWG# MN-ENG-211 |
| Prepared by Minnesota Board of Water & Soil Resources-Rev 09/17/02 |            |    |                 |