

SECTION 01270
MEASUREMENT AND PAYMENT



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for measurement and payment procedures, conditions for nonconformance assessment and nonpayment for rejected products.

1.2 MEASUREMENT

- A. Measurement methods delineated in individual Sections are intended to complement the criteria of this Section. In the event of conflict, the requirements of the individual Section governs.
- B. Take measurements and compute quantities accordingly.
- C. Provide equipment, workers and survey personnel as necessary to perform the measurement.

1.3 UNIT QUANTITIES

- A. Quantity and measurement estimates stated on the Unit Price Schedule are for contract purposes only.
- B. If greater or lesser quantities are required than those quantities indicated in the Unit Price Schedule, provide the required quantities at the unit prices contracted.
- C. Measurement by Volume: Measure by cubic dimension.
- D. Measurement by Area: Measure by square dimension. (Area calculated using slope distance where applicable)
- E. Linear Measurement: Measure by linear dimension, at the item centerline or mean chord. (Length measured using slope distance where applicable)
- F. Unit Price Measurement: Measure by unit designated on the Unit Price Schedule.

1.4 PAYMENT

- A. Payment includes: Full compensation for required supervision, labor, products, tools, equipment, plant, transportation, services and appurtenances; erection, application or installation of an item of the work; and Contractor's overhead and profit.
- B. Total compensation for required work shall be included in the unit price bid on the Unit Price Schedule. Claims for payment of work not specifically covered in the list of unit prices contained in the Unit Price Schedule will not be accepted.

- C. Progress payments will be based on the Engineer's observations and evaluations of quantities incorporated in the work multiplied by the unit price.
- D. Final payment for pay items governed by unit prices will be made on the basis of actual measurements and quantities, up to the lines and levels of the required work, as determined by the Engineer, multiplied by the unit price for the pay item which is incorporated in or made necessary by the work.
- E. Prepare and submit an Application for Payment for work completed and not previously paid. The application at a minimum shall include the following:
 - 1. Application for Payment: The application will be in a form acceptable to the Engineer. A sample form will be provided to the Contractor.
 - 2. Construction Schedule: See Section 01325 - Construction Schedules, Paragraph 1.3 General Form and Contents of Schedules.
 - 3. Contractor Payroll Certificate: See Prevailing Wage Rates.
 - 4. Pollution Prevention Plan (PPP) Reports: See Storm Water Pollution Prevention Plan (if applicable). Inspection & Maintenance reports for either SWPPP or BMP.
 - 5. Quantity supporting documents include: plotted and tabulated cross-sections, quantity calculations or suppliers' invoices, etc.
 - 6. Application supporting documents and submittal items are provided to verify products, regulations and contract requirements are being met. Application supporting documents include: signed daily work reports, field obtained data, truck volume tickets, truck weight tickets, seed and fertilizer tags, pesticide use records, etc. and other supporting documents as they may be necessary or required by Contract Documents.
 - 7. When the project requires a Notice of Intent (NOI), a copy of the submitted contractor's Notice of Termination (NOT) to TCEQ is required as support documentation for approval of final payment.
 - 8. Progress Meetings: Meet with the Engineer 1 week prior to each scheduled Application for Payment to discuss progress and corrective action. Meetings are required, unless approved otherwise by the Engineer
- F. Incomplete Applications for Payment will not be processed and will be returned to the Contractor.

1.5 NONCONFORMANCE OF WORK

- A. Remove and replace the work, or portions of the work, not conforming to the Contract Documents.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the work, the Engineer will direct one of the following remedies:
 - 1. The nonconforming work will remain as is, but the unit price will be adjusted to a lower price at the discretion of the Engineer.

2. The nonconforming work will be modified as authorized by the Engineer, and the unit price will be adjusted to a lower price at the discretion of the Engineer, if the modified work is deemed to be less suitable than originally specified.
- C. Individual Sections may modify these options or may identify a specific formula or percentage price reduction.
- D. The authority of the Engineer to assess the nonconforming work and identify payment adjustment is final.

1.6 NONPAYMENT

- A. Payment will not be made for any of the following:
 1. Products wasted or disposed of in a manner that is not acceptable to Engineer.
 2. Products determined as nonconforming before or after placement.
 3. Products placed beyond the lines and levels of the required work.
 4. Products remaining on hand after completion of the work, unless specified to remain.
 5. Loading, hauling and disposing of nonconforming products.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION – Not used

END OF SECTION

SECTION 01292
SCHEDULE OF VALUES AND
MATERIAL ON HAND



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes the requirements for requesting approval of partial payment on a Schedule of Values including a Material on Hand basis for specific pay items.
- B. Refer to Section 01270 - Measurement and Payment.

1.2 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Submit the Schedule of Values or Material on Hand submittals to the Engineer for review and approval.
- C. After review by the Engineer, revise and resubmit the submittals, if required. The initial Application for Payment on a Schedule of Values or a Material on Hand basis will not be processed until the submittals are approved.
- D. During review, the Engineer may request additional documentation to support the data on the submittals.

1.3 REQUIREMENTS AND CONDITIONS

- A. Schedule of Values:
 - 1. Contractor must make a separate request for each major pay item that they would like to be paid for on a Schedule of Values basis.
- B. Material on Hand:
 - 1. For payments of Material on Hand, refer to the "Policy for Payment of Material on Hand" as adopted by Harris County Commissioners Court on December 6, 2005 or as amended.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION – Not used

END OF SECTION

SECTION 01457

CONSTRUCTION TESTS AND INSPECTION



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for tests and inspection.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment is made under this Section. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and Payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 ACCESS TO WORK

- A. The District, the Engineer, engineer's consultants, other representatives and personnel of the District, independent testing laboratories and governmental agencies with jurisdictional interests shall have access to the work for their observation, inspection and testing. Provide proper and safe conditions for such access and advice of site safety procedures and programs.
- B. Provide Engineer 24 hour notice of readiness of the work for inspections, tests or approvals and cooperate with inspectors and testing personnel to facilitate required inspections or testing. Failure to provide 24 hour notice may result in the Work being removed and replaced at no cost to the District.

1.4 TESTS AND INSPECTIONS

- A. Testing and Inspection includes, but is not limited to, services of a construction materials engineering laboratory or other agent employed by the District, to perform laboratory testing, field testing or examinations required in the Contract Documents.
- B. The District will employ and pay for testing as noted above. Exceptions include, but are not limited to, the following:
 - 1. Arrange, obtain and pay for inspections, tests and approvals required by laws and regulations of other public bodies having jurisdiction. Transmit to the Engineer the required certificates of inspection or approval.
 - 2. Arrange, obtain and pay for inspections, tests or approvals required for submittals of materials or equipment. This includes expenses

surrounding materials, mix designs or equipment submitted for approval for incorporation in the work.

3. Perform retest or inspection of the corrected defective work at no cost to the District.
- C. Retests that are required to verify the adequacy of reworked areas or work performed for the Contractor's convenience will be deducted from the Contractor's final payment for that work item.
- D. Inspections and tests performed for either Engineer or Contractor shall be performed by an independent testing laboratory that is American Association for Laboratory Accreditation (A2LA) certified for the Work associated with the required inspections and tests.
- E. Acceptance of tests or non-performance of tests or inspections, in no way relieves the Contractor of obligation to furnish required work in accordance with the Plans and Specifications.
- F. Contractor may be required to remove and replace Work that is in non-conformance to inspections or tests at the discretion of the Engineer. Removal and replacement of non-conforming Work shall be done at the Contractor's expense.
- G. **Any inspection or test requested by the Contractor in addition to the standard minimum requirements shall be done at the Contractor's expense.**

1.5 SUBMITTALS

- A. Submit testing laboratory or examination reports, as specified or required, dated, signed and sealed by a Licensed Professional Engineer in the State of Texas accepting technical responsibility for the report. The work performed by the laboratory shall be covered by a report that accurately, clearly and unambiguously presents the test or examination results and other relevant information in accordance with the criteria for accreditation used by A2LA.

1.6 LIMITS OF AUTHORITY

- A. The testing laboratory is not authorized to:
 1. Release, revoke, alter or enlarge on requirements of the Contract Documents.
 2. Approve or reject any portion of the work.
 3. Perform any duties of the Contractor.
 4. Stop the work.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION – Not used

END OF SECTION

SECTION 01562
CONSTRUCTION FENCE



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for furnishing, installing, maintaining and removing construction fence.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

PART 2 – PRODUCTS

2.1 FENCE PROPERTIES

- A. Provide construction fence comprised of extruded, high-density polypropylene, 4 foot tall minimum and orange in color unless shown otherwise on the Plans.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install the construction fence with posts of sufficient size and spacing to insure that the construction fence remains upright throughout its installed length and functions as an effective barrier for the areas designated for protection.
- B. Maintain and repair the construction fence throughout the duration of the project, at no cost to the District, to insure that the barrier continuously performs its intended function.

3.2 REMOVAL AND DISPOSAL

- A. Remove and dispose of the construction fence upon completion of the project. Refer to Section 02120 - Material Disposal.

END OF SECTION

SECTION 01565
GENERAL SOURCE CONTROLS



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for best management practices and care of the work area.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and Payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 DEFINITION

- A. State Waters: The water of the ordinary flow, underflow, and tides of every flowing river, natural stream, and lake, and of every bay or arm of the Gulf of Mexico, and the stormwater, floodwater, and rainwater of every river, natural stream, and watercourse in the state. State Waters do not include percolating groundwater, diffuse surface rainfall runoff, groundwater seepage or springwater before it reaches the watercourse.

1.4 PROTECTION OF TREES

- A. Heavy equipment, vehicular traffic and stockpiles of construction materials are not permitted within the dripline of any tree designated to remain. Contractor shall avoid all contact with trees to remain unless otherwise directed by the Engineer. For trees determined to have been damaged refer to Specification Section 01566 - Tree and Plant Protection.
- B. Trees to remain will be shown on the Plans or marked onsite prior to construction. For Additional information, refer to Specification Section 01566 - Tree and Plant Protection.

1.5 DUST CONTROL

- A. Control dust blowing and movement on construction sites and roads to prevent exposure of soil surfaces, to reduce on and offsite damage, to prevent health hazards and to improve traffic safety.

- B. Control dust blowing by utilizing one or more of the following:
 - 1. Paper or wood mulches bound with natural or chemical binders.
 - 2. Temporary vegetative cover.
 - 3. Apply dust suppressants containing polyacrylamide (PAM) at manufacturer's recommended rate for duration required. Submit manufacturer's label identifying active ingredient.
 - 4. Irrigation by water sprinkling.
 - 5. Spreading hay.
- C. Implement dust controls immediately whenever dust can be observed blowing on the site or as directed by the Engineer.
- D. Provide copy of Water Rights Permit from the Texas Commission on Environmental Quality (TCEQ) prior to using State Water.

1.6 EQUIPMENT MAINTENANCE AND REPAIR

- A. Confine maintenance and repair of construction machinery and equipment to areas specifically designated for that purpose. Locate and design designated areas so that oils, gasoline, grease, solvents and other potential pollutants cannot be allowed into soils, receiving streams or stormwater conveyance systems. Provide adequate waste disposal receptacles for liquid, as well as, solid waste. Inspect and clean maintenance areas daily.
- B. On a site where designated equipment maintenance areas are not feasible, care must be taken during each individual repair or maintenance operation to prevent potential pollutants from becoming available to be washed into streams or stormwater conveyance systems. Provide and use temporary waste disposal receptacles.

1.7 WASTE COLLECTION AND DISPOSAL

- A. Refer to Section 02120 - Material Disposal.
- B. Provide a plan for the collection and disposal of waste materials on the site, at the request of the Engineer. Designate locations for trash and waste receptacles and establish a collection schedule. Specify and carry out methods for ultimate disposal of waste in accordance with applicable local, State and Federal rules and regulations. Make special provisions for the collection and disposal of liquid wastes and toxic or hazardous materials.
- C. Keep receptacles and other waste collection areas neat and orderly. Do not allow waste to overflow its container or accumulate for excessively long periods of time. Locate trash collection points where they will least likely be affected by stormwater runoff.

1.8 PUBLIC ROAD MAINTENANCE

- A. Remove soil spilled, dropped, washed or tracked on to public rights-of-way immediately.

1.9 WASHING AREAS

- A. Wash vehicles and other construction equipment in accordance with current local, State and Federal rules and regulations and, as a minimum, vehicles such as concrete or dump trucks and other construction equipment shall not be washed at locations where runoff will flow directly into a watercourse or stormwater conveyance system. Special areas shall be designated for washing vehicles. These areas should be located where the wash water will spread out and evaporate or infiltrate directly into the ground, or where runoff can be collected in a temporary holding or seepage basin. Construct wash areas with gravel or rock bases to minimize mud generation.

1.10 CONCRETE WASH OUT AREAS

- A. Wash concrete trucks only in a designated concrete truck wash out area. Contain washed out materials in such a manner as to prevent discharges directly into the receiving water(s). Excavated traps, earthen embankment traps, or filter fabric fences may be used for containment. Stabilize designated areas prior to project completion to prevent material from entering the receiving water. For projects including a formal Notice of Intent (NOI), refer to the SWPPP narrative for detailed information on concrete wash out activities.

1.11 STORAGE OF CONSTRUCTION MATERIALS, CHEMICALS, ETC.

- A. Isolate sites where chemicals, cements, solvents, paints or other potential water pollutants are to be stored, so that they will not cause runoff pollution.
- B. Store toxic chemicals, and materials such as fuels, lubricants, pesticides, paints, and acids in accordance with manufacturer's guidelines. Protect groundwater resources from leaching by placing a plastic liner or other containment system, as approved by the Engineer, on any areas where toxic liquids are to be opened and stored.

1.12 SANITARY FACILITIES

- A. Provide construction site with adequate sanitary facilities for workers in accordance with applicable local, State and Federal rules and regulations.

1.13 INSPECTION REPORTS

- A. Best Management Practices (BMP's) must be implemented and maintained for sediment control. Submit Weekly Texas Pollutant Discharge Elimination System (TPDES) Inspection and Maintenance Reports on a monthly basis, or as required by the Engineer.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION – Not used

END OF SECTION

SECTION 01785
PROJECT RECORD DOCUMENTS



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for preparing and maintaining record documents for the project to reflect the construction as built conditions.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintain at the job site, one hard copy of the following items.
 - 1. Contract Documents to include a project manual and one complete issued for construction set of plans with any issued revisions or addendums to the contract.
 - 2. Approved Shop Drawings.
 - 3. Written directive for any changes in scope.
 - 4. Contractor obtained permissions to perform the work. (i.e. access agreements, temporary construction easement, parking, etc.)
 - 5. TCEQ Notice of Intent (NOI) if applicable.
 - 6. Construction Site Notice.
 - 7. TPDES Stormwater Construction Permit.
 - 8. Stormwater Pollution Prevention Plan (SWPPP)
 - 9. TCEQ Notice of Termination (NOT) if applicable, as they are filed.
 - 10. Other Environmental Permits, as required.
- B. Store record documents apart from documents used for construction. Do not use record documents for construction purposes. Maintain documents in clean, dry, legible and orderly condition. Make documents and samples available at all times for inspection by the Engineer.
- C. For all projects, final deliverable record documents shall include:
 - 1. Set of plans marked with field changes for use to create final Record Drawings.
 - 2. Notice of Termination (NOT) as required.
 - 3. Warranty and Guaranty Affidavits

4. Any Contractor obtained permits as required for the Work
5. Acceptance of any part of the Work done outside of HCFCD ROW.

1.4 RECORDING

- A. Label each document "PROJECT RECORD" in neat, large, **printed** letters.
- B. Mark changes legibly in red pencil or red ink.
- C. Keep record documents current.
- D. Do not conceal work until required information is recorded.
- E. Legibly mark and date the plan set with field changes for final Record Drawing submittal.
 1. Alignment and profile of the project, location and elevation of appurtenances.
 2. Horizontal and vertical location of underground utilities and appurtenances.
 3. Location of internal utilities and appurtenances referenced to permanent surface improvements.
 4. Field changes of dimension and detail.
 5. Changes made by change in contract
 6. Details not on original Plans.
- F. Legibly annotate, mark and date Shop Drawings to record any changes made after approval.

1.5 SUBMITTALS

- A. At project completion, deliver record documents to the Engineer. Place letter-sized material in a 3-ring binder, neatly indexed. Bind Plans and Shop Drawings in rolls of convenient size for ease of handling.
- B. Accompany submittals with a transmittal letter containing:
 1. Date.
 2. Project title and number.
 3. Contractor's name and address.
 4. Title and number of each record document.
 5. Certification that each document as submitted is complete and accurate.
 6. Signature of Contractor.
- C. As-Built Survey: Signed and Sealed by Registered Professional Land Surveyor; Must be performed by West Belt Surveying, Inc; No substitutions allowed.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION – Not used

END OF SECTION

SECTION 02120
MATERIAL DISPOSAL



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for removal and proper disposal of unusable, objectionable or excess material.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 – Measurement and Payment for unit price procedures.

1.3 SUBMITTALS

- A. Submittals shall be as indicated in Section 01330 – Submittal Procedures.
- B. Submit prior to start of work:
 - 1. For disposal of material required to be taken to a landfill submit:
 - a. Copy of TCEQ license
 - b. HCFCD project number and pay item number.
 - c. Flood Insurance Rate Map (FIRM) page with boundary of fill location identified.
 - d. Aerial map with boundary of fill location identified.
 - e. Physical address of the disposal location.
 - f. Estimated total number of cubic yards of excavated material to be disposed at the location.
 - 2. For disposal of excavated material submit:
 - a. Fill permit, or demonstration of compliance with any local jurisdictional requirements for material disposal.
 - b. Disposal agreement signed by the property owner to include access for HCFCD personnel to verify suitability of the site to receive fill.
 - c. HCFCD project number and pay item number.
 - d. Flood Insurance Rate Map (FIRM) page with boundary of fill location identified.

- e. Aerial map with boundary of fill location identified.
 - f. Physical address of the disposal location.
 - g. Estimated total number of cubic yards of excavated material to be disposed at the location.
- 3. For disposal or recycling of concrete rubble, pipe or debris submit:
 - a. HCFCD project number and pay item number.
 - b. Physical address of disposal location.
 - c. Intended use of the material if not taken to a landfill or recycling facility.
 - d. Estimated total quantity of material to be disposed at the location.
- 4. For disposal of tires submit:
 - a. HCFCD project number and pay item number.
 - b. Name and physical address of disposal or recycling location.
 - c. Estimated total quantity of material to be disposed at the location.
- 5. For burning of cleared vegetation submit:
 - a. HCFCD project number and pay item number.
 - b. Material intended to be burned.
 - c. Intended location of burn pit.
 - d. Copy of TCEQ burn permit.
 - e. List of notified local agencies and contact phone numbers.
- 6. Demonstration of compliance with any local jurisdictional requirements for material disposal.
- C. During construction, for material disposed in a landfill or at a recycling facility submit the following pay application support documents. At the direction of the Engineer provide one of the following;
 - 1. One copy of the landfill operator's ticket or receipt clearly showing the truck load weight and/or cubic yards accepted by the landfill or recycling facility.
 - 2. Summary including the amount of material and disposal location for all material removed from the site on a daily basis.
 - a. For disposal or recycling of concrete rubble, pipe or debris submit:
 - 1. HCFCD project number and pay item number.
 - 2. Physical address of disposal location.
 - 3. Intended use of the material if not taken to a landfill or recycling facility.
 - 4. Estimated total quantity of material to be disposed at the location.
 - b. For disposal of tires submit:
 - 1. HCFCD project number and pay item number.
 - 2. Name and physical address of disposal or recycling location.
 - 3. Estimated total quantity of material to be disposed at the location.

- c. For burning of cleared vegetation submit:
 - 1. HCFCD project number and pay item number.
 - 2. Material intended to be burned.
 - 3. Intended location of burn pit.
 - 4. Copy of TCEQ burn permit.
 - 5. List of notified local agencies and contact phone numbers.
- d. Demonstration of compliance with any local jurisdictional requirements for material disposal.
- D. During construction, for material disposed in a landfill or at a recycling facility submit the following pay application support documents. At the direction of the Engineer provide one of the following;
 - 1. One copy of the landfill operator's ticket or receipt clearly showing the truck load weight and/or cubic yards accepted by the landfill or recycling facility.
 - 2. Summary including the amount of material and disposal location for all material removed from the site on a daily basis.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION

3.1 GENERAL

- A. Remove unusable, objectionable or excess material from the construction work area and properly dispose of such material.
- B. Disposal of material in wetlands or other environmentally sensitive areas without permits is prohibited.
- C. Disposal of material in the base flood elevation (BFE) or the 500-year flood plain as determined by the latest FEMA approved FIRM maps is prohibited. If a disposal site is rejected on these grounds, the Contractor, at their discretion, can submit a variance request with an explanation why the disposal of material is not considered fill in the flood plain. The Engineer will consider the request and respond accordingly. The decision of the Engineer shall be final.
- D. Material disposed of without permits shall be removed and properly disposed of at no cost to the District. Restore the site at no cost to the District.
- E. Cleared and grubbed material may be burned on the right-of-way, provided the following items are adhered to:
 - 1. Obtain permits required for burning including, but not limited to, permit(s) authorizing operation of the trench burner.
 - 2. Notify appropriate State and local governmental agencies and adhere to the requirements of these agencies.
 - 3. Obtain approval for location of the burn pit from the appropriate government agency and the Engineer.

4. Perform burning with a permitted trench burner.
 5. Constantly supervise burning until extinguished. When burning is complete, remove ash, stumps and other objectionable material from the pit and dispose of in accordance with this Section.
 6. Backfill burn pit in accordance with Section 02315 – Excavating and Backfilling.
- F. Cleared and grubbed material may be chipped on-site and chips disposed of in areas approved by the Engineer, under the following conditions:
1. Scatter chips evenly on berm or slopes in a thickness not to exceed 3 inches to prevent killing turfgrass or other desirable vegetation.
 2. Dispose of excess chips in accordance with this Section.
 3. Avoid discharge of chipped material into waterways.

END OF SECTION

SECTION 02200

SITE PREPARATION AND RESTORATION



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for construction preparation, and final site cleanup/restoration.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item(s) listed on the Unit Price Schedule.
- B. Payment will be on the following schedule:
 - 1. Payment of 70 percent of bid amount: When mobilization is complete, including move-in of major equipment, installation of project signs, sanitary facilities and, if required, accepted initial Construction Schedule, temporary office and sanitary facilities for Engineer.
 - 2. Payment of 30 percent of bid amount: When clean up/restoration of project site is complete, including removal of construction debris, temporary facilities, signs, any other related project appurtenances, and delivery of final Project Record Documents.
- C. Measurement and payment is as noted on the Unit Price Schedule.
- D. Refer to Section 01270 - Measurement and Payment for unit price procedures.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION

3.1 GENERAL

- A. Establish and maintain access to the site.
- B. Install, remove, relocate, replace and reinstall fences, barricades, guard rails or barriers required to secure the site.
- C. Secure the site as necessary to perform the Work.
- D. Maintain all-weather access to adjacent facilities that have driveways.
- E. Maintain access and drainage continuously for duration of the project.
- F. Protect items designated for preservation from abuse, marring or damage during construction operations.
- G. At no cost to the District, remove temporary items restricting the use of HCFCFCD facilities for their intended purpose when Project is under a

National Weather Service Flood Watch or when directed by the Engineer when needed to protect the public and public infrastructure.

- H. Remove structures, abandoned utility lines and related obstructions to a depth of 2 feet below the finished grade.
- I. Collect tires, batteries, paint cans, oil cans and related items found on the right-of-way in a location approved by the Engineer, for disposal by others. Inform the Engineer of possibly hazardous material found on site for assessment and handling/disposal by others.
- J. Remove structures, outfall pipes, drainage facilities and other items that may interfere with the construction work or as designated on the Plans.
- K. Clean up and restore the site.
- L. When Work is finished, remove existing HCFCD signs and reinstall in an approved location or deliver the sign to an HCFCD facility when directed by the Engineer.

3.2 ABANDONED UTILITY LINES

- A. Refer to Section 02120 - Material Disposal.
- B. Notify the utility owner prior to work on such abandoned lines.
- C. Remove abandoned utility lines that may interfere with the construction work or as designated on the Plans.
- D. Plug and abandon utility lines left in place as approved by the Engineer.

3.3 ENCROACHMENTS

- A. Fences and/or other encroachments in the HCFCD right-of-way are not to be removed unless otherwise stated on the plans.
- B. Encroachments identified for removal must be removed prior to any other work on the site.
- C. Coordinate with property owners at least 24 hours prior to any work on such encroachments.
- D. Place the removed encroachment neatly on the property owner's property.

3.4 PROJECT SIGNS

- A. Refer to Section 01580 - Project Signs.

3.5 TEMPORARY FACILITIES FOR ENGINEER

- A. Provide temporary facilities as required on the Unit Price Schedule. Refer to Section 01520 - Temporary Facilities for Engineer.

3.6 Construction Schedules

- A. Provide Construction Schedules as required for payment applications. Refer to Section 01325 - Construction Schedules.

3.7 BACKFILLING

A. Refer to Section 02315 - Excavating and Backfilling.

3.8 DISPOSAL

A. Refer to Section 02120 - Material Disposal.

3.9 RECORD DOCUMENTS

A. Provide Record Documents as required for payment applications. Refer to Section 01785 - Project Record Documents.

3.10 SURVEYING

A. Refer to Section 01328 - Construction Surveying

END OF SECTION

SECTION 02233
CLEARING AND GRUBBING



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for clearing and grubbing of trees, woody vegetation, stumps, roots and buried logs.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION

3.1 CLEARING AND GRUBBING

- A. Remove trees, woody vegetation and stumps from construction work limits necessary for access, staging, excavation, fill, or other earthen work activities from the work site.
- B. Clearing and grubbing beyond construction limits for the Contractor's convenience is not to be permitted unless approved by the Engineer, and shall be done at no cost to the District.
- C. For clearing and grubbing on private property where the Contractor has agreements, transmit written evidence to the Engineer that permission has been obtained from the property owner prior to beginning work.
- D. For linear projects, clearing and grubbing shall not exceed more than 1,500 linear feet ahead of the work completed and accepted by the HCFCD Vegetation Management Department for turf establishment.
- E. Engineer will designate and clearly mark trees to be saved. Protect designated trees in accordance with Section 01565 - General Source Controls, or Section 01566 - Tree and Plant Protection as they apply to the contract.
- F. Tree limbs extending over the project may be trimmed for access purposes, or for execution of Work. Trim with a sharp saw or by-pass pruner to produce a smooth cut, and execute evenly as not to harm the structural stability of the tree.

- G. For adjacent vegetation extending into the project site, refer to Section 01566 - Tree and Plant Protection.
- H. Remove stumps, roots and buried logs in areas of excavation or fill to a depth of 1 foot below design or existing ground surface.
- I. Grub trees and brush 2 feet below adjacent grades, in areas where excavation or fill will not be performed, in a manner which permits smooth grading.

3.2 HERBICIDE APPLICATION

- A. Apply herbicide to stumps as directed by the Engineer. Refer to Section 02941 - Herbicide Application.

3.3 DISPOSAL

- A. Refer to Section 02120 - Material Disposal.

END OF SECTION

SECTION 02269
TRENCH SAFETY SYSTEM



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for the installation and maintenance of a Trench Safety System.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

- A. Implement the Trench Safety System requirements of the Federal, State and local Safety and Health Regulations and the Occupational Safety and Health Administration (OSHA), 29 CFR, Part 1926 Subpart P - Excavation.
- B. Texas Health and Safety Code Ann., Chapter 756. Miscellaneous Hazardous Conditions. Subchapter C. Trench Safety § 756.023. Trench Excavation for Political Subdivision.

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Submit a safety plan specifically for the construction of trench excavation. Design the trench safety plan to be in accordance with OSHA regulations, referenced above, that govern the presence and activities of individuals working in and around trench excavations.
- C. Construction and Shop Drawings containing deviations from OSHA regulations or special designs shall be sealed by a licensed Texas Professional Engineer retained and paid by the Contractor.
- D. Review of the safety plan or Trench Safety System by the Engineer will only be in regard to compliance with this Section and will not constitute approval by the Engineer or relieve the Contractor of obligations under State and Federal trench safety laws.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION – Not used

END OF SECTION

SECTION 02315

EXCAVATING AND BACKFILLING



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for removing, stockpiling and replacing on-site vegetation and topsoil, excavating, repairing slopes, backfilling, grading the berms, backslope swales and related work. This Section does not include excavating and backfilling for structures.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- D. Measurement shall be based upon Registered Professional Land Surveyor (RPLS) surveyed cross-sections or a digital terrain model, as required and approved by the Engineer. See Paragraph 1.4 Definitions in this Section.
 - 1. Cross sections or survey data obtained by Contractor shall be tied to the base line and, as a minimum, at the same locations and limits as the design points/break points or every 100 Linear Feet (LF) whichever is shorter.
 - 2. Cross-sections or survey data obtained by Contractor shall be plotted at the same scale as design cross-sections where available or to the same horizontal and vertical scale where design cross-sections are not available.
 - 3. Plots of cross-sections or survey data shall include the pre-construction, intermediate, final and design information.
- E. Cross-sections in areas of buried riprap or protective linings, such as riprap and concrete channel lining, shall be to the top of these materials. Excavation required for placement of such protective lining is considered structural excavation and incidental to the cost of related protective lining. See Section 02316 – Structural Excavating and Backfilling.
- F. For small areas or other areas where limits can readily be determined visually, measurement may be by conventional taping and/or measuring techniques, as approved by the Engineer. Measurement shall be witnessed by the HCFCD site representative.
- G. Where paid for separately, backslope swales shall be measured as noted

on the Unit Price Schedule.

- H. Contractor shall perform all quantity calculations for approval by Engineer.
- I. No payment will be made for over-excavation or over-filling beyond the design cross-sections, except as directed by the Engineer.
- J. Support partial pay application quantities with pre-construction and intermediate cross-sections, Plan quantity calculations to-date or quantity calculations determined from field measurement techniques previously approved by the Engineer. **Partial payment documented by field measurement techniques other than approved survey submittals will be limited to 90% of the plan quantity until a survey submittal is approved.**
- K. Support final pay request quantities by using pre-construction, intermediate and final cross-sections or final field measured quantity calculations, as approved by the Engineer.

1.3 REFERENCES

- A. ASTM D 698 – Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³).

1.4 DEFINITIONS

- A. Existing Cross-Sections or Survey Data: Information obtained by design engineer to prepare Plans and bid documents.
- B. Pre-Construction Cross-Sections or Survey Data: Information obtained by Contractor prior to construction to establish pre-construction conditions. Contractor may accept existing cross-sections as pre-construction cross-sections.
- C. Intermediate Cross-Sections or Survey Data: Information obtained by Contractor to establish extent of work, such as to remove disturbed soil and to repair slope failures, and/or periodic surveys completed prior to Final Cross-Sections.
- D. Final Cross-Sections or Survey Data: Information obtained by Contractor at completion of excavation and/or fill.
- E. Design Cross-Section or Survey Data: Proposed channel section shown on Plans showing final grades.

1.5 SUBMITTALS

- A. Refer to Section 01330 – Submittal Procedures.
- B. Submit written acceptance of Existing Cross-Sections or Survey Data, or submit Pre-Construction Cross-Sections or Survey Data for review and approval by the Engineer prior to the start of any excavation activities on site.
- C. Submit plotted cross-sections and earthwork quantity calculations in tabular form. For electronic survey data submittals, include all electronic

files and report data used to calculate final quantities.

- D. Survey information submittal shall include at a minimum: plan view showing points taken with elevations, 1-ft contour lines, and baseline corresponding with the design plan benchmark information, north arrow and scale.

1.6 CONSTRUCTION TESTS AND INSPECTION

- A. Refer to Section 01457 – Construction Tests and Inspection.

PART 2 – PRODUCTS

2.1 FILL MATERIAL

- A. Refer to Section 02314 – Fill Material.

PART 3 – EXECUTION

3.1 SITE PREPARATION

- A. Prepare the site for construction in accordance with Section 02200 – Site Preparation and Restoration and Section 02233 – Clearing and Grubbing.
- B. Remove grass and other vegetative cover from areas to be excavated or filled.
- C. Remove material that may interfere with the proposed work, including unusable materials, disturbed soils and/or objectionable material as directed by Engineer.
- D. Engineer will inspect and approve foundation soil prior to placement of fill.

3.2 TOPSOIL

- A. Refer to Section 02911 – Topsoil.

3.3 CARE AND CONTROL OF WATER

- A. Refer to Section 02241 – Care and Control of Water.

3.4 CONSTRUCTION

- A. Construct to lines, grades and dimensions shown on the Plans.
- B. Return over-excavation beyond the specified limits to grade at no cost to the District in accordance with Paragraph 3.5 of this Section.
- C. Do not cast or place material, either temporarily or permanently, on top of bank without approval of Engineer.
- D. Do not cut temporary shelves into side slopes without approval of Engineer.
- E. Correct grading resulting in standing water at no cost to the District.

- F. Grade side slopes as required by the Engineer to smoothly transition the lateral into the main channel at locations where lateral ditches enter the channel.

3.5 FILL

- A. Level soil surface prior to placing first layer of fill.
- B. Compaction of foundation soil surface shall be considered satisfactory when the Contractor is capable of achieving specified compaction for the first layer of fill.
- C. Protect foundation soils and/or fill soils from detrimental drying.
- D. Scarify surfaces to receive fill to ensure proper bonding. When the surface can be penetrated by tamping roller feet, additional scarification is usually not necessary.
- E. In areas that are shown to receive fill material, cut into existing (undisturbed) material in a “benching” or “stair step” fashion. Each bench shall form a horizontal surface and corresponding nearly vertical surface. The height difference between adjacent horizontal surfaces shall be a minimum of 3 feet.
- F. Mechanically compact backfill provided under Section 02314 – Fill Material in 8-inch maximum layers, loose measure, to not less than 95 percent of maximum standard dry density (ASTM D 698) within plus or minus 3 percent of optimum moisture content. Where approved for use by the Engineer, fat clay (CH) soil shall be mechanically compacted to not less than 95 percent or more than 98 percent of maximum standard dry density (ASTM D 698) at or within plus 3 percent of optimum moisture content.
- G. Refer to Section 02316 – Structural Excavating and Backfilling for backfilling behind retaining structures, unless shown otherwise on the Plans.

3.6 BACKSLOPE DRAINAGE SYSTEMS

- A. Backslope swale and interceptor structure elevations and locations shown on the Plans are approximate. Final elevations and locations shall be field verified by the Engineer prior to installation. Minor changes in location and grade shall be considered incidental and no extra payment will be made for such adjustments.

3.7 MAINTENANCE OF DRAINAGE

- A. Maintain constant flow and drainage in the main and lateral channels, backslope swales and off-site swales.

3.8 EROSION AND SEDIMENT CONTROL

- A. Use means, methods, sequences and scheduling to minimize erosion and sedimentation and other damage to the project site and facilities, including the following:
1. Limit work in this Section to no more than 1,500 feet of channel at any time unless approved by the engineer.
 2. Construct backslope drainage system, silt fences and vegetate each reach of the channel as soon as practical. Refer to Section 02361 – Silt Fences and Section 02921 – Turf Establishment.
 3. Failure to construct erosion control facilities in a timely manner may result in a directive to do so. Engineer may stop construction on the project if, in the opinion of the Engineer, conditions warrant such action.
 4. Remove sediment and debris prior to final acceptance of the Work by the Engineer at no additional cost to the District. The removal of sediment includes reaches of channel downstream of the project where sedimentation occurred due to construction of this Project.
 5. Comply with terms and conditions of the Texas Pollutant Discharge Elimination System (TPDES) permit, the Stormwater Pollution Prevention Plan (SWPPP) and Best Management Practices (BMPs) for this Project, if applicable.

3.9 MATERIAL DISPOSAL

- A. Refer to Section 02120 – Material Disposal.

END OF SECTION

SECTION 02316

STRUCTURAL EXCAVATING AND BACKFILLING



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for excavating and backfilling under, above and adjacent to structures, including riprap and buried riprap.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment is made under this Section. Include the cost for the work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

- A. ASTM D 698 - Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³)).

1.4 CONSTRUCTION TESTS AND INSPECTION

- A. Refer to Section 01457 - Construction Tests and Inspection.

PART 2 – PRODUCTS

2.1 FILL MATERIAL

- A. Refer to Section 02314 - Fill Material.

2.2 CEMENT STABILIZED SAND

- A. Refer to Section 02321 - Cement Stabilized Sand.

2.3 CONCRETE BACKFILL

- A. Refer to Section 03310 - Concrete, Non-structural.

2.4 FLOWABLE FILL

- A. Refer to Section 02322 – Flowable Fill.

2.5 SUBGRADE STABILIZATION

- A. Provide stabilized subgrade or stabilized soil backfill as indicated in the Specifications, as noted on the Unit Price Schedule or as noted in the Plans.
- B. Unless shown otherwise on the Plans, provide 12 inches of Cement Stabilized Sand below precast inlets, manholes, headwalls and wingwalls, junction boxes, and any other miscellaneous catchment structures.

2.6 SAND OR GRAVEL BACKFILL

- A. Provide sand or gravel backfill in accordance with the material and gradation requirements as noted on the Plans.

2.7 GRANULAR FILL

- A. Refer to Section 02378 - Riprap and Granular Fill.

2.8 TOPSOIL

- A. Refer to Section 02911 - Topsoil.

PART 3 – EXECUTION

3.1 SITE PREPARATION, INCLUDING REMOVING VEGETATION

- A. Refer to Section 02200 - Site Preparation and Restoration and Section 02233 - Clearing and Grubbing.
- B. Remove grass and other vegetative cover from areas to be excavated or to receive fill.

3.2 EXCAVATION

- A. Determine the size, shape and dimensions of the excavation necessary to accomplish the Work within the project site. This includes selecting the means, methods and techniques of excavation and other related matters. Extend the excavation a sufficient distance from walls and edges of the structure to allow for placing and removing of forms and trench safety systems, for inspection and installing ancillary items. Complete excavations within the following tolerances:
 - 1. Perform structural excavation to the grade necessary to provide the minimum design thickness as shown on the Plans and to allow the top to be no higher than the design grade.
 - 2. Cut vertical planes for footing excavations to neat lines with a tolerance of minus 1/2 inch to plus 3 inches.
 - 3. Excavate to the elevations required forming a relatively level undisturbed subgrade surface free of mud or other soft material.

Excavation extending deeper than required is considered unauthorized excavation unless it meets the criteria defined in Paragraph 3.2.B. Fill unauthorized excessive excavation as directed by the Engineer at no cost to the District.

- B. When the bottom of the excavation is unsuitable for foundation bearing, remove pockets of soft or otherwise unstable soils and replace with satisfactory material as directed by the Engineer compacted to match adjacent stable soil or as directed by the Engineer.
- C. Protect open excavation from rainfall, freezing or excessive drying to maintain the foundation subgrade or backfill in a satisfactory condition. Subgrade soils which become soft, loose or otherwise unsatisfactory for support of the foundation resulting from inadequate excavation protection, dewatering or other construction methods, shall be removed and replaced with satisfactory material, as directed by the Engineer, at no cost to the District.

3.3 SHEETING, SHORING AND BRACING

- A. Perform sheeting, shoring and bracing of excavations as required to properly and safely complete the work as shown on the Plans. Install sheeting, shoring and bracing to prevent the excavation from extending beyond specified or indicated limits and to protect adjacent structures or improvements.
- B. Protect workmen and the public with sheeting, shoring and bracing that is in strict conformity with Section 02269 - Trench Safety System.
- C. Care shall be taken to prevent voids during the installation, use and removal of sheeting. Immediately fill voids with satisfactory material as directed by the Engineer and compact.
- D. Remove sheeting, shoring and bracing after completion of the structure unless approval has been granted by the Engineer, in writing, to leave members in place.

3.4 CARE AND CONTROL OF WATER

- A. Refer to Section 02241 - Care and Control of Water.

3.5 PLACING BACKFILL

- A. Place backfill in 8 inch maximum layers (loose measure) to the elevation of surrounding natural ground or to the lines and grades shown on Plans.
- B. Place backfill as promptly as practicable after completion of the structure or portion of a structure.
- C. Placing operations shall be performed in such a manner as not to impair safety or serviceability of the structure. Do not place backfill against concrete walls or similar structures until all affected concrete has attained at least 85 percent of the design compressive strength, unless otherwise

shown on the Plans. A plan for early placement of backfill must be submitted by the Contractor and approved by the Engineer. Any additional material testing required for early placement of backfill will be the responsibility of the Contractor.

- D. Do not backfill where the top of walls are supported by slabs or intermediate walls until the slab or intermediate walls have been placed and cured. Do not backfill until the minimum curing requirement and minimum design compressive strength have been met unless otherwise shown on the Plans.
- E. Prevent any wedging action of backfill against the structure. Step cut (bench) the slopes bounding the excavation, as required, to prevent wedging.
- F. Use sand or gravel backfill for backfilling behind sheet pile walls, wingwalls, retaining walls, rectangular concrete channel walls or other retaining structures. Backfill in the zone for a distance of 3 feet from the wall to 1.5 foot below the top of the wall, unless shown otherwise on the Plans. Backfill the 1.5 foot zone with 1 foot of clay soil conforming to Part 2 of this Section and backfill the top 6 inches with topsoil conforming to Section 02911 - Topsoil.
- G. Excavate a minimum of 3 feet around abutment backwalls, inlets, junction boxes, and manholes and fill with cement stabilized sand, unless shown otherwise on the Plans.

3.6 COMPACTING BACKFILL

- A. Mechanically compact soil backfill as follows:
 - 1. Compact to not less than 95 percent of maximum standard dry density (ASTM D 698) within plus or minus 3 percent of the optimum moisture content.
 - 2. Where approved for use by the Engineer, fat clay (CH) soil shall be mechanically compacted to not less than 95 percent or more than 98 percent of maximum standard dry density (ASTM D 698) at or within plus 3 percent of the optimum moisture content.
 - 3. Compact sand and/or gravel backfill behind retaining walls including the top 1 foot of backfill material utilizing hand operated tamping or vibratory plate type of compaction equipment. Compact to no less than 90 percent of maximum standard dry density (ASTM D 698) within plus or minus 3 percent of the optimum moisture content.
 - 4. Compact cement stabilized sand to produce a minimum unconfined compressive strength of 200 psi in 48 hours when compacted to at least 95 percent maximum standard dry density (ASTM D 698) and in accordance with Section 02321 - Cement Stabilized Sand.
 - 5. Install flowable fill according to Section 02322 - Flowable Fill.
 - 6. Compact stabilized subgrade or stabilized soil backfill in accordance with the Plans and Specifications.

- 7. Consolidate concrete backfill in accordance with Section 03310 - Concrete.
- B. Prevent damage to structures caused by backfilling or other construction operations.

3.7 MATERIAL DISPOSAL

- A. Refer to Section 02120 - Material Disposal.

END OF SECTION

SECTION 02317
DESILTING CHANNELS



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for the removal and disposal of sediment, vegetation and debris.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment is made under this Section. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

PART 2 – PRODUCTS – Not used

PART 3 – EXECUTION

3.1 DESILTING

- A. Excavate and grade the flowline of the channel bottom to the lines and grades noted on the Plans or as directed by the Engineer, to restore positive drainage during base flow conditions.
- B. Desilting the channel bottom is intended to restore the channel to its original design configuration. Do not excavate beyond the design grade to deepen the channel or undermine/disturb the adjacent channel banks, unless directed by the Engineer.
- C. When desilting concrete lined channel sections, remove all sediment within the channel through the concrete lined channel section reach.
- D. Clear and remove all sediment from culverts, pipes, and drainage conduits outfalling into the project reach to the limits of the Districts right-of-way.
- E. Clear and remove all sediment from culverts, pipes, and underneath bridges that serve as a crossing structure to allow for positive drainage during base flow conditions in the channel.
- F. Remove and dispose of sediment accumulations located in the channel bottom not shown on the plans to restore positive drainage during base flow conditions.

3.2 EQUIPMENT

- A. Provide equipment with rubber tracks or tires for sediment removal from concrete lined channels, and protect existing concrete features as approved by the Engineer.

3.3 MATERIAL DISPOSAL

- A. Refer to Section 02120 - Material Disposal.
- B. Contain material in the truck, wet or dry, and haul without loss.
- C. For desilted material placed on-site as on-site fill, refer to Section 02315 - Excavating and Backfilling.
- D. Desilted material temporarily placed on-site in spoil piles for draining and drying, prior to final removal and disposal from the site, shall comply with terms and conditions of the Texas Pollutant Discharge Elimination System (TPDES) permit, the Stormwater Pollution Prevention Plan (SWPPP) and Best Management Practices (BMPs) for this Project, if applicable, refer to Section 01565 - General Source Controls.

3.4 REPAIRS

- A. Repair damage caused by the desilting operations. Such repairs shall be to the satisfaction of the Engineer and at no cost to the District.

END OF SECTION

SECTION 02321
CEMENT STABILIZED SAND



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for supplying and installing cement stabilized sand for backfill, bedding and free formed structures.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

- A. ASTM C 40 - Organic Impurities in Fine Aggregates for Concrete.
- B. ASTM C 94 - Ready-Mixed Concrete.
- C. ASTM C 123 - Lightweight Pieces in Aggregate.
- D. ASTM C 142 - Clay Lumps and Friable Particles in Aggregates.
- E. ASTM C 150 - Portland Cement.
- F. ASTM D 558 - Moisture-Density Relations of Soil-Cement-Mixtures.
- G. ASTM D698 - Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lb/ft³ (600kN-m/m³)).
- H. ASTM D 1633 - Compressive Strength of Molded Soil-Cement Cylinders.
- I. ASTM D 2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- J. ASTM D 4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Submit proposed design mix, test data for sand/cement mixture and sample batch ticket for Engineer review and approval.
- C. Submit supplier's batch ticket indicating cement content per cubic yard or per ton of product, batch date and time and weight of load to Engineer at time of delivery.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide material conforming to:
 - 1. Cement - ASTM C 150, Type I.
 - 2. Sand - Clean, durable sand:
 - a. ASTM D 2487, classified as SW, SP, SC or SM by the Unified Soils Classification System.
 - b. Deleterious materials:
 - (1) Clay lumps - ASTM C 142, less than 0.5 percent.
 - (2) Lightweight pieces - ASTM C 123, less than 5.0 percent.
 - (3) Organic impurities - ASTM C 40, color no darker than the standard color.
 - (4) Plasticity index - ASTM D 4318, of 4 or less.
 - 3. Water - ASTM C 94.

2.2 MIX DESIGN

- A. Use sand/cement mixture containing a minimum of 2 sacks of cement per cubic yard (1-1/2 sacks of cement per ton). Design sand/cement mixture to produce a minimum unconfined compressive strength of 200 psi in 48 hours when compacted to 95 percent maximum standard dry density in accordance with ASTM D 558. Perform molding, curing and compression testing in accordance with ASTM D 1633 - Method A.

2.3 MIXING MATERIALS

- A. Add required amount of water and mix it thoroughly in pugmill-type mixer.
- B. Stamp batch ticket at plant with time of loading. Material not placed and compacted within 4 hours after mixing will be considered nonconforming.

PART 3 – EXECUTION

3.1 EXCAVATING FOR FREE FORMED STRUCTURES

- A. Refer to Section 02316 - Structural Excavating and Backfilling.

3.2 PLACEMENT

- A. Place sand/cement mixture for free formed structures in 8-inch-thick loose layers and compact to not less than 95 percent maximum standard dry density (ASTM D 698) unless otherwise specified. The moisture content during compaction shall be on the dry side of optimum but sufficient for hydration.

- B. Perform and complete compaction of sand/cement mixture within 4 hours after addition of water to mix at the plant.
- C. Do not place or compact sand/cement mixture in standing or free water.

3.3 TESTING AND INSPECTION

- A. Refer to Section 01457 - Construction Tests and Inspection.

3.4 ACCEPTANCE

- A. Strength level of material will be considered satisfactory if:
 - 1. The average 48-hour strength is greater than 200 psi with no individual strength test below 140 psi.
 - 2. All 7-day individual strength tests (average of two specimens) are greater than or equal to 200 psi.
- B. Material will be considered deficient when 7-day individual strength test (average of two specimens) is less than 200 psi but greater than 140 psi. See Paragraph 3.5 Adjustment for Deficient Strength.
- C. The material will be considered unacceptable and subject to removal and replacement at Contractor's expense when individual strength tests (average of two specimens) have 7-day strength less than 140 psi.
- D. When moving average of three daily 48-hour averages falls below 200 psi, discontinue shipment to project until plant is capable of producing material, which exceeds 200 psi at 48 hours. At no cost to the District, five 48-hour strength tests shall be made in this determination with no individual strength tests less than 200 psi. Testing laboratory shall notify Contractor, Project Manager, and material supplier of tests indicating results falling below specified strength requirements within 24 hours.
- E. If any strength test of laboratory cured specimens falls below the specified strength, Contractor may, at his own expense and with Engineer approval, request test of cores drilled from the area in question in accordance with ASTM C42. In such cases, three (3) cores shall be taken for each strength test that falls below the values given in 3.4.A.
- F. Cement stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least 200 psi and if no single core is less than 140 psi. Additional testing of cores extracted from locations represented by erratic core strength results will not be permitted.

3.5 ADJUSTMENT FOR DEFICIENT STRENGTH

- A. When mixture produces 7-day compressive strength greater than or equal to 200 psi, then material will be considered satisfactory and bid price will be paid in full.

- B. When mixture produces 7-day compressive strength less than 200 psi and greater than or equal to 140 psi, material shall be accepted contingent on credit in payment. Compute credit by the following formula:

$$\text{Credit per Pay Item} = \frac{\$ (\text{Bid Amount}) \times [(2 (200 \text{ psi} - \text{actual psi at 48 hours})) / 200]}{200}$$

1. To use this formula, Bid Amount refers to the unit price of the related Pay Item (CMP, RCP, RCB, etc.)
 2. Credit per Pay Item refer to the amount to be deducted, per unit from the unit price of the related Pay Item.
- C. When mixture produces 2-day compressive strength less than 140 pounds per square inch, then remove and replace cement-sand mixture and paving and other necessary work at no cost to the District.

END OF SECTION

SECTION 02361
REINFORCED SILT FENCE



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for furnishing, installing, maintaining and removing temporary reinforced silt fence.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- C. No separate measurement and payment will be made for maintenance or removal of accumulated sediment. Removal of the reinforced silt fence is incidental to the cost of the reinforced silt fence.

1.3 REFERENCES

- A. AASHTO M 288 - Geotextile Specification for Highway Applications.
- B. ASTM D 4355 - Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus.
- C. ASTM D 4491 - Water Permeability of Geotextiles by Permittivity.
- D. ASTM D 4632 - Grab Breaking Load and Elongation of Geotextiles.
- E. ASTM D 4751 - Determining Apparent Opening Size of a Geotextile.

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Submit catalog data and mill certificate for the reinforced silt fence geotextile and catalog data for welded wire fabric mesh or plastic grid mesh reinforcement to be used.

PART 2 – PRODUCTS

2.1 GEOTEXTILE FABRIC

- A. Geotextile fabric shall consist of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins in a woven fabric.
- B. Geotextile fabric shall contain stabilizers and/or inhibitors to make the fibers resistant to deterioration resulting from exposure to sunlight or heat. The geotextile fabric shall be resistant to commonly encountered soil chemicals, mildew, rot and insects.

- C. Geotextile fabric shall be free of defects or flaws that affect its physical properties.
- D. Provide a geotextile fabric with a minimum grab strength of 100 lbs (ASTM D 4632).
- E. Provide reinforced silt fence with properties in accordance with AASHTO M 288 *Geotextile Specification for Highway Applications* Table 6.

2.2 SUPPORTS

- A. Provide wooden stakes or steel fence supports having a minimum length of 4 feet.
- B. Provide mesh reinforcement of galvanized 2 inch by 4 inch welded wire fabric mesh.

PART 3 – EXECUTION

3.1 GENERAL

- A. Install reinforced silt fences at locations shown on Plans or as approved by the Engineer.
- B. Place reinforced silt fences in a continuous manner and transverse to the runoff. Place the reinforced silt fence to follow the contours of the site. Do not allow water to flow around the end of the fence.
- C. Provide continuous rolls of the reinforced silt fence fabric and cut to length to minimize the use of fabric joints. When joints are necessary, the fabric shall be spliced together only at a support with a minimum 6 inch overlap.

3.2 MAINTENANCE

- A. Inspect reinforced silt fence after each rainfall, daily during periods of daily rainfall, and, at a minimum, once every week. Repair and/or replace any component of the reinforced silt fence that becomes defective from intended use.
- B. Remove sediment deposits when the deposit reaches 1/3 the height of the fence. Dispose of sediment properly.
- C. Remove reinforced silt fence and dispose of any sediment accumulations promptly when directed by Engineer.

3.3 DAMAGED MATERIAL

- A. Repair damage to reinforced silt fence and supports immediately.

3.4 DISPOSAL

- A. Refer to Section 02120 – Material Disposal.

END OF SECTION

SECTION 02364

FILTER DAMS



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for furnishing, installing, maintaining and removing filter dams.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- C. Geotextile, excavation and disposal, granular fill and reinforcing wire will not be measured separately.
- D. No separate payment shall be made for removal of accumulated sediment. Maintenance and removal and subsequent reinstallation, if required, of the filter dam are incidental to the cost of the filter dam.

1.3 REFERENCES

- A. ASTM A 975 - Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire with Poly (Vinyl Chloride) (PVC) Coating).

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Submit catalog data and mill certificate for geotextile and catalog data for wire to be used.
- C. Submit gradation for granular fill shown on the Plans.

PART 2 – PRODUCTS

2.1 GRANULAR FILL

- A. Provide granular fill as noted on the Plans.
- B. Refer to Section 02378 - Riprap and Granular Fill.

2.2 WIRE COATING

- A. Style 1 - zinc coated prior to being double twisted into mesh in accordance with ASTM A 975.

2.3 WIRE MESH FOR REINFORCEMENT

- A. Provide 20 gauge galvanized double-twisted hexagonal wire mesh and tie wires or as shown on the Plans.

2.4 CONNECTION WIRES AND STIFFENERS

- A. Provide spiral binders, lacing wire and stiffeners made of wire having the same coating material and same wire size as the wire mesh for reinforcement.

2.5 GEOTEXTILE SEPARATION FABRIC

- A. Provide a geotextile of woven or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins. Provide geotextile fabric equal to the following average roll values or as directed by the Engineer:
 - 1. Minimum average roll value.
 - a. Elongation < 50 percent.
 - b. Grab Strength \geq 200 pounds.
 - c. Puncture Strength \geq 75 pounds.
 - d. UV Stability (retained strength) \geq 50 percent after 500 hours of exposure.
 - 2. Maximum average roll value.
 - a. Apparent Opening Size (AOS) - 0.212 to 0.6 mm (#70 to #30 US sieve).
- B. Refer to Section 02379 - Geotextiles for Erosion Control Systems for storage and handling precautions and requirements.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install in accordance with the Plans.

3.2 MAINTENANCE

- A. Sediment Accumulation.
 - 1. Remove accumulated sediment as needed or when directed by the Engineer.
 - 2. Reshape the filter dam as needed or when directed by the Engineer.

3.3 REMOVAL

- A. Maintain the filter dam, in place, throughout the duration of the Project. Remove when directed by the Engineer. Sod the exposed earth beneath the filter dam and areas damaged by the removal process in accordance with Section 02921 - Turf Establishment.

3.4 SEDIMENT DISPOSAL

A. Refer to Section 02120 - Material Disposal.

END OF SECTION

SECTION 02365

STABILIZED CONSTRUCTION ACCESS



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for construction, maintenance and removal of stabilized construction access.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- C. No separate measurement and payment will be made for maintenance or removal.

1.3 SUBMITTALS

- A. Refer to Section 01330 - Submittals.
- B. Refer to Section 02379 - Geotextiles for Erosion Control Systems.
- C. Submit gradation for 3 inch to 5 inch granular fill. Refer to Section 02378 - Riprap and Granular Fill.

PART 2 – PRODUCTS

2.1 GEOTEXTILE SEPARATION FABRIC

- A. Provide a geotextile of woven or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins. Provide geotextile fabric equal to the following average roll values or as directed by the Engineer:
 - 1. Minimum average roll value.
 - a. Elongation < 50 percent.
 - b. Grab Strength ≥ 200 pounds.
 - c. Puncture Strength ≥ 75 pounds.
 - d. UV Stability (retained strength) ≥ 50 percent after 500 hours of exposure.
 - 2. Maximum average roll value.
 - a. Apparent Opening Size (AOS) - 0.212 to 0.6 mm (#70 to #30 US sieve).

2.2 GRANULAR FILL

- A. Refer to Section 02378 - Riprap and Granular Fill.

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide stabilized access, washing areas and parking areas at locations shown on the Plans or as approved by the Engineer.
- B. Furnish and place geotextile fabric as a permeable separator to prevent mixing of granular fill with underlying soil.
- C. Place 3 inch to 5 inch granular fill to dimensions and depths shown on the Plans, or as directed by the Engineer. The minimum thickness shall be 8 inches.
- D. Granular Fill being reused shall be free of sediment, and meet the requirements of Specification 02378 - Riprap and Granular Fill.
- E. Roads and parking areas shall be graded to provide sufficient drainage away from stabilized areas. Use sandbags, gravel, boards or similar methods to prevent sediment from entering public rights-of-way, storm drains, ditches and watercourses.

3.2 MAINTENANCE

- A. Inspect and maintain stabilized areas daily. Provide periodic top dressing with additional granular fill as necessary.
- B. Repair or replace components of stabilized access areas that become defective from intended use.
- C. Maintain stabilized access areas until acceptance of the Project or as directed by Engineer.
- D. Remove stabilized access promptly when directed by Engineer. Restore areas where stabilized construction access was removed to final project grade in preparation of turf establishment by others.

3.3 DISPOSAL

- A. Refer to Section 02120 - Material Disposal.

END OF SECTION

SECTION 02378

RIPRAP AND GRANULAR FILL



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for furnishing and installing gravel, granular fill, riprap and boulders and filling and burying gravel, granular fill, riprap, and boulders when required.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- D. Excavation for gravel, granular fill, riprap and buried riprap, and boulders is measured from finished grade, and will not be measured separately, but is incidental to riprap unit price measurement.
- E. Riprap and granular fill used in toe walls, grade beams or termination trenches are incidental to unit price measurement.
- F. Excavation for rock trenches will not be measured separately, but is incidental to the unit price measurement of Riprap and Granular Fill.
- G. The excavated volume of material displaced for the installation of rock mats will not be measured separately, but is incidental to the unit price measurement of Riprap and Granular Fill. Payment for fill material placed above the rock mat will be made under the appropriate fill unit item.
- H. On-site topsoil will not be measured and paid separately, but is incidental to riprap surface measurement.
- I. Imported topsoil will be paid for as noted on the Unit Price Schedule.

1.3 REFERENCES

- A. ASTM D 5240 – Test Method for testing rock slabs to Evaluate Soundness of Riprap by Use of Sodium Sulfate or Magnesium Sulfate.
- B. ASTM D 5519 – Standard Test Methods for Particle Size Analysis of Natural and Man-Made Riprap Materials (Test A)

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Keep the storage area clean, firm, smooth and well drained in order that the product can be placed with a minimum of foreign matter.
- B. Stockpile and handle gravel, granular fill, riprap and boulders to minimize segregation of particle sizes either in the stockpile or while loading, hauling and handling.

PART 2 – PRODUCTS

2.1 RIPRAP

- A. Provide riprap consisting of broken concrete or natural stone. Provide riprap that is dense, durable and hard material free from cracks, seams and other defects which would increase deterioration from handling and natural causes.
- B. Riprap consisting of natural stone, shall have a weight loss of not more than eighteen (18) percent after five (5) cycles of magnesium sulfate solution as tested per ASTM D 5240, Test Method for testing rock slabs to Evaluate Soundness of Riprap by Use of Sodium Sulfate or Magnesium Sulfate.
- C. Shape and Dimensions.
 - 1. Provide riprap in cubic form, rather than elongated (flat) shapes.
 - 2. Provide riprap with a minimum thickness of 6 inches.
 - 3. No more than 25 percent shall have a length greater than 2-1/2 times the width or thickness. No length shall exceed 3 times the width or thickness.
- D. Do not provide spalls, fragments and chips exceeding 5 percent by weight. The dimension and shape limitations do not apply to this portion of the riprap.
- E. Where broken concrete is used, cut exposed metal flush with the surface prior to placing the riprap. Riprap that is designated to be re-used from the project site will be verified for re-use by the Engineer.
- F. Provide riprap conforming to the following tables, when tested using Method A, as outlined in ASTM D 5519, Standard Test Methods for Particle Size Analysis of Natural and Man-Made Materials:

TABLE 1								
RIPRAP GRADATION NO. 1								
	Stone Weight		Volume		Cubical Shape		Spherical Shape	
Percent	Lbs.		Cubic Ft (2)		Ft (Each Side)		Ft (Dia.)	
Lighter	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
by Weight	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit
100	180	265	1.20	1.77	1.06	1.21	1.31	1.50
50	80	110	0.53	0.73	0.81	0.90	1.01	1.12
15	40	60	0.27	0.40	0.64	0.74	0.80	0.91
Notes:								
1.	The theoretical cube and sphere size is presented for guidance only. Paragraph 2.1 shall control riprap shape and dimensions.							
2.	Volume is based on 150 pcf, unit weight.							
3.	Riprap Gradation No. 1 is to be used where an 18 inch thick riprap mat is noted on the Plans.							

TABLE 2								
RIPRAP GRADATION NO. 2								
	Stone Weight		Volume		Cubical Shape		Spherical Shape	
Percent	Lbs.		Cubic Ft (2)		Ft (Each Side)		Ft (Dia.)	
Lighter	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
by Weight	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit
100	260	640	1.73	4.27	1.20	1.62	1.49	2.01
50	130	200	0.87	1.33	0.95	1.10	1.18	1.37
15	40	150	0.27	1.00	0.64	1.00	0.80	1.24
Notes:								
1.	The theoretical cube and sphere size is presented for guidance only. Paragraph 2.1 shall control riprap shape and dimensions.							
2.	Volume is based on 150 pcf, unit weight.							
3.	Riprap Gradation No. 2 is to be used where a 24 inch thick riprap mat is noted on the Plans.							

2.2 GRANULAR FILL

- A. Provide granular fill consisting of concrete or stone. Provide granular fill that is dense, durable and hard material.
- B. Provide granular fill, as shown on the Plans or as directed by the Engineer, to the following dimensions:
 1. Provide 3 inch to 5 inch granular fill with no material diameter less than 3 inches and no material diameter greater than 5 inches.
 2. Provide 4 inch to 8 inch granular fill with no material diameter less than 4 inches and no material diameter greater than 8 inches.
 3. Provide riprap Gradation No. 1 and Gradation No. 2 as shown on the Plans or as directed by the Engineer.
- C. Do not provide spalls, fragments and chips exceeding 5 percent by weight.
- D. Where broken concrete is used, cut exposed metal flush with the surface prior to placing granular fill.

2.3 GRAVEL

- A. Provide gravel consisting of natural stone, with the exception of limestone, that is dense, durable and hard material free from cracks, seams and other defects which would increase deterioration from handling and natural causes.
- B. Shape and Dimensions.
 - 1. Provide gravel in cubic form, rather than elongated (flat) shapes.
 - 2. Provide gravel with a minimum thickness of a No. 4 stone (1 inch). No more than 25 percent shall have a length greater than 2-1/2 times the width or thickness.
 - 3. No length shall exceed 3 times the width or thickness.
- C. Do not provide spalls, fragments and chips exceeding 5 percent by weight. The dimension and shape limitations do not apply to this portion of the gravel.
- D. Provide gravel conforming to the following table:

GRAVEL (NO. 57 STONE)

Standard Sizes of Coarse Aggregate						
Amounts Finer than Each Laboratory Sieve (Square Openings), weight percent						
Size No.	Nominal Size Square Openings	1-1/2 Inches	1-Inch	1/2-Inch	No. 4	No. 8
57	1-inch to No. 4	100	95 to 100	25 to 60	0 to 10	0 to 5

2.4 BOULDERS

- A. Provide boulders consisting of blasted or cut stone that is dense, durable, and hard material free from cracks, seams and other defects which would increase deterioration from handling and natural causes.
- B. Boulders shall meet the dimensions and weights specified in the plans and construction documents.
- C. Boulders shall be relatively flat on either side in the same dimension, preferably the long dimension.

2.5 GEOTEXTILE

- A. Refer to Section 02379 - Geotextiles for Erosion Control Systems.

PART 3 – EXECUTION

3.1 GRADE PREPARATION

- A. Refer to Section 02241 - Care and Control of Water.
- B. Trim and dress the channel bottom and side slopes to proper lines and grade prior to placing riprap or granular fill. Where shown on the Plans, place geotextile in accordance with Section 02379 - Geotextiles for Erosion Control Systems.
- C. The Engineer will inspect prepared section prior to placing geotextile, gravel, granular fill, riprap or boulders.

3.2 EXCAVATION AND FILL

- A. Excavate the channel. Refer to Section 02315 - Excavating and Backfilling.
- B. Excavate for riprap. Refer to Section 02316 - Structural Excavating and Backfilling.

3.3 RIPRAP OR GRANULAR FILL PLACEMENT

- A. Place the gravel, granular fill, riprap or boulders to the slopes, lines and grades as shown on the Plans.
- B. To establish a well-graded mass of riprap with minimal voids, fill voids between larger riprap blocks with spalls and smaller blocks of the largest feasible size to form a compact mass. Do not place spalls and small blocks in place of larger size riprap or granular fill.
- C. Install riprap and granular fill mat to the thickness as shown on the Plans. Riprap shall have minimum mat thickness as shown on the gradation tables.
- D. Install gravel and boulders to the thickness as shown on the Plans.
- E. Place the gravel, granular fill, riprap and boulders to avoid displacement or damage to the prepared surface or geotextile and in a manner to avoid segregation of particle sizes.
- F. Fill riprap voids and bury riprap a minimum of 6 inches with topsoil on side slopes as directed by the Engineer.

END OF SECTION

SECTION 02505

HIGH DENSITY POLYETHYLENE PIPE



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for high density corrugated polyethylene (HDPE) smooth lined (open profile) pipe for gravity sewers and drains, including fittings and appurtenances.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

- A. ASTM D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- B. ASTM D 3350 - Polyethylene Plastics Pipe and Fittings Materials.
- C. ASTM D 4976 - Polyethylene Plastics Molding and Extrusion Materials.
- D. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- E. AASTO M294 - Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter.

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Provide manufacturer's product specification and certification that pipe was manufactured in compliance with standards referenced in this Section.

PART 2 – PRODUCTS

2.1 PIPE AND FITTINGS

- A. Provide HDPE pipe which conform to the requirements of ASTM D 3350.
- B. Furnish corrugated HDPE smooth lined gravity sewer pipe with integral bell and "o"-ring gasketed spigot (bell-n-spigot). The bell shall overlap a minimum of two corrugations of the spigot end when fully engaged. Join two straight cut pipe (not tapered) ends by either a double "o"-ring gasketed bell-bell coupler or approved equal.
- C. Do not use HDPE pipe in applications requiring auguring of sewer pipe.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install pipe in accordance with the manufacturer's recommended installation procedures.
- B. Install bedding and backfilling in accordance with Section 02631 - Storm Sewers and Outfalls.

END OF SECTION

SECTION 02611
REINFORCED CONCRETE PIPE



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for reinforced concrete pipe.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

- A. ASTM A 506 - Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe.
- B. ASTM A 507 - Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
- C. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- D. ASTM C 443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- E. ASTM C 655 - Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe.
- F. ASTM C 877 - External Sealing Bands for Non-circular Concrete Sewer, Storm Drain, and Culvert Pipe.
- G. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- H. ASTM C1619 - Standard Specification for Elastomeric Seals for Joining Concrete Structures

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. Submit for approval, Shop Drawings and data on piping, fittings, gaskets and appurtenances. Indicate conformance to appropriate reference standards using Certificate of Compliance.
- C. Submit manufacturer's literature for product specified including materials, sizes, and installation procedures.

PART 2 – PRODUCTS

2.1 REINFORCED CONCRETE PIPE

- A. Provide circular reinforced concrete pipe in accordance with the requirements of ASTM C 76 for Class III wall thickness. Provide joints comprised of rubber gaskets conforming to ASTM C 443.
- B. Provide reinforced concrete arch pipe in accordance with the requirements of ASTM C 506 for Class A-III. Provide joints comprised of preformed flexible joint sealants conforming to C990
- C. Provide reinforced concrete elliptical pipe, either vertical or horizontal, in accordance with the requirements of ASTM C 507 for Class VE-III for vertical or Class HE-III for horizontal. Provide joints comprised of preformed flexible joint sealants conforming to C990.
- D. Provide reinforced concrete D-load pipe in accordance with the requirements of ASTM C 655.

PART 3 – EXECUTION

3.1 EXCAVATION AND INSTALLATION

- A. Excavate in accordance with the requirements of Section 02316 - Structural Excavating and Backfilling.
- B. Install as shown on the Plans or in accordance with the requirements of Section 02631 - Storm Sewers and Outfalls.

END OF SECTION

SECTION 02632

INLETS, HEADWALLS AND WINGWALLS



PART 1 – GENERAL

1.1. SUMMARY

- A. Section includes requirements for inlets for storm sewers or outfalls, including all appurtenances, and headwalls and wingwalls.

1.2. MEASUREMENT AND PAYMENT

- A. Measurement and payment is as noted on the Unit Price Schedule.
- B. Refer to Section 01270 - Measurement and Payment for unit price procedures.
- C. Handrails are incidental to the structure and shall not be measured separately, unless a unit item for handrails is included in the Unit Price Schedule (UPS).

1.3. REFERENCE

- A. ASTM C 270 - Mortar for Unit Masonry.

1.4. SUBMITTALS

- A. Refer to Section 01330 – Submittal Procedures.
- B. Submit Sealed Shop Drawing for approval of design and construction details for cast-in-place or precast units which differ from the Plans.
- C. Submit manufacturer's data and details for frames, grates, rings, covers, handrails, precast inlets, and appurtenances.
- D. Submit manufacturer's data and Certificate of Compliance for concrete brick.

PART 2 – PRODUCTS

2.1 PRECAST CONCRETE INLETS

- A. Precast concrete manhole sections shall conform to ASTM C 478 in which design is based on AASHTO HS 20 vehicle loading unless otherwise indicated on the Plans.
- B. Provide joints between sections with "o"-ring gaskets conforming to ASTM C 443.
- C. When base is cast monolithic with portion of vertical section, extend reinforcing in vertical section into base.

- D. Precast Concrete Base: Provide suitable cutouts or holes to receive pipe and connections.

2.2 CONCRETE

- A. Use concrete conforming to the requirements of Section 03310 – Concrete unless otherwise shown on the Plans or approved by the Engineer.
- B. Precast Manholes.
 - 1. Channel Inverts: Use structural concrete for inverts not integrally formed with manhole base.
 - 2. Cement Stabilized Sand Foundation: Provide cement stabilized sand foundation under base section. Refer to Section 02321 – Cement Stabilized Sand.
 - 3. Concrete Foundation: Provide structural concrete for concrete foundation slab under manhole base section where indicated on Plans.

2.3 PIPE CONNECTIONS TO MANHOLES

- A. Storm sewer pipe connection should meet ASTM C923 and ASTM F2510 for flexible CMP and HDPE pipe. Rigid (concrete) pipe connections to manholes do not have to comply with ASTM C923, and may be grouted instead.

2.4 SEALANT MATERIALS

- A. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, such as Adeka Ultraseal P201 or approved equal.
- B. Provide butyl sealant, such as Press-Seal EZ Stick or approved equal, for HDPE rings.
- C. Provide non-shrink cement based grout requiring only addition of water conforming to ASTM C 1107.

2.5 CONCRETE

- A. Cast-in-Place Concrete or Concrete Brick: structural concrete conforming to requirements of Section 03310 – Concrete, unless otherwise indicated on the Plans or approved by Engineer.

2.6 REINFORCING STEEL

- A. Refer to Section 03310 – Concrete.

2.7 MORTAR

- A. Provide mortar conforming to requirements of ASTM C 270, TYPE S using Portland cement or as shown on the Plans.

2.8 MISCELLANEOUS METALS

- A. Provide cast iron frames, grates, rings, covers and handrails conforming to the Plans.

PART 3 – EXECUTION

3.1 EXCAVATION AND INSTALLATION

- A. Excavate in accordance with the requirements of Section 02316 – Structural Excavating and Backfilling.
- B. Install as shown on the Plans or in accordance with the requirements of Section 02631 – Storm Sewers and Outfalls.

END OF SECTION

SECTION 02922

SOD



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for the placement of sod to establish and promote vegetation.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment is made under this Section. Include the cost for the work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 SUBMITTALS

- A. Refer to Section 01330 - Submittals.
- B. At the time of delivery, submit delivery tickets showing the quantity of sod delivered to each project site, and the type and quantity of sod staples delivered to each project site.
- C. Submit letter from sod supplier attesting to the growing site, and provenance, and that the sod meets the requirements of the District's specifications.

PART 2 – PRODUCTS

2.1 SOD

- A. Provide Bermuda grass, or St. Augustine Grass unless otherwise directed by the Engineer or designee.
- B. Provide live, green and growing sod, as required by HCFCD.
- C. Grass sod shall be delivered and installed with a healthy and vigorous system of dense, thickly matted roots throughout the soil for a minimum depth of five-eighths (5/8) inch (+/- 1/4 inch), excluding top growth thatch.
- D. Sod shall contain no more than five (5) percent noxious weeds and other crop and weed contaminations and be free of disease and harmful insects.
- E. Sod shall be cut in uniform panels; broken panels or panels with torn or uneven ends will not be accepted.
- F. Sod panels shall be strong enough to support their own weight and retain size and shape when suspended vertically from a firm grasp on the upper ten (10) percent of the panel.

2.2 STAPLES

- A. Staples used for anchored sod shall be 4 X 1/8 inch or 11 gauge steel staples.

PART 3 – EXECUTION

3.1 GENERAL

- A. Harvest, deliver, and install sod within a 36 hour period. Sod not planted within this time period will be inspected and approved by HCFCD prior to installation.
- B. Sod that has been allowed to dry out by exposure to the sun and air is unacceptable and will be rejected.
- C. Sod shall be placed in areas as shown on the site plans or as directed by HCFCD.
- D. HCFCD reserves the right to reject any unacceptable sod.

3.2 SOD PLACEMENT

- A. Spread fertilizer evenly and uniformly and incorporate by disking, harrowing or raking into the seedbed prior to placing sod. Refer to Section 02936 - Fertilizer and Soil Amendments.
- B. Lightly water prepared seedbed immediately prior to placing sod.
- C. Sod Panels
 - 1. Place sod panels tightly against each other in rows.
 - 2. Stagger lateral joints. Exercise care to ensure the sod is not stretched or overlapped and joints are butted tightly with no spaces between strips.
 - 3. Place a minimum of 2 staples, at diagonal corners, of each sod panel.
- D. Sod Rolls
 - 1. Provide rolls 24 inches wide. Sod roll is equivalent to two rows of sod panels. Do not provide rolls wider than 24 inches unless shown otherwise on the Plans. For sod rolls greater than 24 wide, provide a staple plan for approval.
 - 2. Exercise care to ensure the sod rolls are not stretched and joints are butted tightly with no spaces between roll ends.
 - 3. Lay sod by use of a sod roller, placed with tractor equipment, at the discretion of HCFCD representative.
 - 4. Place staples every 48 inches along each side. Stagger staples on opposing sides by 24 inches. Place 3 additional staples in corners and center of roll ends.
 - 5. Cut ends of sod rolls at 45 degree angle before placing adjacent rolls together.
- E. Tamp or roll the sod after placement to ensure good contact with the seedbed.

- F. Lightly water sod during placement to prevent excessive moisture loss.
- G. Immediately after installation of sod, remove extraneous clumps of sod or plant remnants from adjacent pavement and the finished sod surface.

END OF SECTION

SECTION 02923
BROADCAST SEEDING



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for seed in support of turf establishment.

1.2 MEASUREMENT AND PAYMENT

- A. When there is not a separate item listed for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related unit price work.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCES

- A. Texas Seed and Plant Certification Act and Standards, Section 62.
- B. U.S. Department of Agriculture Rules and Regulations - Federal Seed Act.

1.4 SUBMITTALS

- A. Refer to Section 01330 - Submittal Procedures.
- B. When requested, submit seed tags showing name of seed, location and year of harvest, percentage of purity, germination and dormant seed, and noxious weed content with the monthly invoice.
- C. When requested, submit delivery ticket showing total quantity of seed delivered for each project site.

PART 2 – PRODUCTS

2.1 MATERIAL

- A. Provide seed in clean, unopened and undamaged containers/bags.
- B. Provide seed containers/bags with tags affixed for inspection in the field and tested and certified by a state laboratory not more than nine (9) months prior to the date of planting. Containers/bags without tags will be rejected.
- C. Provide seed with no objectionable material such as sticks, stems and unthrashed seed heads, which will hinder proper distribution.
- D. Seed that is wet, moldy, starting to germinate or otherwise damaged will not be accepted by HCFCD.

- E. Provide Certified Bermuda grass tested by an accredited seed testing lab. Only bags with blue tags affixed will be accepted.

PART 3 – EXECUTION

3.1 SEED BED PREPARATION

- A. Refer to Section 02921 - Turf Planting Zone Preparation.

3.2 SEED PLAN

- A. HCFCDD may not require all of the species listed in each of the seed plans, some species may be excluded based on site conditions or other factors.
- B. Seed shall be applied in accordance with the following seed plan:

Seed Plan	Planting Dates	Species	Planting Rate Per Acre
1	Oct. 1- March 31 When soil temperatures fall below 75F, or as directed.	Unhulled Bermuda Grass Tall Fescue And Durana Clover Crimson Clover	50 lbs. 100 lbs. and 5 lbs. 5 lbs.
2	April 1-Sept. 30 When soil temperatures rise above 65F, or as directed	Certified Bermuda Grass Or Common Bermuda Grass, minimum purity/ germination of 95/85	65 lbs. or 60 lbs. PLS
3	As directed	Certified Bermuda Grass Or Common Bermuda Grass minimum purity/ germination 95/85 and Pensacola Bahia Grass	65 lbs. or 60 lbs. PLS and 20 lbs.
5	As directed	Annual Ryegrass and Fescue Or Millet	100 lbs. each 100 lbs.
6	As directed	Improved Bermuda Grass Cultivars	60 lbs.
7	As directed	Legume or Grain	20 lbs.

- C. Planting dates are approximate, HCFCDD will determine which seed to use prior to start of seeding.
- D. Seeding rate for Pure Live Seed (PLS) is used to determine the actual application rate of bulk seed to apply.
- E. To determine PLS- ($\% \text{ germination} \times \% \text{ purity} / 100$) ex. $95 \times 85 / 100 = 80.75\% \text{ PLS}$

- F. To determine quantity of PLS needed per acre (seeding rate / %PLS) = lbs. of seed needed for application. Ex. 60 lbs. /0.807PLS = 74.34 lbs. of seed needed per acre.

END OF SECTION

SECTION 02925
HYDROMULCH-HYDROSEEDING



PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for hydromulch and hydroseeding applications to establish and promote vegetation.

1.2 MEASUREMENT AND PAYMENT

- A. When there is not a separate item listed in the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related unit price work.
- B. Measurement and Payment is as noted on the Unit Price Schedule.

1.3 SUBMITTALS

- A. Submit, prior to the start of work, the product and manufacturer's name of hydro-mulch/soil binder/tackifier to be used.
- B. Submit a delivery ticket showing quantity of hydro-mulch/soil binder/tackifier delivered to each turf establishment project site.

PART 2 - PRODUCTS

2.1 HYDROMULCH

- A. Provide mulch that is an Engineered Fiber Matrix (EFM) and conforms to the following property values when uniformly applied at a rate of 3500 pounds per acre under laboratory conditions.

Property (physical)	Test Method	Req. Value (English)	Req. Value (SI)
Mass Per Unit	ASTM D6566 ^a	11.6 oz./yd ² (min.)	393 g/m ² (min.)
Thickness	ASTM D6525 ^a	0.16 inch (min.)	4 mm (min.)
Ground Cover	ASTM D6567 ^a	98% (min.)	98% (min.)
Water Holding	ASTM D7367	1100% (min.)	1100% (min.)
Material Color	Observed	Green	Green
Cover Factor ^b	Large Scale	0.05 (max.)	0.05 (max.)
% Effectiveness ^c	Large Scale	95% (min.)	95% (min)
Cure Time	Observed	24-48 hrs.	24-48 hrs.
Vegetation	ASTM D7322	600% (min)	600% (min)
Yield	Calculated	1.82 (min.)	1541 (min.)
Functional	Observed	Up to 12 months	Up to 12 months
Ecotoxicity	EPA 2021.0	96-hr. LC50 > 100%	96- hr. LC50> 100%
Biodegradability	ASTM D5338	100% (min.)	100% (min.)

1. ASTM test methods developed for Rolled Erosion Control Products and have been modified to accommodate Hydraulically-Applied Erosion Control Products.
 2. Cover Factor is calculated as soil loss ratio of treated surface versus an untreated control surface.
 3. % Effectiveness= One minus Cover Factor multiplied by 100%.
- B. All components of the EFM shall be pre-packaged by the manufacturer to assure both material performance and compliance with the following values.
1. Thermally processed wood fiber (within a pressure vessel). Wood fiber 77% (heated to a temperature greater than 380 degrees Fahrenheit (193 degrees Celsius) for 5 minutes at a pressure greater than 50 psi (345 kPa).
 2. Wetting agents 18%
 3. Crimped, man-made biodegradable interlocking fibers, 2.5%
 4. Proprietary mineral activator, 2.5%

END OF SECTION

SECTION 03310

CONCRETE



PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for cast-in-place concrete.

1.2 MEASUREMENT AND PAYMENT

- A. Where there is not a separate item listed on the Unit Price Schedule for work in this Section, no separate measurement and payment is made. Include cost for work under this Section in the related item listed on the Unit Price Schedule.
- B. Measurement and payment is as noted on the Unit Price Schedule.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.3 REFERENCE

- A. ACI 117 - Tolerances for Concrete Construction and Materials.
- B. ACI 211.1 - Selecting Proportions for Normal, Heavyweight and Mass Concrete.
- C. ACI 214.3R - Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete.
- D. ACI 302.1R - Concrete Floor and Slab Construction.
- E. ACI 304R - Measuring, Mixing, Transporting, and Placing Concrete.
- F. ACI 305R - Hot Weather Concreting.
- G. ACI 306R - Cold Weather Concreting.
- H. ACI 308 - Curing Concrete.
- I. ACI 309R - Consolidation of Concrete.
- J. ACI 315 - Detailing Reinforced Concrete Structures.
- K. ACI 318 - Building Code Requirements for Reinforced Concrete.
- L. ASTM A 82 - Steel Wire, Plain, for Concrete Reinforcement.
- M. ASTM A 185 - Steel Welded Wire Reinforcement, Plain, for Concrete.
- N. ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- O. ASTM A 767 - Zinc-coated (Galvanized) Bars for Concrete Reinforcement.
- P. ASTM A 775 - Epoxy-Coated Steel Reinforcing Bars.
- Q. ASTM A 884 - Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
- R. ASTM C 33 - Concrete Aggregates.

- S. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- T. ASTM C 94 - Ready-Mixed Concrete.
- U. ASTM C 138 - Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
- V. ASTM C 143 - Slump of Hydraulic-Cement Concrete.
- W. ASTM C 150 - Portland Cement.
- X. ASTM C 172 - Sampling Freshly Mixed Concrete.
- Y. ASTM C 173 - Air Content of Freshly Mixed Concrete by Volumetric Method.
- Z. ASTM C 231 - Air Content of Freshly Mixed Concrete by Pressure Method.
- AA. ASTM C 260 - Air-Entraining Admixtures for Concrete.
- BB. ASTM C 309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- CC. ASTM C 494 - Chemical Admixtures for Concrete.
- DD. ASTM C 595 - Blended Hydraulic Cements.
- EE. ASTM C 618 - Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
- FF. ASTM C 685 - Concrete Made by Volumetric Batching and Continuous Mixing.
- GG. ASTM C 1077 - Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- HH. CPMB-100 - Concrete Plant Standards, Part 2 – Plant Control Systems.
- II. CRSI - Placing Reinforcing Bars.
- JJ. CRSI MSP-1 - Manual of Standard Practice.

1.4 SUBMITTALS

- A. Refer to Section 01330 – Submittal Procedures.
- B. Submit proposed mix design and strength test data for each type and strength of concrete used.
- C. Submit laboratory reports prepared by an independent testing laboratory verifying that materials used comply with the requirements of this Section.
- D. Provide manufacturer's mill certificates for reinforcing steel for inspection in the field. Steel not accompanied by manufacturer's mill certificates will not be approved. Provide specimens for testing when required by Engineer.
- E. Provide batch tickets showing mix design number and the information required by ASTM C 94 for ready-mixed concrete delivered to the site. Provide batch tickets showing the information required by ASTM C 685 for concrete produced by continuous mixing.

- F. If requested submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Section.
- G. Submit Shop Drawings in accordance with ACI 315 and ACI 318, when required, showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details and other pertinent information.
- H. For waterstops, submit product information, including manufacturer's description literature, installation instructions and specifications.
- I. Submit curing procedures including materials and equipment to be used.

1.5 HANDLING AND STORAGE

- A. Reinforcing Steel: Store reinforcing steel to protect it from damage and formation of excessive rust. Protect epoxy-coated steel from damage to the coating.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cementitious Material:
 - 1. Portland Cement: ASTM C 150, Type I/II or II, unless the use of Type III is authorized by Engineer; or ASTM C 595, Type IP. For concrete in contact with sewage, use Type II cement.
 - 2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding 0.6 percent alkali content in the form of $\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$.
 - 3. Type "F" fly ash meeting requirements of ASTM C 618 may be used as mineral admixture in concrete mixture. When fly ash mineral filler is used, store and inspect in accordance with ASTM C 618. Do not use fly ash in amounts to exceed 25 percent by weight of cementitious material in mix design. Cement content may be reduced when strength requirements can be met. When fly ash is used, "cement" is defined as cement plus fly ash.
- B. Water: Clean, free from harmful amounts of oils, acids, alkalis or other deleterious substances and meeting requirements of ASTM C 94.
- C. Aggregate:
 - 1. Coarse Aggregate: ASTM C 33. Unless otherwise indicated, use the following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of the minimum dimension between sides of forms nor larger than 3/4 of minimum clear spacing between reinforcing bars.
 - 2. Fine Aggregate: ASTM C 33.
 - 3. Determine the potential reactivity of fine and coarse aggregate in accordance with the Appendix to ASTM C 33.

- D. Air Entraining Admixtures: ASTM C 260.
- E. Chemical Admixtures:
 - 1. Water Reducers: ASTM C 494, Type A.
 - 2. Water Reducer and Retarder: ASTM C 494, Type D.
 - 3. High Range Water Reducer (Superplasticizer): ASTM C 494, Types F and G.
- F. Prohibited Admixtures: Admixtures containing calcium chloride, thiocyanate, or materials that contribute free chlorine ions in excess of 0.1 percent by weight of cement.
- G. Reinforcing Steel:
 - 1. Use new billet steel bars conforming to ASTM A 615, ASTM A 767, or ASTM A 775, grade 60 unless otherwise shown on Plans. Use deformed bars except where smooth bars are specified. When placed in work, keep steel free of dirt, scale, loose or flaky rust, paint, oil or other harmful materials.
 - 2. Tie Wire: ASTM A 82. Use 16-1/2 gauge minimum for tie wire unless otherwise shown on the Plans.
- H. Curing Compounds: Liquid membrane-forming compounds conforming to ASTM C 309, with white or other heat reflecting pigment.

2.2 FORMWORK MATERIALS

- A. Lumber and Plywood: Seasoned and of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay and other imperfections, which would affect strength or impair the finished surface of concrete. Use S4S lumber for facing and sheathing.
- B. Formwork: For exposed concrete indicated to receive rubbed finish, provide form or form- lining surfaces free of irregularities.
- C. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8 inch in diameter.
- D. Metal Forms: Clean and in good condition, free from dents and rust, grease or other foreign material that tend to mar or discolor concrete, in a gauge and condition capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only metal forms which present a smooth surface and which line up properly.

2.3 PRODUCTION METHODS

- A. Use either ready-mixed concrete conforming to requirements of ASTM C 94 or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685.

2.4 MEASUREMENT OF MATERIALS

- A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C 685.
- B. Measure water and liquid admixtures by volume.

2.5 DESIGN MIX

- A. Use design mixes prepared by a certified testing laboratory in accordance with ASTM C 1077 and conforming to requirements of this Section.
- B. Proportion concrete materials based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this Section.
- C. Proportioning on the basis of field experience or trial mixtures in accordance with the requirements of Section 5.3 of ACI 318 may be used, if approved by Engineer.
- D. Classification:

Type	Minimum 28-Day Compressive Strength (Lbs./sq.in.)	Maximum W/C Ratio	Air Content (Percent)	Consistency Range in Slump (Inches)	Minimum Cementitious Content (Lbs./cy)
Structural	4000	0.45	3-5	4 to 6	517
Non- Structural	3000	0.50	3-5	4 to 6	423

- E. Determine air content in accordance with ASTM C 138, ASTM C 173 or ASTM C 231.
- F. Use of Concrete Types: Use types of concrete as indicated on the Plans. Unless indicated otherwise on the Plans or Specifications, use non-structural, unreinforced concrete for pipe plugs, seal slabs, thrust blocks, trench dams and concrete fill; use structural, reinforced concrete for all other applications.

PART 3 – EXECUTION

3.1 FORMS AND SHORING

- A. Install forms in accordance with ACI 304R.
- B. Provide mortar-tight forms sufficient in strength to prevent bulging between supports. Set and maintain forms to lines designated such that finished dimensions of structures are within the tolerances specified in ACI 117. Construction forms to permit removal without damage to

concrete. Provide adequate cleanout openings. Before placing concrete, remove extraneous matter from within forms.

- C. Unless otherwise indicated, form outside corners and edges with triangular 3/4 inch chamfer strips (measured on sides).
- D. Remove metal form ties to depth of at least 3/4 inch from surface of concrete. Do not use pipe spreaders. Remove spreaders which are separate from forms as concrete is being placed.
- E. Immediately before the concrete is placed, wet surface of forms which will come in contact with concrete.

3.2 PLACING REINFORCEMENT

- A. Place reinforcing steel as shown on the Plans. Secure steel in position in forms to prevent misalignment. Welding of reinforcing steel is not permitted unless noted on the Plans. Maintain reinforcing steel in place using approved concrete, hot-dip galvanized metal or plastic chairs and spacers. Place reinforcing steel in accordance with CRSI Publication "Placing Reinforcing Bars." Request inspection of reinforcing steel by Engineer before concrete is placed.
- B. Minimum spacing center-to-center of parallel bars: 2-1/2 times nominal bar diameter. Minimum cover measured from surface of concrete to face of reinforcing bar unless shown otherwise on the Plans: 2 inches.
- C. Detail bars in accordance with ACI 315. Provide reinforcing steel fabricated in accordance with CRSI Publication MSP-1, "Manual of Standard Practice." Bend reinforcing steel to required shape while steel is cold. Do not over bend steel.
- D. Provide splice and development length of bars as shown on Plans. Stagger splices or locate at points of low tensile stress.

3.3 EMBEDDED ITEMS

- A. Install conduit and piping as shown on the Plans. Locate and fasten conduit, piping and other embedded items in forms.

3.4 BATCHING, MIXING AND DELIVERY OF CONCRETE

- A. Measure, batch, mix and deliver ready-mixed concrete in accordance with ASTM C 94 and ACI 304R. Produce ready-mixed concrete using an automatic batching system as described in CPMB-100 Concrete Plant Standards, Part 2 - Plant Control Systems.
- B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685.
- C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Engineer before adjustment and change of mix proportions.

- D. Do not exceed the maximum water-cement ratio of the approved mix design. If all water allowed by the water cement ratio has not been added at the start of mixing the remaining water may be added no later than the time of delivery. Addition of water should be in accordance with ASTM C 94.
- E. Do not mix concrete when the air temperature is at or below 40 degrees F and falling. Concrete may be mixed when temperature is 35 degrees F and rising. Take temperature readings in the shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until the concrete has cured for a minimum of three (3) days at 70 degrees F or five (5) days at 50 degrees F.
- F. Conform to ACI 305R for batching concrete when air temperature is above 90 degrees F.
- G. Clean, maintain and operate equipment so that it thoroughly mixes material.
- H. Mixing methods other than as described above shall be used only when approved by Engineer.

3.5 PLACING CONCRETE

- A. Place and consolidate in accordance with ACI 304R and ACI 309R.
- B. Give at least 24 hours advance notice to Engineer to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to Engineer's inspection.
- C. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, if necessary to continue after daylight hours, light the site as required. If rainfall occurs after placing operations are started, provide covering to protect the work.
- D. Use troughs, pipes and chutes lined with approved metal or synthetic material. Place concrete without allowing segregation. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Do not allow aluminum material to be in contact with concrete.
- E. Limit free fall of concrete to prevent segregation. Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms after concrete has taken on initial set; do not place any strain on projecting reinforcement or anchor bolts.
- F. Use tremies for placing concrete in walls and similar narrow or restricted locations. Use tremies made in sections, provide in several lengths, so that outlet may be adjusted to proper height during placement operations.
- G. When the weather is hot enough to cause the concrete temperature to exceed 90 degrees F, employ means, such as pre-cooling aggregates and mixing water, using ice or placing at night, to maintain concrete temperature below 90 degrees F.
- H. Consolidate each layer of concrete with concrete spading implements and mechanical vibrators of type and adequate number for the size of

placement. Apply vibrators to concrete immediately after depositing. Do not use vibrators to aid lateral flow of concrete. Do not over-consolidate concrete.

- I. When placement of concrete flatwork is stopped unexpectedly, install a rigid transverse bulkhead, accurately notched for the reinforcing steel and shaped accurately to the cross section.
- J. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

3.6 CURING AND REMOVAL OF FORMS AND SHORING

- A. Comply with ACI 308. Cure by preventing loss of moisture and rapid temperature change for a period of seven (7) days when Type I/II, II or IP cement has been used and for three (3) curing days when Type III cement has been used.
- B. Start curing as soon as free water has disappeared from the concrete surface after placing and finishing.
- C. A curing day is any calendar day in which the temperature is above 50 degrees F for at least 19 hours. Colder days may be counted if air temperature adjacent to concrete is maintained above 50 degrees F. In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at the end of calendar days equal to twice the required number of curing days.
- D. Formed surfaces not requiring rubbed-finished surface:
 - 1. Cure by leaving forms in place for the full cure period or forms may be removed after two (2) days and curing compound applied. Keep wood forms wet during the curing period. Add water as needed for other types of forms.
 - 2. Soffit Forms: Leave soffit forms and shores in place until concrete has reached the specified design strength unless a plan for early removal of forms is submitted by the Contractor and approved by the Engineer. Any additional material testing required for the early removal of forms will be responsibility of the Contractor.
- E. Rubbed Finish:
 - 1. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging the surface. Remove forms from surfaces requiring rubbing only as rapidly as rubbing operation progresses.
 - 2. After rubbed-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.
- F. Unformed Surfaces: Cure with approved membrane curing compound method in accordance with ASTM C 309.
 - 1. After concrete has received a final finish and surplus water sheen has disappeared, immediately seal surface with a uniform coating of approved curing compound, applied at the rate of coverage

recommended by manufacturer or as directed by Engineer. Provide uniform coverage at a minimum rate of one (1) gallon per 180 square feet of area.

2. Thoroughly agitate the compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.
3. Do not apply compound to a dry surface. If concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or if rain falls on a newly coated surface before film has dried sufficiently to resist damage, apply an additional coat of compound at the specified rate of coverage.

3.7 FINISHING

- A. Patch honeycomb, minor defects and form tie holes in concrete surfaces with cement mortar mixed one (1) part cement to two (2) parts fine aggregate. Repair defects by removing unsatisfactory material and replacing with new concrete, keyed and bonded to existing concrete. Finish to provide a uniform surface between patches and existing concrete.
- B. Apply a broomed finish to all exposed surfaces of interceptor structure inlets and channel lining. Apply broomed finish in a single, continuous stroke perpendicular to the channel flow to produce a uniform surface. Apply a rubbed finish to all other exposed surfaces unless directed otherwise on the Plans or by the Engineer. After pointing has set sufficiently, wet the surface and perform first surface rubbing with No. 16 carborundum stone or approved equal. Do not add cement to form surface paste. Rub sufficiently to bring surface to paste; to remove form marks and projections; and to produce a smooth, dense surface. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or approved equal. After rubbing, allow paste on the surface to re-set; then wash surface with clean water. Leave structure with a clean, neat and uniform finish.

3.8 DEFECTIVE WORK

- A. Remove and repair defective work at no cost to the District.
- B. If concrete surface is bulged, uneven, or shows honeycombing or form marks, which cannot be repaired satisfactorily through patching, remove and replace the defective work as directed by the Engineer.
- C. Replace or submit a repair plan for pitted or washed concrete to be approved by the Engineer.

3.9 TESTING AND INSPECTION

- A. Refer to Section 01457 - Construction Tests and Inspection.

3.10 PROTECTION

- A. Refer to Section 02316 - Structural Excavating and Backfilling.
- B. Provide for protection of freshly placed concrete against damage from precipitation by having sufficient material on-site to protect finished surface.

3.11 MATERIAL DISPOSAL

- A. Refer to Section 02120 - Material Disposal.

END OF SECTION