City of Coos Bay

Coos County, Oregon

CONTRACT DOCUMENTS

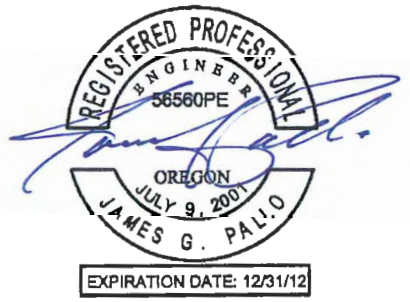
FOR THE CONSTRUCTION OF:

PUMP STATION 4

SCHEDULE I: Pump Station No. 4 Replacement

SCHEDULE II: New Gravity Sewer Line and Force Main

August, 2011
City Project No. 09/10-002
Engineers Project No.1201-022



Civil West
Engineering Services, Inc.

DIVISION 1- GENERAL REQUIREMENTS
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SECTION 01010 – SUMMARY OF THE WORK

1.01 WORK SUMMARY

A. The Contractor shall furnish all labor, equipment, and materials necessary to complete all work in accordance with the Contract Documents.

B. The work shall be performed within the City of Coos Bay, Coos County, Oregon. Coos Bay is located on U.S. Hwy 101 approximately 5 miles north of the junction with Oregon Hwy 42.

C. The Project Scope for each schedule is briefly described below:

1. Schedule I – Pump Station No. 4 Replacement shall take place within the easement south of Anderson Avenue and north of Blossom Gulch Creek. Demolition of existing station shall take place on 10th Street, adjacent to Blossom Gulch Elementary School.

    a. Obtain permits as required. Coordinate with public and private agencies including NW Natural Gas, Pacific Power, Coos Bay/North Bend Water Board, Frontier Communications and the City of Coos Bay.
    b. Construct new precast concrete wetwell, valve vault and flow meter vault as shown on the Plans. Wetwell will be 7-foot inside diameter and approximately 23 feet deep.
    c. Furnish and Install 6-inch and 8-inch ductile iron pipe, valves, fittings, and flow meter as shown on Plans.
    d. Furnish and Install new manholes and pipe to convey sewage to new wetwell.
    e. Furnish and Install two submersible centrifugal pumps, guide rails, VFDs, controls and appurtenances.
    f. Construct new CMU electrical and control building and concrete flatwork as shown on the Plans.
    g. Install natural gas-fired stationary generator, automatic transfer switch, natural gas supply pipe and connections as required.
    h. Perform site work including raising the site grade above floodplain and a new retaining wall as shown on the Plans. New asphaltic cement pavement and crushed rock surfaces. Furnish and Install chain link and cedar board perimeter fence.
    i. Connection to new 8-inch HDPE forcemain.
    j. Demolition of existing wetwell, control building, forcemain and gravity influent pipe.
    k. Electrical installation including in ground conduit, power and control wire, panels, power supply and other as required for a complete and operational installation.
    l. Temporary pumping facilities as required to maintain operation of existing pump station during construction.

2. Schedule II – New gravity sewer line and force main construction shall take place along a portion an easement between 10th Street and vacated 11th Street. Force main will continue north under 11th Street easement, across Anderson Avenue and terminate at the existing manhole at the intersection of 11th Street and an alley.

    a. Obtain permits as required. Coordinate with public and private agencies as required.

b. Furnish and install approximately 335 lineal feet of 12-inch 3034 PVC sanitary sewer piping and 58 lineal feet of 12-inch 30304 PVC storm sewer piping . Complete installation shall include, but is not limited to: trench excavation, connection to existing systems and complete testing of facilities.

c. Furnish and install approximately 465 feet of 8-inch HDPE pressure piping. Complete installation shall include, but is not limited to: trench excavation, connection to existing systems and complete testing of facilities.

d. Restoration of ac pavement and landscape under easements, 11th Street and Anderson Avenue.

e. Temporary pumping facilities as required to maintain sewer service during construction.

D. Coordination as required between Schedule I and II.

E. Work shall not begin until Engineer has issued the *Notice to Proceed* to the Contractor.

1.02 WORK PROGRESS

A. It is the intent of these Contract Documents that the Work proceed in a systematic manner so that a minimum of inconvenience to the public results in the progression of the work. Suitable equipment will be required to properly execute the work with the least amount of disruption to services and access through the work area. Contractor shall contain operations to within the designated public properties, rights-of-way and within any construction easements obtained for this project.

B. Order and schedule delivery of materials in ample time to avoid delays in construction. If any item is found to be unavailable, notify the Engineer immediately to permit the Engineer's selection of suitable substitute. Timely delivery of all materials and equipment is Contractor's responsibility. No extensions in Contract Time will be allowed due to delays caused by late delivery of items. Availability of items should be determined during bidding.

C. The Contractor shall protect the work and materials from damage due to the nature of the work, the elements, carelessness of others, or from any other cause until the completion and final acceptance of the work. All loss or damage arising out of the nature of the work to be done under these Contract Documents, or from any unseen obstruction or defects which may be encountered in the execution of the work, or from the action of the elements, shall be sustained by the Contractor.

D. The Contractor shall remove completely all materials designated for removal, to the extent specified and/or indicated in the drawings. For such materials, removal, hauling, disposal (including providing disposal location), and applicable precautions are entirely the Contractor's responsibility. Allow no excess accumulation of non-reusable material at job site(s).

E. Contractor is responsible for the protection of all existing improvements that are to remain in place. This includes, but is not necessarily limited to: existing utilities, roads, driveways, drainage ditches, culverts, fencing, shrubbery, and all landscaping structures and vegetation. Temporary enclosures, walls, covers, or other protection shall be provided and maintained by the Contractor as required. Contractor shall cooperate with the owners of such improvements, and shall restore and/or replace all damaged items as directed, without any additional expense to the Owner or payments to the Contractor.

1. The location and depth shown on the drawings for the existing underground facilities are approximate only and are not guaranteed to be accurate or complete. As-builts are not available for existing improvements.

2. Existing water meters, clean outs and other utility locations are not specifically indicated on the plans but do exist throughout the project, the contractor shall field locate all utilities prior to the start of construction. Pothole all utility crossings prior to construction as necessary to avoid conflicts. Contractor shall keep existing utilities in service and protect them during construction. Contractor is responsible for any damage to existing utilities. Portions of utilities which are to be abandoned in place may be removed be the contractor to the extent necessary to accomplish the construction.

END OF SECTION

SECTION 01025 – MEASUREMENT AND PAYMENT

1.01 GENERAL

A. Wherever in these Specifications an article, device or piece of equipment is referred to in the singular, such reference shall include as many such items as are shown on the Drawings or are required to complete the installation.

B. Miscellaneous items required in the project that do not have a corresponding Section in the Bid Form are to be considered incidental costs to the project. Compensation for such items and/or work shall be incorporated into other related bid items or total costs. No separate measurement and payment will occur for such incidental costs.

C. Monthly progress payments and final payment will be made in accordance with the Contract, the General Conditions, and the Supplementary General Conditions. A portion of all progress payments will be withheld as "retainage" in accordance with the General and Supplementary General Conditions.

D. Additional detail on measurement and payment may be found in other Sections detailing specific items.

1.02 UNIT PRICES

A. Payment will be made on a unit price basis according to the prices provided by the Contractor in the accepted Bid Form (Proposal). Payment will be made for the actual quantity of individual items (units) incorporated and installed in the project.

1.03 LUMP SUMS

A. Payments on lump sum contracts and/or bid items will be made based on the percentage of work complete at the end of the particular payment period.

B. Percentage of work complete will be recorded and submitted by the Contractor and estimated by the Engineer based on inspection. Payment will be based on the Contractor's approved schedule of values.

1.04 PROGRESS PAYMENTS

A. Monthly progress payments will be made as set forth in the Agreement, in accordance with the General Conditions and Supplementary General Conditions.

B. At the stated day of the month, submit a monthly payment request in accordance with the General Conditions and Supplementary General Conditions. Base request on actual quantities installed and completed, and/or approved schedule of values with percent complete of each item. Show payment requested for each item, and total payment requested.

C. Engineer will review payment requests and compare with inspection records to verify quantities and completed items. Engineer will recommend payment amounts for Owner approval and payment.

END OF SECTION

SECTION 01028 – CHANGE ORDER PROCEDURE

1.01 SUMMARY

A. Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as described by Change Orders signed by the Owner, Engineer, and the Contractor.

B. See also applicable sections of the General Conditions and applicable portions of the Supplementary General Conditions.

C. Work outside the scope of the original Contract Document intent will not be paid for by Owner or Engineer unless an approved Change Order precedes such work.

1.02 PROCESSING CHANGE ORDERS

A. Change Orders will be numbered in sequence and dated. The Change Order will describe the changes and will be signed by the Owner, Engineer and the Contractor. Request for estimates for possible changes are not to be considered Change Orders or direction to proceed with the proposed changes.

B. Change Orders will be prepared by the Engineer.

C. Contractor may request that the Owner consider a Change Order by sending a written Change Order Request to both Owner and Engineer to initiate the Change Order process. Any increase in cost or time requested by Contractor shall be reasonable and based on the provisions in the Contract Documents.

D. When requested, Contractor shall provide written evidence substantiating cost changes including receipts, cost proposals from suppliers, and wage forms showing labor used for a particular change.

E. Change Orders will be processed using the form shown in these Contract Documents.

F. Change Order may include changes for costs, time, material selections, or other changes to the Contract Documents as necessary.

END OF SECTION

SECTION 01040 – COORDINATION

1.01 SUMMARY

A. Restrict work to within public rights-of-way and easements obtained for this project.

B. The Contractor shall coordinate his work with the following:

1. City of Coos Bay
2. Pacific Power
4. NW Natural
5. Frontier & Charter Communications or other affected communications
6. City of Coos Bay Public Works Department
7. Coos Bay/North Bend Water Board
8. Private Property Owners and general public
9. Other affected utilities and agencies

C. Permit and maintain access for the Owner and/or residents to any adjacent facilities that are not part of work included within the project.

D. Coordinate with Owner to determine the locations of underground piping, vaults, valves and other items that could be damaged during construction. Call the statewide utility locating service at: 1-800-332-2344 with your schedule at least two days prior to beginning work.

E. Restoration and cleanup work shall be completed with each phase of the construction project. Parking lots and properties shall be maintained and kept clean and clear of excess excavation, debris, dirt and other materials.

END OF SECTION

SECTION 01046 – PROTECTION OF EXISTING IMPROVEMENTS

1.01 GENERAL

A. Where Contractor's operations are near utility systems, structures, or are adjacent to other property, no work shall be started until Contractor has made all arrangements necessary for protection thereof have been made. Contractor shall exercise all possible precautions to prevent damage to existing structures, improvements, and underground utilities which are to remain.

B. Approximate locations of known underground utilities are shown on the Plans. Exact location or extent of such utilities is not guaranteed, and utilities may exist which are not shown on the Plans. Contractor shall call for utility locates prior to any digging. Contractor shall also pothole as required ahead of the work to verify the location and depths of affected utilities. No additional compensation will be given for such work or for utilities being different than shown on the plans.

1. All trench excavations and structure excavations within two (2) feet of any existing underground utility shall be performed by hand methods in accordance with state laws.

2. Call 1-800-332-2344 for statewide locating services prior to excavations.

a. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through 952-0010090. You may obtain copies of the rules by calling the center. (note the telephone number for the Oregon Utility Notification Center is (503) 232-1987).

C. The Contractor shall be solely and directly responsible to the owner's and operator's of such properties and services for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the carrying out of the work to be done under this Contract.

D. Restoration of Existing Improvements. Except as shown on the Plans or as provided elsewhere in these specifications, the Contractor shall, at their own expense, repair and/or replace all utilities, services, landscaping, structures, substructures and other improvements damaged by the operations associated with this project, as directed. These repairs and replacements shall all be suitable and proper for intended use and in every respect acceptable to the Owner, Engineer and appropriate governing body or owner of such improvement. At minimum, restoration will be required to match the existing adjacent structure/improvement in thickness, finish, quality, quantity, and aesthetics.

E. In the event of interruption of domestic water, electric, telephone, sewer, or other utility services, the Contractor shall promptly notify the proper authority and the Owner. The Contractor shall cooperate with the proper authority in restoration of service as promptly as possible and shall bear all costs of repair. In no case shall interruption of any water, sewer, or utility service be allowed to exist outside working hours unless prior approval is received from said authority and Owner.

F. The Contractor shall pothole existing waterlines or other utilities ahead of his work so that potential conflicts can be minimized or that minor relocation of the new waterline routes can be made. Potholing is defined as exploratory excavation of existing waterlines or other utilities to verify their depth and location.

1.02 INTERFERING STRUCTURES, IMPROVEMENTS AND LANDSCAPING

A. It shall be entirely the responsibility of the Contractor to locate and protect all existing structures, landscaping, and other improvements in advance of the work. Neither the Owner, Engineer, nor any of their officers or agents shall be responsible to the Contractor for damages as a result of any structures or improvements being located differently than indicated in the drawings, nor which exist and are not indicated on the drawings.

B. If interfering power poles, telephone poles, guy wires, or anchors are encountered, the Contractor shall notify the affected utility and the Engineer at least seven (7) days in advance of construction to permit arrangements for protection or relocation of the structure. However, failure of utility to respond shall create no obligation on Owner, and Contractor shall protect all utilities against damage, or shall stand all costs involved thereof.

C. Landscaping, Tree and Plant Protection. Provide adequate protection of existing landscaping against damage from construction operations, including all structures and vegetation. Protect roots, trunk and foliage of existing and new shrubs and trees from all damage including that possible from compaction and dust. Contractor shall be entirely responsible to remove and replace all property which is damaged by work related to the project. Contractor shall bear all costs associated with replacement of existing landscaping, and shall cooperate with the owner of such improvements, the Owner, and the Engineer in all protection and restoration/replacement that is required. In specific circumstances, Contractor may make special arrangements with property owners for removal of landscaping without replacement. Copies of written agreements for all such arrangements shall be furnished to the Engineer.

D. When construction operations will affect the property of a private citizen (such as driveways, landscaping, etc.), even when such improvements are in the road right-of-way, the Contractor shall notify the owner of such property and the Owner, at least seven (7) days in advance of any affecting Work, so that any desired preparations can be made.

1.03 ROADS AND ACCESS

A. All work shall be conducted to minimize damage to existing roadways, easements and parking lots, including limiting wheel loads to acceptable levels. At all times keep roadways, shoulders, and ditches free from excess materials and debris.

B. Spillage of soil, dust, rock, mud, etc. on all roads (including State, County, City and private roads) used by the Contractor (and any working for Contractor) during construction, shall be prevented as much as possible. If spillage cannot be prevented, an hourly patrol shall be provided by the Contractor to police and sweep clean all spillage. At the conclusion of each workday, such traveled areas shall be left completely clean and free from all extraneous materials. Contractor is entirely responsible to prevent such spills and follow all related laws and regulations. If spillage of hazardous material occurs, Contractor shall immediately notify the proper authorities and remove the spill in the proper manner. Owner will not be liable for any additional costs due to spillage of any kind.

C. All damaged gravel, concrete and/or asphaltic concrete surfaces shall be repaired as required to conditions acceptable to the governing body and Engineer. No cleated or

crawl-type equipment shall be operated on paved surfaces, except to cross a road when adequate protection of the surface is provided.

D. During construction the Contractor shall take necessary measures to avoid and abate excessive dust. Sprinkling of roadways and sites may be necessary and shall be conducted carefully to avoid over wetting while keeping dust to a minimum.

E. Contractor is responsible for constructing, maintaining, and removing any additional access that Contractor deems necessary for the Work. Contractor must notify Owner and Engineer, and must obtain written consent from the governing body, prior to construction of additional access not shown on the drawings. All applicable regulations shall be followed in such access construction, including obtaining any required permits.

END OF SECTION

SECTION 01050 – FIELD ENGINEERING

1.01 SUMMARY

A. Construction stakeout – No specific construction stakeout is expected for this project. Contractor shall be responsible for all project layout based upon the information provided on the Plans and measurements made at the site.

B. Contractor shall maintain proper equipment on site as necessary to ensure horizontal and vertical control and proper location of improvements.

C. The Contractor will be solely responsible for laying out the work from the information provided and no additional stakeout will be provided except at the expense of the Contractor.

END OF SECTION

SECTION 01060 – REGULATORY REQUIREMENTS

1.01 SUMMARY

A. The Contractor shall at all times observe and comply with all federal and state laws and lawful regulations issued and local laws, ordinances and regulations which in any manner affect the activities of the Contractor under this contract and further shall observe and comply with all orders or decrees as exist as present and those which may be enacted later by bodies or tribunals having any jurisdiction or authority over such activities of the Contractor.

B. The contractor shall be responsible and liable for all accidents, damage or injury to any person or property resulting from any activity, duty and obligation of the Contractor under this Contract for which the Contractor may be legally liable. The contractor shall hold blameless and harmless and shall indemnify the Owner and its officers, employees and against the any and all claims, demands, loss injury, damage, actions and cost of actions whatsoever which they or any may sustain by reason of any act, omission or neglect of the Contractor or employees, agents, representatives or assignees of the Contractor in connection with the activities, duties and obligations of the Contractor under this Contract.

END OF SECTION

SECTION 01100 – REFERENCE STANDARDS

1.01 GENERAL

A. Abbreviations and Acronyms. Whenever the following abbreviations are used in these specifications or in the drawings, the following definitions apply. Unless otherwise designated, all reference to the following standards, specifications and methods shall imply the latest adopted revision in effect at the time of bid opening. Such standard, except as modified herein, shall have full force and effect as though printed in the specifications.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Association
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
EPA	United States Environmental Protection Agency
DEQ	Department of Environmental Quality (both Federal and State)
DWP	Oregon Dept. of Human Services, Drinking Water Program
FM	Factory Mutual
NEC	National Electric Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OAR	Oregon Administrative Rules
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statutes
OSSC	Oregon Structural Specialty Code
OSHA	Occupational Safety and Health Act (both Federal and State)
UL	Underwriters' Laboratories
USDA	United States Department of Agriculture
SSPC	Steel Structures Painting Council or, The Society for Protective Coatings

B. The abbreviation of "N.I.C." if shown on the plans or specifications represents work that is "Not in Contract". This work is to be completed at a later date by Owner or others and for which the Contractor will not be responsible for.

END OF SECTION

SECTION 01300 - SUBMITTALS

1.01 GENERAL

A. This section outlines in general the items the Contractor must prepare or assemble during the progress of the work, including technical submittals, O&M data, record drawings, and substitution requests. Submittals are required for each piece of equipment or material even when the item being proposed for use is the same as specified.

1.02 RELATED SECTIONS

A. General Conditions – Article 6.05, Substitutes and "Or-Equals"
B. Supplementary General Conditions – SGC 6.05
C. General Conditions – Article 6.17, Shop Drawings and Samples
D. Section 01230 – Construction Schedules
E. Section 01630 – Product Substitutions
F. Section 01700 – Closeout Submittals
G. Section 01730 – Operation and Maintenance Manuals
H. Section 01780 – Record Drawings
I. Various sections requiring submittals for equipment and materials

1.03 SUBSTITUTION REQUESTS

A. Where the specifications state "or-equal", "or approved equal", or similar statement, the Engineer alone will determine if the proposed substitute item is allowed.

B. Requests for substitution for items specified by manufacturer or manufacturer's model number as specified throughout the Contract Documents shall be in writing and be accompanied with sufficient information to allow the Engineer to identify the nature and scope of the request. Information to be provided shall include.

1. Reason the substitution request is being made.

2. All submittal information required for the specified item or equipment, including all deviations from the specified requirements necessitated by the proposed substitution.

3. Reproducible contract drawings, marked up to illustrate the alterations to all structural, architectural, mechanical and electrical systems required to accommodate the proposed substitution.

4. If the substitution requires any mechanical, electrical or structural changes, the Contractor will be responsible for costs in evaluating a requested substitution. The cost for such an evaluation will be determined on a case-by-case basis, after receipt of written request. The Engineer will notify the Contractor in writing of said cost. If the Contractor wishes to proceed, he shall advise the Engineer in writing and submit additional information as may be requested. Final approval of a substitution must be made by both the Engineer and Owner.

5. No additional costs of any kind will be incurred by the Owner or Engineer by approval or rejection of any substitution request.

1.04 SUBMITTALS

A. Technical submittals

1. Technical submittals covered by these specifications include manufacturer's information, shop drawings, test procedures, test results, samples, request for substitutions and miscellaneous work related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, piping and conduit details, and lead time required for delivery to job site.

2. Contractor's Responsibilities

   a. The Contractor shall furnish all drawings, specifications, descriptive data, certifications, dimensional drawings, samples, tests, methods, schedules and manufacturers installation and other instructions as required by the contract documents, or the Engineer, to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the contract documents.

   b. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Contractor shall verify that all features of all products conform to the specified requirements.

   c. The Contractor shall ensure that there is no conflict with other submittals and notify the Engineer in each case where his submittal may affect the work as shown on the Plans.

   d. The Contractor shall coordinate submittals among his subcontractors and suppliers.

   e. Submittals shall coordinate with the work so that work will not be delayed. Coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals.

   f. The Contractor shall not proceed with work related to a submittal until the submittal process is complete.

   g. The Contractor shall certify on each submittal document that he has reviewed the submittal, verified final conditions and complied with the contract documents. The Contractor may authorize in writing a material or equipment supplier to deal directly with the Engineer. This interaction shall be limited to contract interpretations to clarify and expedite the work.

   h. Charges will be documented and the Contractor will be charged for review of multiple non-conforming submittals for any one (1) item in excess of two (2) times.

1.05 RECORD DRAWINGS

A. During the course of construction, Contractor shall maintain a marked-up set of the project drawings. See Section 01780.

1.06 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Contractor shall collect O&M data from all equipment and material suppliers for all items provided in the project, for review and approval by Engineer and Owner. See Section 01730.

1.07 ENGINEER'S REVIEW

A. Review shall not extend to means, methods techniques, sequences or procedures of construction, or to verify quantities, dimensions, weights or gages, or to fabrication processes, except when specifically indicated or required by the contract documents, or to safety precautions or programs.

B. The Contractor shall submit four (4) copies of all submittal material to Engineer. Two (2) copies will be returned upon final approval. If the submittal is rejected all four (4) copies will be returned.

C. Unless otherwise specified, within 14 calendar days after receipt of submittal, the Engineer will return the marked-up copies. The Contractor shall take appropriate action if the submittal needs to be resubmitted. If specified submittal material is to be used for O&M data, all corrections shall be made and new clean copies shall be submitted with the O&M data.

D. Review of contract documents, method of work or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibilities for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or Owner. The Contractor shall have no claim under the Contract on account of failure or partial failure of the method of work, material or equipment so reviewed.

END OF SECTION

SECTION 01310 – CONSTRUCTION PROGRESS SCHEDULES

1.01 GENERAL

A. This section specifies detailed scheduling requirements and procedures including interim and overall schedules.

B. Submittals

1. The Contractor shall submit the following items as specified in this Section:

a. Interim and Overall Pump Station Schedule

b. Interim and Overall Sewer Pipe and Forcemain Schedule

C. Progress of the Work

1. The Contractor shall execute work with such progress as necessary to prevent delay to the overall completion of the project and with such forces, materials and equipment to assure completion in the time established by the Contract.

D. Interim Schedule

1. Contractor shall submit within 10 days after award of Contract, but before any scheduled pre-construction conference, an Interim Schedule setting forth all activities for the first two (2) months of construction.

2. Review comments by the Engineer concerning the Interim Schedule shall be considered in developing the Overall Schedule.

3. The Contractor shall submit three (3) copies of the Interim Schedule.

E. Overall Schedule

1. For Contract Periods exceeding 60 days, the General Contractor shall prepare and submit, within 30 days after the award of Contract, an Overall Schedule composed of all construction operations in connection with the Contract.

2. Overall Schedule, if it is sufficiently developed to equal or exceed the Interim Schedule requirements, may be submitted in lieu of a separately prepared Interim Schedule. In any event, the Interim Schedule shall form the basis for the Overall Schedule and will be considered an integral part of the Overall Schedule.

3. Contractor shall submit three (3) copies to the Engineer for his review. Within seven (7) days after receipt of the submittal, the Engineer shall review the submitted schedule and return one copy of the marked-up original to the Contractor. If the Engineer finds that the submitted schedule does not comply with specified requirements, the corrective revisions will be noted on the submittal copy returned to the Contractor for corrections and resubmitted.

F. Schedule Content

1. Schedules shall indicate the sequence of work and the time of starting and completion of each activity. Activities shall include, but not be limited to, the following items as they pertain to the Contract:

    a. Each subcontractor's items of work

    b. Temporary provisions for continued service

    c. Installation of specific major items

    d. Submittals from Contractor to Engineer for review and return to the Contractor. Material and equipment order, manufacture and delivery

    e. Dates for performance of all testing procedures

    f. Dates for tie-ins to existing systems

    g. Final cleanup and Start-Up

    h. Allowance for inclement weather

2. The schedule duration of each activity shall be based on the work being performed during the normal 40-hour work week with allowances made for legal holidays and normal weather conditions.

3. Schedule shall be updated each month as required, and more often if changes in scheduling are required or if the original schedule is no longer valid.

4. After each revision, the Contractor shall submit the revised schedule to the Engineer.

5. The Contractor shall consider all critical systems and coordinate existing, temporary, and new construction to ensure continuous production of water.

END OF SECTION

SECTION 01400 – QUALITY CONTROL

1.01 GENERAL

A. Work shall conform to these specifications and the standards of quality contained herein.

B. Only new items of recent manufacturer and quality specified, free from defects, will be permitted on the Work, unless items are specifically noted as existing to be reutilized. Remove rejected items immediately from the Work and replace with items of quality specified. Failure to remove rejected materials and equipment shall not relieve the Contractor from responsibility for quality and character of items used, nor from any other obligation imposed by the Contract.

C. No work defective in construction or quality, or deficient in any requirement of the drawings and specifications will be acceptable in consequence of the Owner's or the Engineer's failure to discover or to point out defects or deficiencies during construction; nor will the presence of Resident Project Representatives on the work relieve the Contractor from responsibility for securing the quality and progress of work as required by the Contract. Defective work revealed within the time required by guarantees shall be replaced by the Contractor by work conforming to the intent of the Contract. No payment, whether partial or final, shall be construed as an acceptance of defective work or improper materials.

END OF SECTION

SECTION 01500 – TEMPORARY FACILITIES AND CONTROLS

1.01 GENERAL

A. This section includes mobilization, temporary utilities, temporary construction, safety requirements, temporary environmental controls, and other temporary controls.

B. Submittals

1. Plans for disposal of waste materials and excavated material not required for fill, including permits as required.

C. Permits. Contractor shall secure and pay for all permits and fees required pertaining to temporary facilities and all other work.

D. Mobilization shall include de-mobilization and consist of preparatory work and operations, including but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to and from the project site; for the establishment of offices, buildings and other facilities necessary for work on the project; for premiums on bond and insurance for the project, and for other work and operations which the Contractor must perform or costs he must incur before beginning work on the project and after completion of the project.

E. Access of Government Officials. Authorized representatives of the Federal, State and Local Governments shall at all times have safe access to the Work, whenever in preparation or in progress, and Contractor shall provide proper facilities for such access and inspections.

2.01 MATERIALS

A. Contractor shall provide all materials necessary for all work this Section.

3.01 WORKMANSHIP

A. During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to their place of business or residence, unless the Contractor has made special arrangements with the affected persons and has notified Engineer and Owner. All temporary facilities shall be removed by the Contractor upon completion of the Work.

B. Temporary Utilities

1. Electric Power and Telephone

a. Electrical power. Power requirements should be confirmed by the Contractor for any special power needs. Arrangements for power shall be the responsibility of the Contractor.

b. Phone service shall be the responsibility of the Contractor.

2. Sanitary Facilities

a. The Contractor shall provide chemical toilets of suitable types and maintain them in a sanitary condition at all times, conforming to code requirements and acceptable to the health authorities. They shall be of watertight construction so that no contamination of the area can result from their use. Arrangements shall be made for frequent emptying of the

toilets. Upon completion of the work, toilets shall be removed and the area restored to its original condition.

b. Portable toilet facilities shall be located only at locations approved by the Owner.

C. Safety Requirements

1. Proper traffic control shall be provided in accordance with Section 01570.

2. Access for Police, Fire, and School Bus Service

a. Notify the fire department, police department and, when applicable, the School District before closing any street or portion thereof, and no closing shall be made without the Engineer's approval. Notify said departments when the streets are again passable for emergency vehicles. Do not block off emergency vehicle access to any area, such as consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, unless the Contractor obtains special written permission from the chief of the fire department. Conduct operations so as to cause the least interference with any fire station access and at no time prevent such access.

b. The Contractor shall furnish a list of emergency telephone numbers to both the Engineer and the Owner so that contact may be made easily at all times in cases of emergencies.

3. Fire Prevention. Contractor shall perform all work in a fire-safe manner. Contractor shall supply and maintain on site all fire-fighting equipment, supplies, and capable personnel for extinguishing incipient fires as required by all Federal, State and local laws and regulations. Each piece of internal combustion engine-driven equipment shall be equipped with a fire extinguisher in accordance with the appropriate recommendation of the National Fire Protection Association (NFPA). All engines shall be equipped with functional spark arrestors and sound suppression devices.

D. Temporary Environmental Controls

1. The Contractor shall maintain affected areas from his construction free from environmental pollution that would be in violation of federal, state or local regulations.

2. Air Pollution Control

a. Minimize air pollution likely to occur from construction operations by wetting down bare soils to control dust and requiring proper combustion emission control devices on construction vehicles.

b. Give unpaved streets, roads, and detours or haul roads in the construction area a dust preventative treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.

3. Water Pollution Control and Erosion Control

   a. Erosion control measures shall be maintained as necessary to ensure their continued effectiveness.

   d. Petroleum products, chemicals, or other deleterious materials shall not be allowed to enter the water.

4.01 PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Mobilization, Bonding, and Insurance - Payment for this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all activities related to mobilization and demobilization on the project, preparatory work, insurance and bonding costs, project closeout, building permits (as required) and other agency fees and other facilities and equipment necessary for work on the project.

2. Construction Facilities and Temporary Controls - Payment for work in this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all temporary construction facilities, project offices, miscellaneous equipment, costs related to scheduling, coordination, submittals, and all other Division 1 activities within the scope of work not designated with individual payment items shall be included within this item.

B. Schedule II – Sewer Pipe and Forcemain

1. Mobilization, Bonding, and Insurance - Payment for this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all activities related to mobilization and demobilization on the project, preparatory work, insurance and bonding costs, project closeout, building permits (as required) and other agency fees and other facilities and equipment necessary for work on the project.

2. Construction Facilities and Temporary Controls - Payment for work in this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all temporary construction facilities, project offices, miscellaneous equipment, costs related to scheduling, coordination, submittals, and all other Division 1 activities within the scope of work not designated with individual payment items shall be included within this item.

END OF SECTION

SECTION 01570 – TRAFFIC REGULATION

1.01 GENERAL

A. This section includes traffic control related safety requirements as may be required for the project.

B. Contractor shall comply with all rules and regulations of County, State, City, and Federal authorities regarding the closing, detouring, and loading of all public streets or highways.

C. No road (public or private) shall be closed or detoured by the Contractor to the public, except by express written permission of the Engineer and entity governing such roadways. Traffic must be kept open on all roads and streets where no detour is possible. The Contractor shall, at all times, conduct the work so as to assure the least possible obstruction to traffic and normal commercial pursuits. The convenience of the general public and residents, safety, and the protection of property is of prime importance and shall be provided for by the Contractor in an adequate and satisfactory manner.

D. Submittals

1. If road closures, lane closures, or detours are required, Contractor shall prepare, and submit for approval a Traffic Control Plan to the appropriate governing body of such road.

2. Contractor shall submit a traffic control plan and signing plan.

2.01 MATERIALS

A. Contractor shall furnish all flaggers, barricades, lead cars, warning signs, lights, signals, etc. as required to comply with regulations and provide safety.

B. All signs, lights, flags and other warning and safety devices shall meet the current ODOT safety manual affecting the location of construction, or to applicable City/County standards.

C. Barricades shall conform to the Standard Specifications for Highway Construction of the State Highway Department affecting the location of construction, or to City or County Standards where applicable.

3.01 WORKMANSHIP

A. Contractor shall, at their own expense, and without further or other order, provide, erect and maintain at all times during the progress or temporary suspension of the work, suitable barricades, fences, signs or other adequate warnings or protection and shall provide, keep and maintain such danger lights, signals, and flaggers as may be necessary or as may be ordered by the Engineer to insure the safety of the public as well as those engaged in connection with the work.

B. Failure of the Engineer to notify the Contractor to maintain barricades, barriers, lights, flares, danger signals, or watchmen, shall not relieve the Contractor from this responsibility. All barricades and obstructions shall be protected at night by signal lights which shall be suitably distributed and kept burning from sunset to sunrise. Barricades shall be of substantial construction and shall be suitably painted to increase their visibility at night.

C. Whenever the Contractor's operations create a hazardous condition, Contractor shall furnish flagmen and guards as necessary, or as directed, to give adequate warning to the public of any dangerous conditions to be encountered. Contractor shall furnish, erect, and maintain approved fences, barricades, lights, signs, and any other devices that may be necessary to prevent accidents and to avoid damage and injury to the public. Flaggers and guards, while on duty and assigned to give warning to the public, shall be equipped with approved red wearing apparel and a red flag which shall be kept clean and in good repair.

D. Contractor shall provide access to private properties at all times, except during urgent stages of construction when it is impractical to carry on the construction and maintain traffic simultaneously. Coordinate all construction activities with the affected property owners.

E. Contractor shall patrol the traffic-control area and reset all disturbed signs and traffic-control devices immediately, and will remove or cover all non-applicable signs during periods not needed.

F. At the end of each day, the Contractor shall leave work in such condition that it can be traveled without damage to the work and without danger to the public.

G. If, in the opinion of the Engineer or other governing traffic authority, traffic control is lacking or otherwise unsafe or deficient, the Engineer may require that all work be halted until the traffic control measures can be improved to an acceptable level.

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

Payment for this item shall be included within the lump sum price for Construction Facilities and Temporary Controls, unless a line item lump sum bid is shown in the bid form specifically for this item. It shall include all activities related to traffic and safety control on the project and preparatory work for work on the project.

B. Schedule II – Sewer Pipe and Forcemain

Payment for this item shall be included within the lump sum price for Construction Facilities and Temporary Controls, unless a line item lump sum bid is shown in the bid form specifically for this item. It shall include all activities related to traffic and safety control on the project and preparatory work for work on the project.

END OF SECTION

SECTION 01610 – STORAGE AND PROTECTION

1.01 SUMMARY

A. Protect products scheduled for use in the Work by means as described in this Section and as recommended by the manufacturer.

1.02 MANUFACTURER'S RECOMMENDATIONS

A. Except as otherwise approved by the Owner, determine and comply with manufacturers' instructions on product handling, storage and protection.

1.03 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with the labels intact and legible.

B. Maintain packaged materials with seals unbroken and labels intact until time of use.

C. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements at no additional cost to the Owner.

D. The Owner may reject as non-complying such material and products that do not bear identification satisfactory to the Owner as to the manufacturer, grade, quality and other pertinent information.

1.04 STORAGE

A. Store materials on-site in coordination with the Owner to provide suitable site access and clearance.

B. Do not store unnecessary materials that will not be incorporated into the work.

1.05 PROTECTION

A. Protect stored materials from moisture and temperature, and unauthorized handling.

B. Provide protection for finished surfaces.

C. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.

D. Provide proper protection for all workers.

1.06 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the Owner and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Owner to justify an extension of the Contract Time of Completion.

C. Repair all scratches and damage to painted surfaces promptly with proper color and material.

END OF SECTION

SECTION 01630 – PRODUCT SUBSTITUTIONS

1.01 SUMMARY

A. This Section describes procedures for securing approval of proposed product substitutions.

1.02 PRODUCT OPTIONS

A. The Contract is based on standards of quality established in the Contract Documents.

1 In agreeing to the terms and conditions of the Contract, the Contractor has accepted the responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.

2 The Owner has not agreed to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.

B. Where materials and methods are specified by naming one single manufacturer or model number, without stating that equal products will be considered, only the material and method named is approved for incorporation into the Work.

C. Where materials and methods are specified by name or product number, followed by the words "or equal approved in advance", materials and methods proposed by the Contractor to be used in lieu of the named materials and methods shall in all ways be equal or exceed the qualities of the named materials and methods. For consideration as an "equal approved in advance", complete detailed submittals (4 copies) must be received by the Engineer at least fourteen (14) days prior to the bid opening date. Approved substitute items will be listed by addendum prior to bid opening.

D. Where the phrase "or equal," or "or approved equal," occurs in the Contract Documents, do not assume that the materials, equipment or methods will be approved as equal unless the item has been specifically so approved for this Work. Prepare detailed submittal and submit to Engineer. Substitutes will not be incorporated into the work unless submittal is approved by the Owner via the Engineer.

E. Submittals shall include all technical information and diagrams as necessary to allow Engineer to evaluate the proposed substitution. Any/all differences between the specifications or specified equipment and the proposed substitution shall be clearly noted in the submittal. Submittals shall clearly indicate the specific model numbers, part numbers, and options of the proposed substitution.

1.03 DELAYS

A. Delays in construction arising because of the time required for approval of substitution requests will not be considered by the Owner as justifying an extension of the agreed Time of Completion.

END OF SECTION

SECTION 01700 – CONTRACT CLOSEOUT

1.01 GENERAL

A. Section includes procedures and requirements for finalizing and closing out the Project(s).

B. Final clean-ups and restorations shall be done prior to requesting final inspections.

2.01 RESTORATION AND CLEAN-UP

A. Upon completion of any portion of the work, promptly remove temporary facilities generated by that portion of the work, including surplus materials, equipment and machinery unless directed otherwise by the Engineer or the Owner. All construction work by the Contractor shall be clean and free of rubbish, dirt, overspray, and extraneous materials to the satisfaction of the Engineer before acceptance of the work.

B. Street/Road Cleanup. All roadways affected during construction shall be cleaned and restored. All ditches and culverts shall be cleaned and re-graded for proper drainage. Culverts broken or damaged by construction activities shall be restored to their original condition and location. Immediately following construction, remove all dirt, mud, rock, gravel, and other foreign material at the completion of the day or as otherwise required by the Engineer.

C. Site Restoration and Cleanup. Restore or replace any ground covering (e.g., bark chips, cinders, gravel, river rock, etc.) to the original condition or better. Replace topsoiled areas, rake and grade to conform to their original contours. Replace any damaged landscaping or plantings to prior conditions in manner acceptable to Owner. Reseed grass areas as approved. Seed and protect any disturbed slopes.

2.02 CERTIFICATIONS

A. Contractor to prepare on Contractor's letterhead with project title and number clearly identified. Submit to Engineer with application for Final Payment.

1. A written certification that Contractor has fully completed the Work in strict compliance with the Contract Documents, and requesting final inspections.

2. Written certification that all subcontractors and suppliers who have furnished work or materials as part of this project have been paid in full.

3. Written certification that Contractor will replace all materials and workmanship that prove defective within one-year after the date of Final Acceptance. Date Engineer signs Final Payment Certificate is date of Final Acceptance and starts the Contractor's one-year guarantee period.

4. Submission of a signed State or Federal approved Wage Certification Form certifying that Contractor has paid not less than the Prevailing Wage Rate as required by law, and that Contractor has timely submitted the required payroll certificates to the appropriate state or federal wage division.

B. One-Year Warranty Inspection. On the 11th month following final project completion and acceptance, Contractor shall be available to be present during the on-site warranty inspection. Any defects identified in materials or workmanship shall be corrected within 30 days by the Contractor at his own expense.

END OF SECTION

SECTION 01730 - OPERATION AND MAINTENANCE MANUALS

1.01 GENERAL

A. This section outlines in general the format and content of O&M Manuals required on the project.

B. Contractor shall collect O&M data from all equipment and material suppliers for all items provided in the project. Data shall be specific to the actual equipment used with specific model numbers and options highlighted. General cut-sheets that do not clearly indicate the specific parts and options provided on this job will not be accepted.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals
B. Section 01700 – Contract Closeout
B. Various sections requiring operation and maintenance data

1.03 SUBMITTALS

A. The Contractor shall submit three (3) hard copies and one (1) software pdf copy of the complete manuals to Engineer prior to substantial completion. The manuals will be reviewed by the Engineer. If complete and acceptable without corrections, Engineer will notify the Contractor in writing and one (1) additional set will be sent to the Engineer by the Contractor.

B. If changes, corrections, or additional information is required, the Engineer will notify the Contractor and may either return one (1) copy, return portions marked-up, or request additional data. Contractor will then resubmit three (3) copies of the corrected manuals. Contractor shall keep copies for their records. This process will continue until Engineer has three complete approved sets.

C. When the manuals are complete and approved by the Engineer, the Contractor will then provide one (1) additional complete set so that Engineer can retain one set and three sets can be delivered to the Owner.

D. Final payment will not be issued until all approved O&M manuals are received.

1.04 QUALITY ASSURANCE

A. Instructions and data shall be prepared by personnel experienced in maintenance and operation of described products.

1.05 FORMAT

A. Data shall be prepared in the form of an instructional manual providing clear information on operational procedures, periodic maintenance requirements, repair procedures, and troubleshooting procedures.

B. Binders shall be commercial quality, 8-1/2 x 11 inch three-ring binders with hardback plastic covers. Maximum binder ring size is 2 inches and multiple volumes will be used as required. Covers shall have a clear outer shell to allow insertion of cover sheet.

C. Each binder shall be identified with a cover that is typed with the title "OPERATION AND MAINTENANCE INSTRUCTIONS", the title of the project, the name of the Owner, and the date of project completion.

D. Each binder shall include a table of contents and tabbed dividers either color coded or with printed labels. Labels shall be permanently affixed. Manual contents shall be arranged by systems and process flow under section numbers and sequence of table of contents.

E. Text shall be manufacturer's printed data or typewritten data on 20 pound bond paper. Drawings shall be provided with reinforced punched binder tab, bound with text, and folded as necessary to the size of text pages.

1.06 CONTENT

A. The first sheet inside the cover shall provide the title of project; names, addresses and telephone numbers of the Engineer; names, addresses and telephone numbers of the general contractor with the names of responsible parties.

B. For each product or system, provide the names, addresses, and telephone numbers of subcontractors and suppliers, including local sources of supplies and replacement parts.

C. Product Data: Section sheet shall clearly identify specific products, component parts, and data applicable to the installation.

D. Drawings shall supplement product data to illustrate relations of component parts of equipment and systems to show control and flow diagrams.

E. Materials and Finishes

1. Building products, applied materials, and finishes shall include product data with catalog number, size, composition, and color and texture designations.

2. Instruction for care and maintenance shall include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and schedule for cleaning and maintenance.

F. Equipment and Systems

1. For each item of equipment and each system, a description of the unit or system component parts, identification of function, normal operating characteristics, and limiting conditions; and performance curves, engineering data and tests, and complete nomenclature and commercial number for replaceable parts.

2. Electrical service characteristics, controls, and communications for panelboard circuits. Color coded wiring diagrams as installed.

3. Operating procedures. Start-up, break-in, and routine normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and any special operating instructions.

4. Maintenance Requirements. Routine procedures and guide for troubleshooting, disassembly, repair, and reassembly instructions; and alignment, adjusting, and checking instructions.

   a. Servicing and lubrication schedules and list of lubricants required.
   b. Manufacturer's printed O&M instructions
   c. Sequence of operation by controls manufacturer
   d. Parts lists, illustrations, assembly drawings and diagrams
   e. Control diagrams

f. Charts of valve tag numbers
g. List of manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage
h. Additional data requirements as specified in individual product sections.

END OF SECTION

SECTION 01740 – WARRANTIES

1.01 GENERAL

A. Installed Materials Warranties. Prior to 75% completion and payment for work under this Contract, the Contractor shall furnish the Owner through the Engineer, all warranty and/or guarantee forms normally furnished by the manufacturer of equipment. Warranty form shall include the specific equipment installed, the duration of the warranty, details of the warranty, and the installer's name, address and phone number. Installation date will be filled in by the Owner and will coincide with date of substantial completion of the work under this contract. All such warranties shall name the Owner as the warranted party.

a. Attention is directed to various other sections of the Contract Documents where specific material or installation warranties may be required for items specified.

B. Contractor shall guarantee the Work for a period of one (1) year from the date of Final Acceptance. All materials and workmanship that prove defective within the one-year guarantee period shall be promptly replaced or corrected with no additional cost to the Owner. Written certification that Contractor will replace all materials and workmanship that prove defective within one-year after the date of Final Acceptance is required for project close-out and shall accompany application for Final Payment.

END OF SECTION

SECTION 01780 - PROJECT RECORD DRAWINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This section outlines in general the Contractor requirements for preparing and maintaining and record drawings of the project.

B. Contractor shall provide access to the Record Drawings to the Engineer and Owner throughout construction and shall finalize and submit complete record drawings upon completion of the work.

C. Accurate Record Drawings or "As-Builts" are considered extremely important and it shall be entirely the Contractor's responsibility to maintain a complete and accurate record of all details of the project as he constructs and installs equipment and materials.

D. Engineer or Owner may stop work if it is determined that Contractor is not properly recording details in record drawings and require correction and accurate documentation of all previous work before additional work proceeds.

E. Engineer must accept and approve the drawings prior to recommending final payment.

1.02 RELATED SECTIONS

A. General Conditions – Article 6.12, Record Documents

1.03 SUBMITTALS

A. Submit two complete sets of initial marked-up Record Drawings immediately upon completion of construction work. Engineer will review for completeness and either approve or return one set with comments and corrections.

B. If initial submittal required corrections, submit one complete set of corrected marked-up Record Drawings to Engineer with or before request for final payment.

PART 2 – PRODUCTS

2.01 RECORD DRAWINGS

A. Maintain one set of black-line prints of the Contract Drawings. Mark-up drawings using erasable red-colored pencil. Use additional colors as necessary to clearly document changes from original drawings for different categories of work at the same location.

B. Use clear original or copy of project drawings for mark-up. Use shop drawings for markup when they are more capable of showing actual physical conditions completely and accurately.

C. All deviations or differences from the original drawings, including dimensional, location, layout, material, and other details shall be noted clearly. Any additional information discovered during construction shall also be noted including location and depth of buried utilities and structures not shown in the original drawings.

2.02 FORMAT

A. Organize Record Drawings into manageable sets using plans and shop drawings as applicable. Keep sets bound and protected.

B. Keep on-site during construction and clearly identify as "Record Drawing" on cover.

PART 3 – EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Record data as soon as possible after obtaining it. Do not wait until the end of the job or a portion of the job to record data.

B. Give particular attention to information concealed that would be difficult to identify or measure and record later. Record and check the markup before enclosing concealed installations.

C. Require the individual who installed or constructed the portion of the work, or otherwise obtained the record data, to prepare that portion of the marked-up record print.

D. Incorporate changes and additional information previously marked on Record Drawings, erase, redraw, and add details and notations where applicable.

E. Refer instances of uncertainty to Engineer for resolution.

END OF SECTION

DIVISION 2- SITE WORK
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SECTION 02240 – CONTROL OF WATER

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section covers the control of surface water runoff, dewatering of pipeline trenches and structural excavations, bypass pumping of sanitary sewer systems, and other elements required for control of water.

B. The design, installation, and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor assumes all liability for operation of the by-pass system and shall man the system during its operation. The by-pass system shall meet the requirements of all codes and regulatory agencies having jurisdiction of the system operation.

C. Submittals

1. Prior to performing any excavation, the Contractor shall submit a dewatering plan to the Engineer for review. The submittal shall include method of installation and details of the proposed dewatering system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment required for control of water shall be furnished and maintained as required to perform the construction.

B. Pumps

1. Bypass pumps, if required, shall be fully automatic, solids handling, self-priming units.

2. Contractor shall supply all necessary stop/start controls for each pump.

3. Backup pumps shall be available in the case of a primary pump failure.

C. Piping/Hose

1. Contractor shall provide temporary discharge piping constructed of rigid pipe with positive restrained joints.

2. No aluminum irrigation type piping to be allowed.

3. Discharge hose may be allowed for short sections with prior Engineers review and approval.

4. Provide watertight pipe system.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. The necessary machinery, appliances and equipment shall be provided and operated to keep excavations free from water during construction, and to dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public. Sufficient pumping equipment and machinery in good working condition shall be provided for all emergencies including power outage, and sufficient workmen shall be available at all times for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during work stoppages without written permission from the Engineer.

B. The control of groundwater if present shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation, shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils. Natural or compacted soils softened by saturation with groundwater or standing surface water shall be removed and replaced as instructed by the Engineer at no additional expense to the Owner.

C. During construction of structures, installation of pipelines, placing of structure and trench backfill and the placing and setting of concrete, excavations shall be kept free of water. Surface runoff shall be controlled so as to prevent entry or collection of water in excavations. The static water level shall be drawn a minimum of one (1) foot below the bottom of the excavation, so as to maintain the undisturbed state of the foundation soils and allow the placement of fill or backfill to the required density. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

D. Open and cased sumps shall not be used as primary dewatering for excavations deeper than three (3) feet below the static water table. Location of open or cased sumps shall be outside of trench excavation or limits of structural excavation.

E. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures and pipelines.

F. Provisions shall be made to take care of surplus water, mud, silt or other runoff pumped from excavations and trenches or resulting from slicking or other operations. Siltation of completed or partially completed structures and pipelines by surface water or by disposal of water from dewatering operations shall be cleaned up at the Contractor's expense.

G. The Contractor shall be responsible for any damages to existing on- and off-site facilities and work in-place resulting from mechanical or electrical failure of the dewatering system.

H. The Contractor shall comply with all applicable local, State, and Federal laws and regulations pertaining to erosion control and discharge of water off-site.

I. Necessary filtering media, bags, or other methods shall be used to ensure that turbidity limits in the receiving bodies are not exceeded during dewatering activities.

J. Sanitary Sewer Bypass Pumping. Pump shall be suitably sized to handle all incoming flows. Bypass pumping shall be provided continuously until normal flow patterns in sanitary sewers can be reestablished.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Bypass Pumping of sewage flows shall be made on a lump sum basis at the price stated on the Bid Form. Payment shall include all equipment, labor, and materials required to provide continuous bypass pumping of sewage flows during replacement of the sanitary sewer piping as shown on the Plans.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Control of Water and other work in this Section shall be included within the unit prices for sewer lines and associated appurtenance items. A separate payment will not be made for this item.

END OF SECTION

SECTION 02250 – DEMOLITION AND SITE PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. The work in this section includes the furnishing of all labor, equipment, materials, incidentals, and performing all work required for the removal and disposal of concrete, miscellaneous structures, sewer piping as designated for removal, debris and other items or improvements of manmade origin, in accordance with the Plans and these Specifications.

B. The removal work described herein does not include the removal or disposal of items or improvements designated to remain.

C. The area in which removal work, under these Specifications, is to be performed shall be confined to the minimum dimensions, within the public right-of-way or easements, which will permit proper construction of the proposed improvements, or as otherwise indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete shall be as specified in Section 03300.

B. Select fill and Backfill shall comply with Section 02315.

D. Landscape restoration and reseeding shall be as specified in Section 02900.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Pavements, Curbs, Walks and Driveways

1. Where construction operations require the removal of pavements and other concrete flatwork or structures, bituminous pavements or portions thereof, the area to be removed shall be neatly sawcut. Just prior to placement of hot ac pavement final sawcuts shall be made 6-inches outside the limits of the trench on each side to a depth of 1½-inches, or deeper as required, to permit the removal of material without damage to adjoining portions of structures to be left in place. All cuts shall be clean, vertical cuts made true to lines designated or approved by the Engineer. See Detail drawings for further clarification.

2. The Contractor shall remove and dispose of all pavement and structures, or portions thereof, which lie within the limits of excavation.

3. Pavements and/or structures designated to remain but damaged as a result of the Contractor's operations shall be sawcut and removed as described above, and replaced or restored at the sole expense of the Contractor.

B. Removal and Disposal of Asbestos-Containing Pipe

1. Removal of Asbestos-Containing Pipe

a. When existing pipe containing asbestos (i.e. Transite or AC Pipe) is exposed, cut or removed, all requirements of the EPA, Oregon DEQ, and OR-OSHA shall be followed. Specific guidelines pertaining to the handling and removal of asbestos-containing materials are given in OAR 340-248 and OAR 437, Division 3, Construction. The Contractor is required to be familiar with these and all other requirements related to the removal, handling and disposal of asbestos-containing material, and shall comply with all such laws and regulations.

b. All asbestos-containing pipe that is not removed or otherwise disturbed shall be left or abandoned in place. The location of all such pipe shall be documented by the Contractor on the As-Built plans.

2. Disposal of Asbestos-Containing Pipe

a. All asbestos-containing pipe that is removed from the ground or otherwise disturbed must be handled and disposed of in compliance with the guidelines of OAR 340-248 and OAR 437, Division 3, Construction. The asbestos-containing pipe must be adequately wetted to prevent the release of asbestos fibers during cutting and handling. Asbestos-containing materials must be disposed of in leak-tight 6-mil thick plastic bags, plastic-lined cardboard containers or plastic lined metal containers, in accordance with the above requirements.

b. The sealed containers of asbestos-containing pipe shall be hauled to an approved asbestos landfill and disposed of according to DEQ regulations and the landfill requirements.

c. The Contractor shall take special precautions to protect the integrity of the asbestos-containing pipe and prevent the release of asbestos during the handling, loading and transportation of the pipe.

C. Valves and valve covers, fittings, and other pipe appurtenances designated for removal shall be removed in their entirety to the limits shown on the Plans, or as required to permit proper construction of the proposed improvements. Remaining ends of pipes shall be suitably capped or plugged in a watertight manner. Provide a minimum of two (2) feet of concrete slurry filling inside of pipe for full diameter.

D. Salvaged Materials

1. Frame and cover sets, gratings, water system components, valves and other reusable materials from removed or abandoned structures and systems shall remain the property of the City and shall be salvaged as directed by the City Engineer and delivered to the City's storage yard by Contractor.

a. Materials to be salvaged and returned to the City include: Fire hydrant, water valves, pump station hydroranger, and overflow flow meter.

2. Other salvageable materials shall become the property of the Contractor and shall be disposed of by the Contractor away from the site.

a. Salvaged materials of any kind shall not be reused in new work without the written approval of the Engineer.
b. Items to be salvaged include: Gates Valves, Check Valves and Instrumentation.

E. Abandonment of Existing Structures

1. Structures to be abandoned in place shall be removed to a depth indicated on the Plans. Exposed pipes shall be plugged with concrete and the remainder of the structure filled with ¾ -inch or 1-minus crushed aggregate.

2. Wetwell shall be cleaned of all sewage, grit and sludge prior to abandonment.

3. Interior surfaces of the ends of pipes to be abandoned shall be cleaned prior to constructing permanent plugs. Concrete plugs shall be constructed in the ends of all pipe 18-inches in diameter or less. Concrete pipe shall be at least 8-inches thick.

F. All items and materials designated to remain shall be protected against damage as required. Damage to items or materials not intended for removal shall be repaired promptly by the Contractor to the satisfaction of the affected property owner. If the Engineer determines it necessary, repairs shall consist of complete replacement of the affected items or materials. All such repairs and replacements shall be made by the Contractor without compensation.

G. Disposal of Materials

1. All materials, except those determined by the Engineer or Owner to be reusable, shall become property of the Contractor at the place of origin and shall be disposed of by the Contractor in conformance with all laws, regulations and rules legally imposed on such activities.

   a. Contractor shall make every effort to salvage or recycle construction demolition items and debris as is feasible.

2. Materials shall not be disposed of on District owned or District controlled lands except by written permission of the District, and if so permitted, the materials shall be placed only at such locations and in such manner as District may direct. Materials may be disposed of on private properties only with written permission of the property owner(s) involved, and with copies of the agreement furnished to the District and Engineer.

H. Excavations resulting from the removal of structures and/or obstructions shall be backfilled and compacted in accordance with the requirements of Section 02315. Backfill materials shall consist of the type and class designated on the Plans and specified in Section 02315.

G. All existing ditches damaged by the Contractor by his operations and incidental ditching shall be re-constructed as required as to maintain existing drainages and ditches. The Contractor shall maintain channel width and side slopes of existing conditions.

H. 1. Existing sanitary sewer pipe and laterals where designated shall be removed entirely to the limits shown on the Plans or to the limits as required to facilitate proper installation and connection of new facilities.

2. Existing sanitary sewer manholes where designated for removal shall be removed to the limits shown or described on the Plans & Specifications or to the limits as required to facilitate the proper abandonment of existing facilities and installation and placement of new facilities.

3. Manhole Abandonment & Removal

A guideline for the abandonment or removal of existing manholes is as follows:

a. Remove existing frame, lid and top cone section of manhole.

b. Plug existing 8 inch pipe with concrete and fill remaining portion of manhole with sand.

c. Backfill remaining excavation with class "B" backfill material and restore surrounding grade and gravel surfaces.

4. Abandon Piping

a. A short portion of the existing 16 inch mainline is to be abandoned in place.

b. Exposed ends of remaining mainline or lateral shall be suitably capped or plugged in a watertight manner and pack end with a concrete slurry to seal completely.

c. Existing forcemain shall be filled with concrete slurry and capped and plugged in a watertight manner.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT (Schedule I and II)

A. Payment for Demolition & Site Preparation shall be made on a lump portions basis for the amount stated on the Bid Form. Payment shall include compensation for all work described herein for the removal and disposal of portions of sewer pipe, structures and obstructions as required for the proposed improvements. Contractor shall sequence his work in such that no disruption existing service or system occurs unless said disruption is approved by the Engineer.

B. Measurement and payment for abandonment of those portions of the existing mainline and laterals shall be included within the lump sum cost of Demolition & Site Preparation. A separate payment will not be made for this item.

C. Measurement and payment for the removal and disposal of excavated material for the removal and abandonment of existing manhole and appurtenances and backfill shall be included within the lump sum cost of Demolition & Site Preparation as stated on the Bid Form. A separate payment will not be made for this item.

D. Measurement and payment for ac pavement excavation and disposal, backfill and other preparation of trenches shall be included in the lineal foot cost for gravity and pressure sewer pipe.

E. The Cost for sawcutting existing pavement adjacent to new utility trenches shall be considered incidental to the work. No additional compensation will be allowed for sawcutting.

F. Measurement and payment for ac pavement replacement shall be as specified in Section 02740.

G. No additional compensation will be allowed the Contractor for the handling, removal or disposal of any asbestos-containing pipe encountered during construction.

END OF SECTION

SECTION 02260 - SHORING AND BRACING

1.01 GENERAL

A. This section specifies requirements for shoring and bracing of trenches and other excavations as required to furnish safe and acceptable working conditions, protect existing and new structures and vegetation and maintain existing slopes, fills and open excavations.

B. The Contractor shall have sole responsibility to determine the construction means and methods required to satisfy the requirements of this section. The Contractor shall design sheeting, shoring and bracing in accordance with Oregon Occupational Safety and Health Act (OSHA).

C. The Contractor shall furnish a safe place of work pursuant to the provisions of OSHA and the subsequent amendments and regulations and for the protection of the work, structures and other improvements.

D. Shoring and bracing shall include all necessary sheeting, sloping and other means and procedures such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils.

E. Slope Stability

1. OSHA Health and Safety Standards for Excavation, 29 CFR Part 1926, or successor regulations shall be strictly enforced and, if they are not followed, the Contractor and/or earthwork and utility subcontractor could be liable for penalties.

2. Owner and/or Engineer may stop work at any time if Contractor is deemed to be performing work in an unsafe manner.

2.01 MATERIALS - NOT USED

3.01 WORKMANSHIP

A. General

The construction of sheeting, shoring and bracing shall not disturb the state of soil adjacent to the excavation or below the excavation bottom. Sheeting, shoring and bracing shall be removed after placement and compaction of initial backfill, except as otherwise specified.

B. Structure and Existing Piping

The Contractor shall provide support of existing and new structures where shown, specified and at all other locations where excavation infringes on a 1:1 slope extending from the bottom of the footing. Existing piping shall be protected with shoring and bracing where excavation could expose the pipe and/or cause damage to the pipe.

C. Damages

Any damages to new or existing structures occurring through settlements, water or earth pressures, or other causes due to failure or lack of sheeting, shoring or bracing, or through negligence or fault of the Contractor shall be repaired by the Contractor at his

own expense.

4. PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for all shoring, bracing and other work in this section shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Improvements.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for shoring, bracing and other work in this Section shall be included within the unit prices for sewer lines and associated appurtenance items. A separate payment will not be made for this item.

END OF SECTION

SECTION 02315 – TRENCH EXCAVATION, BEDDING AND BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. This work consists of furnishing all labor, materials, incidentals and equipment, as well as performing all work required for excavation, foundation stabilization, pipe bedding, pipe zone material, trench backfill, compaction, final grading, hauling and disposal of material resulting from the construction of sewer piping, manholes, and all related appurtenances. Included also is the locating and protecting of existing utilities and other improvements (see Division 1), shoring, bracing, and dewatering of excavations, excepting only such work as is covered and included under other sections of this Division, or other Divisions of these Contract Documents.

B. Excavation must be in accordance with ORS 757.541 to 757.571 and all other applicable laws and regulations.

1.02 REFERENCES

A. Oregon Standard Specifications (OSS) – The Joint Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

1.03 DEFINITIONS

A. Trench Excavation – Trench excavation consists of the removal of all material encountered in the trench to the limits shown on the Plans or as directed. Trench excavation shall be classified as either common excavation or rock excavation.

1. Common excavation is defined as the removal of all material as required to complete the planned improvements, regardless of type, nature or condition of materials encountered, except that which is designated as rock excavation.

2. Rock excavation is defined as the removal of boulders composed of igneous, sedimentary or metamorphic stone material which have a least dimension of 36-inches or more, or a displacement of one cubic yard or more; or the removal of solid ledge rock which, in the opinion of the Engineer, requires for its removal drilling and blasting, wedging, sledging, barring or breaking with power operated tools.

a. No soft or disintegrated rock; hard-pan or cemented gravel that can be removed with a hand pick or power operated excavator or shovel; no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock outside of the minimum limits of measurement allowed, which may fall into the excavation, will be measured or allowed.

b. When solid rock layers have an overburden of non-rock material (common material) which cannot practically be stripped and handled separately, and/or when solid rock is interspersed with non-rock material, the entire mass will be classified as solid rock if the actual solid rock fraction exceeds 85% of the entire volume.

B. Trench Foundation – Trench foundation is defined as the bottom of the trench on which the pipe bedding is to lay and which provides support for the pipe.

C. Foundation Stabilization – Foundation stabilization is defined as the furnishing, placing and compacting of specified materials for any unsuitable material removed from the bottom of an excavation, as directed by the Engineer, to provide a firm trench foundation.

D. Pipe Bedding – Pipe bedding is defined as the furnishing, placing and compacting of specified materials on the trench foundation so as to uniformly support the barrel of the pipe. The total bedding depth shall be a minimum of 6-inches below the outside bell of the pipe.

E. Pipe Zone – Pipe zone is defined as the furnishing, placing and compacting of specified materials for the full width of the trench and extending from the top of the bedding to a level 10-inches above the top outside surface of the barrel of the pipe. Specified zone material to be placed in this region in conformance with these Specifications.

F. Trench Backfill – Trench backfill is defined as the furnishing, placing and compacting of material in the trench extending from the top of the pipe zone to the bottom of pavement base, ground surface or surface material. Plans generally show locations for each type of backfill class.

G. Drain Rock – Drain rock is defined as the furnishing, placing and compacting of specified free draining material for the full width of the drain trench (perforated pipe drains) and extending to a level as specified above the top outside surface of the pipe barrel.

PART 2 PRODUCTS

2.01 MATERIALS

A. Trench Foundation – The trench foundation shall be undisturbed native material when suitable. Where ground water or other unstable conditions exist and the native material cannot properly support the pipe, additional excavation may be required. The trench shall be stabilized with foundation stabilization material when such conditions are present in the opinion of the Engineer.

B. Foundation Stabilization – Foundation Stabilization: 1½"-0 or 2"-0 aggregate base rock meeting OSS Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the Engineer.

C. Pipe Bedding – Material for pipe bedding shall be clean, hard, sound, durable, well-graded, ¾-inch minus pea gravel or crushed rock, free from organic matter. Engineer must approve material prior to use.

D. Trench Backfill

1. Class "A" Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 3-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the Engineer. If stockpiled material becomes saturated or unsuitable, Class B, C or D Backfill shall be substituted. Engineer must approve material prior to use.

2. Class "B" Backfill: ¾"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.

3. Class "C" Backfill: Clean sand with no particles larger than ¼-inch.

4. Class "D" Backfill: Pit run or bar run material, well graded from coarse to fine, with maximum aggregate size of 3 inches.

5. Class "E" Backfill (CLSM or CDF): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.

   a. Slurry shall consist of a highly flowable lean concrete mix; mixture of Portland cement, fly ash, fine aggregates, water and admixtures as required for a mixture that results in a hardened, dense, non-settling, hand excavatable fill.

PART 3 EXECUTION

3.01 GENERAL

A. Remove, haul, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions encountered, within lines and grades shown on the Plans or defined herein, and as necessary for completion of the proposed improvements. The method of excavation shall be as determined by the Contractor, and as required for special protection of existing improvements. Special care shall be taken to avoid overexcavation below subgrades. Store and protect materials suitable for use as backfill where applicable. Clearing and Grubbing and Removal of Structures and Obstructions to be completed prior to excavation.

B. When the precise location of subsurface structures and/or utilities is unknown, locate such items by hand excavation prior to utilizing mechanical excavation equipment. Use hand excavation when mechanical equipment might damage existing improvements which are to remain undisturbed. See Division 1 for other requirements.

C. Incidental to excavation shall be the furnishing, installing and removal of all shoring, sheeting, bracing and dewatering equipment as required to support adjacent earth banks and structures, keep excavations free from excess water, and to provide for the safety of the public and all personnel working in excavations.

3.02 EXCAVATION

A. Excavate to the lines and grades shown on the project Plans, allowing for forms, shoring, working space and gravel base. Provide minimum 6-inch clearance around pipe barrel in all directions or greater in accordance with the standard trench detail drawing.

B. Shoring and Bracing

1. Sheet and brace excavation as necessary to prevent caving and to protect adjacent structures, property, workers and the public.

2. All sheeting, shoring and bracing shall conform to safety requirements of OSHA and other Federal, State and local agencies.

3. Shoring and bracing loads and recommendations are provided in the January 3, 2011 Foundation Report and Seismic Hazard Study prepared by Foundation Engineering, Inc. (FEI). A representative of FEI must be present during installation of sheet piles or slide rail system, and preparation of the excavation.

C. Dewatering

1. Furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during digging and initial backfilling. Dispose of water in such a manner as to prevent damage to public or private property, or nuisance or menace to the public.

2. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. Have available, at all times, competent workers for operation of the equipment.

3. Control surface runoff to prevent entry or collection of water within excavations. All excavations shall be kept free of water during placement of backfill and/or concrete placement.

4. Comply with all laws regarding stormwater runoff, protection of natural resources, and other applicable laws and regulations.

5. Dewatering recommendations are provided in the January 3, 2011 Foundation Report and Seismic Hazard Study prepared by Foundation Engineering, Inc. (FEI). Contractor shall conform to recommendations within the FEI report.

3.03 FOUNDATION STABILIZATION

A. The contractor shall overexcavate the trench to firm undisturbed soils or rock when, in the opinion of the Engineer, the trench foundation materials are not suitable for the support of the pipe. Foundation Stabilization materials, as specified, shall be placed and compacted in lifts not exceeding 6-inches in compacted thickness to the required grade. Each lift shall be compacted to at least 95% relative compaction in accordance with ASTM D698.

3.04 DISPOSAL OF EXCESS MATERIALS

A. Excavated materials not suitable or required for backfill shall be hauled away and disposed of on approved sites arranged by the Contractor. No site shall be used for disposal of materials without written approval of the property owner. All costs associated with the hauling and disposal of materials shall be borne by the Contractor. The Contractor shall be entitled to any proceeds received from the sale of excess materials.

3.05 TEMPORARY STOCKPILING

A. Place excavated materials suitable for use as backfill (and not excess material) only within construction easements, right-of-way, or approved work area. Stockpiles shall be placed in such manner as to provide the minimum inconvenience to the public.

B. The Contractor shall obtain written permission from any property owners prior to placement of stockpiles on private property. Provide copies to the Owner and Engineer. Remove stockpiles as soon as possible and restore sites to affected property owners' satisfaction.

C. Access to all fire hydrants, water valves and meters shall be maintained. Stockpiles shall not be permitted to block any stormwater drainage ditches, gutters, drain inlets, culverts or natural water courses.

D. Protect stockpiled material which is to be later incorporated into the work so that excessive wetting or drying of the material does not occur. Material shall be brought to near optimum moisture content prior to placement and compaction. Depending on the moisture content of stockpiled materials, necessary processing may include aeration,

mixing and/or wetting. No additional payment will be allowed for protecting or preparing native backfill materials.

E. If approved native materials become unsuitable (too wet or mixed with unsuitable materials) due to negligence by the Contractor, then imported granular materials may be required for backfilling at the subject location at no additional cost to the Owner.

F. Provide necessary protection for stockpiled materials so that silt-laden runoff does not occur during rain events and to prevent wind-blown dust from stockpiles.

3.06 TRENCH BACKFILL

A. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material.

B. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

C. Contractor shall backfill the trench above the pipe zone in successive lifts not exceeding 12-inches in loose thickness. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Each lift shall be compacted, using suitable mechanical or pneumatic equipment, to a minimum of 95% of the maximum dry density as determined by ASTM D698. If the specified compaction is not obtained, the Contractor may be required to use a modified compaction procedure and/or reduce the thickness of lifts. If approved materials meeting the specifications cannot be compacted to the required density regardless of compactive effort or method, the Engineer may reduce the required density or direct that alternate materials be used. In no case shall excavation and pipe laying operations proceed until the Contractor is able to compact the backfill to the satisfaction of the Engineer.

D. CLSM. When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours.

E. When backfilling is complete, the Contractor shall finish the surface area as specified. In paved or graveled areas the Contractor shall maintain the surface of the trench backfill level with existing adjacent grades with ¾"-0 crushed rock until pavement replacement is completed and accepted by Owner.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for all Trench Excavation, Bedding and placement of Backfill shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Replacement.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Trench Excavation, Bedding and Backfill shall be included within the unit prices for sewer lines and associated appurtenance items. Price will include all such trench work and materials required for each backfill class and size and type of pipe as shown in the Bid Form. A separate payment will not be made for this item.

2. Where gravel backfill is used through gravel shoulders and gravel roadways the backfill shall be brought to the finish grade of the existing shoulder and gravel roadway and shall be included in the unit prices for waterlines. A separate payment shall not be made for this item.

3. Payment for Foundation Stabilization will be made on a cubic yard basis, truck measure. Payment shall include all excavation, removal and disposal of existing materials excavated and placement of new foundation material.

END OF SECTION

SECTION 02316 – EXCAVATION AND SELECT (STRUCTURAL) BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. This work consists of furnishing all labor, materials, incidentals and equipment, as well as performing all work required for excavation and structural fill placement for the pump station.

B. Excavation must be in accordance with ORS 757.541 to 757.571 and all other applicable laws and regulations.

C. Adhere to rules and recommendations of the Oregon Department of Environmental Quality *Erosion and Sediment Control Manual*, most recent edition.

D. Excavation and backfill work at the pump station site shall comply with 2010 Geotechnical Investigation Report prepared by SHN Consulting Engineers & Geologists, Inc. as directed.

1.02 REFERENCES

A. Oregon Standard Specifications for Construction (OSS) – 2008 Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

B. Oregon Department of Environmental Quality (DEQ) *Erosion and Sediment Control Manual,* most recent edition.

1.03 DEFINITIONS

C. Excavation – excavation consists of the removal of all material at site to the limits shown on the Plans or as directed. Excavation shall be classified as either common excavation or rock excavation as specified in Section 02315.

D. Foundation – foundation is defined as the bottom of the excavated area on which the granular pad is to lay and which provides support for the pipe and granular pad.

E. Foundation Stabilization – Foundation stabilization is defined as the furnishing, placing and compacting of specified materials for any unsuitable material removed from the bottom of an excavation, as directed by the Engineer, to provide a firm foundation.

F. Select Fill – Select fill is defined as furnishing, placing and compaction of specified material for the entire excavated area for granular pad.

PART 2 PRODUCTS

2.01 MATERIALS

A. Granular Pad Foundation – The trench / granular pad foundation shall be undisturbed native material when suitable. Where ground water or other unstable conditions exist and the native material cannot properly support the pipe or granular pad, additional excavation may be required. The excavation shall be stabilized with foundation stabilization material when such conditions are present in the opinion of the Engineer.

B. Foundation Stabilization – Foundation Stabilization: 1½"-0 or 2"-0 aggregate base rock meeting 2008 OSS Sections 00641 and 02630. Required when native excavation foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the Engineer.

C. Select Fill - select fill shall consist of 1"-0 or 1 ½"-0, dense-graded, crushed aggregate base rock meeting 2008 OSS Section 02630.10. Engineer must approve material prior to use.

D. Geo-Fabrics

1. Separation Liner (fabric) shall be provided beneath granular pad and native bearing soil and shall have a mean average roll value (MARV) strength properties meeting the requirements of AASHTO M 288-2000 Class 2 geotextile (geotextile for separation) with a permittivity greater than 0.05 sec. $^{-1}$ and an apparent opening size less than 0.6 mm.

2. Filter Fabric shall consist of a non-woven geotextile with a grab tensile strength greater than 200 lbs and an apparent opening size (AOS) of between #70 and #100 (U.S. Sieve) and a permittivity greater than 0.1 sec. $^{-1}$.

3. Specification sheet to be submitted on selected geotextiles for approval prior to order and delivery to site.

PART 3 EXECUTION

3.01 GENERAL

A. Remove, haul, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions encountered, within lines and grades shown on the Plans or defined herein, and as necessary for completion of the proposed improvements. The method of excavation shall be as determined by the Contractor, and as required for special protection of existing improvements. Special care shall be taken to avoid overexcavation below subgrades. Store and protect materials suitable for use as backfill where applicable. Clearing and Grubbing and Removal of Structures and Obstructions to be completed prior to excavation.

B. When the precise location of subsurface structures and/or utilities is unknown, locate such items by hand excavation prior to utilizing mechanical excavation equipment. Use hand excavation when mechanical equipment might damage existing improvements which are to remain undisturbed. See Division 1 for other requirements.

E. Excavation shall be done in accordance with the Recommendations for Design and Construction of the 2010 Geotechnical Investigation Report prepared by SHN Consulting Engineers & Geologists, Inc. as directed. Subgrade shall be inspected by SHN Consulting Engineers & Geologists, Inc. (geotechnical engineer) prior to compaction or placement of select fill.

C. Shoring and Bracing

1. Sheet and brace excavation as necessary to prevent caving and to protect adjacent structures, property, workers and the public.

2. All sheeting, shoring and bracing shall conform to safety requirements of OSHA and other Federal, State and local agencies.

D. Dewatering

1. Furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during digging and initial backfilling. Dispose of water in such a manner as to prevent damage to public or private property, or nuisance or menace to the public.

2. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. Have available, at all times, competent workers for operation of the equipment.

3. Control surface runoff to prevent entry or collection of water within excavations. All excavations shall be kept free of water during placement of backfill and/or concrete placement.

4. Comply with all laws regarding stormwater runoff, protection of natural resources, and other applicable laws and regulations.

5. Dewatering recommendations are provided in the August, 2010 Geotechnical Investigation Report prepared by SHN Consulting Engineers and Geologists, Inc. Contractor shall conform to recommendations in the report.

3.02 EXCAVATION

A. Excavate to the lines and grades shown on the project Plans, allowing for forms, shoring, working space and gravel base.

3.03 FOUNDATION STABILIZATION / OVER EXCAVATION

A. Foundation stabilization shall be placed and compacted in accordance with the recommendations of the Geotechnical Report.

B. The contractor shall over excavate the pipeline trench to firm undisturbed soils or rock when, in the opinion of the Engineer, the trench foundation materials are not suitable for the support of the pipe. Foundation stabilization materials, as specified, shall be placed and compacted in lifts not exceeding 6-inches in compacted thickness to the required grade. Each lift shall be compacted to at least 95% relative compaction in accordance with ASTM D698.

3.04 DISPOSAL OF EXCESS MATERIALS

A. Excavated materials not suitable or required for backfill shall be hauled away and disposed of on approved sites arranged by the Contractor. No site shall be used for disposal of materials without written approval of the property owner. All costs associated with the hauling and disposal of materials shall be bourn by the Contractor. The Contractor shall be entitled to any proceeds received from the sale of excess materials.

3.05 INSPECTION

A. Contractor shall notify Engineer not less than 48 hours prior to required inspections. Required geotechnical inspections shall not be waived and work shall not proceed until inspection has been completed and the Contractor has been authorized to proceed by the Engineer.

inspection has been completed and the Contractor has been authorized to proceed by the Engineer.

a. Geotechnical Engineer shall inspect excavated subgrade under the wetwell prior to subgrade compaction or placement of select fill. Engineer may require adjustment to the subgrade, compaction of the subgrade, or other action depending on actual conditions.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station Improvements

1. Payment for Excavation and placement of Backfill and Select Fill shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Improvements Project.

END OF SECTION

SECTION 02320 – BYPASS PUMPING

PART 1 GENERAL

1.01 SUMMARY

A. This work in this section includes the furnishing of all labor, equipment, materials, incidentals, and performing all work required to implement a temporary bypass pumping system for the purpose of diverting sanitary sewer flows around the designated work zone for the project duration.

B. The operation, design and installation of the temporary bypass pumping system shall be the responsibility of the Contractor. The Contractor assumes all liability for the operation of the bypass pumping system and shall man the system during its operation. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction of the systems operation.

C. Submittals

1. Prior to the start of any excavation the Contractor shall submit a bypass pumping plan to the Engineer for review. The submittal shall include the method of installation and details of the proposed bypass pumping system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment required for the bypass pumping equipment shall be furnished and maintained as required to perform the sanitary sewer line replacement.

B. Pumps

1. Bypass pumps shall be fully automatic, solids handling, self priming units.

2. Contractor shall supply all necessary start/stop controls for each pump.

3. Backup pumps shall be available in the case of a primary pump failure.

C. Piping/Hose

1. Contractor shall provide temporary bypass discharge piping constructed of pipe with positive restrained joints.

2. Use of discharge hose may be allowed for short sections with prior Engineers review and approval.

3. Discharge piping system shall be watertight. Contractor shall perform pressure and leakage tests on the bypass pumping system prior to start of operation of the system.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. It is essential to the operation of the existing sanitary sewer system that there will be no interruption in the flow of sewerage during the duration of the project. Operation of the bypass pumping system shall maintain the sanitary sewer flows around the work area in such a manor as not to cause surcharging of upstream and downstream sewers, damage to existing sewers, and will protect both public and private property from flooding and damage.

B. Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, primary pumping equipment, back up pumping equipment, bypass piping and all necessary power, labor and equipment as required to intercept the sewage flow prior to interfering with the work area. Flows shall be conveyed past the work area and returned to the existing sewer system at a point downstream of the work area.

1. After projects completion and installed plugging is no longer required, plugging shall be removed in such a manner that permits sewerage flow to return to normal without surcharging downstream the existing system.

C. The Contractor shall provide the design, installation and operation of the temporary bypass pumping system. The Contractor shall assume responsibility of such bypass pumping system. Bypass system shall meet the requirements of the Oregon Department of Environment Quality (DEQ) and any other State, County or local agencies having jurisdiction over the operation of such facilities.

D. The Contractor will not be permitted to stop mainline flows under any circumstances without prior approval from District or the Engineer.

E. The Contractor shall assume liability for providing all necessary means to convey sewage past the work area.

F. All water resources, wetlands and other natural resources shall be protected from discharge of sanitary sewers.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for all Bypass Pumping shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Improvements.

B. Schedule II – Sewer Pipe and Forcemain

a. Payment for Bypass Pumping shall be included within the unit prices for sewer lines, manholes and associated appurtenance items. A separate payment will not be made for this item.

END OF SECTION

SECTION 02321 – COMPACTION TESTING

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall retain and pay for the service of an approved, recognized independent testing laboratory to conduct laboratory tests on materials and field testing to determine the relative compaction of trench backfill, subgrades, embankments, gravel surfacing, aggregate base and asphalt concrete pavement, as indicated. The approved Testing Agency shall recommend methods of compaction to Contractor and issue final report to the Owner, through the Engineer, regarding compaction testing results and material compliance with the specifications.

B. These specifications call for field compaction efforts to achieve a specified relative compaction for each of the indicated classes of backfill. Determination of in-place density shall be made by means of non-destructive nuclear probe method testing in accordance with ASTM D2922-01 and ASTM D3017-01 test methods.

1.02 DEFINITIONS

Relative Compaction -- The ratio, expressed as a percentage, of the in-place density of the Engineered fill material to the maximum density of the same material as determined by the ASTM D698 Standard Test Method.

PART 2 PRODUCTS

2.01 APPROVED TESTING AGENCIES

A. Foundation Engineering; 820 N.W. Cornell Ave; Corvallis, OR 97330; (541) 757-7645

B. Western Testing; 3329 N.E. Stephens; Roseburg, OR 97470; (541) 957-1233

C. Western Testing; 2455 Maple Leaf, Bay #4; North Bend, OR 97459; (541)266-9875

D. Other certified private testing laboratory approved by Engineer

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Field Testing

1. Testing to determine the relative compaction of materials placed and compacted by the Contractor shall be performed a short distance behind construction. Tests shall be taken on each lift of the material prior to placement of the succeeding lift to ensure proper compaction is obtained. The Testing Agency shall perform testing at such locations and elevations as to be representative of the entire material and area being compacted. The Engineer shall have authority to require testing at times and locations he deems necessary.

2. A sufficient number of density tests shall be taken on the first section of subgrade and trench backfill placed by the Contractor to establish the effectiveness of the Contractor's compactive efforts. If tests indicate that the specified relative

compaction for a given material is not being achieved, the Contractor shall modify compaction methods in order to obtain the specified results.

3. A minimum of four (4) tests shall be required to be taken during each site visit. It is estimated that two (2) site visits will be required for this project.

B. Failing Tests – For areas failing to meet the specified compaction, the Contractor shall be responsible to perform all additional work necessary to achieve specified compaction at no additional cost to the Owner. Additional work may include further compactive effort, moisture treatment, other compaction methods, removal and replacement of failing materials, or other processes required to obtain the specified results.

C. Any subsequent settlement of backfilled areas during the one-year warranty period shall be considered to be the result of insufficient compaction, and shall be promptly repaired by the Contractor at no additional cost to the Owner.

D. The Contractor shall not be allowed any additional compensation for down time incurred as a result of compaction testing or waiting for test results.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Trench Excavation, Bedding and placement of backfill shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Compaction Tests shall be included within the unit prices for sewer lines, service laterals and associated appurtenance items. The price shall include compensation for all costs associated with compaction testing, including sampling, laboratory testing, field testing, administration, and all other work required to obtain certification of backfills placed under this Contract for each type of pipe as shown in the Bid Form.

a. Only Compaction Tests with results meeting the requirements of these Specifications will be accepted. All costs associated with or arising from additional work required due to failing compaction test results, including removal and replacement of material, shall be borne by the Contractor.

b. Contractor must submit invoice from Testing Agency clearly identifying Project, location and date of testing, material tested, test method, test results, specified compaction, maximum dry density of material tested, and number of tests taken. Only tests directed by the Engineer and which obtain passing results will be paid for.

END OF SECTION

SECTION 02512 – PERFORATED DRAIN PIPING

PART 1 GENERAL

1.01 SUMMARY

A. The work in this Section consists of furnishing all labor, materials, equipment and performing all work necessary for the proper installation of the perforated drain piping to provide drainage as indicated on the Plans and/or required for the completion of the proposed project.

B. Perforated drain piping shall either be a polyvinyl chloride rigid pipe (PVC) or a high density polyethylene flexible pipe (HDPE).

PART 2 PRODUCTS

2.01 MATERIALS

A. PVC pipe and fittings for perforated drain piping shall conform to Class 12454-B as defined in ASTM D1784. Neoprene gaskets with push on joints shall conform to ASTM F477.

B. HDPE pipe shall be a bell and spigot design and shall include a rubber gasket conforming to ASTM F477.

C. Perforated drain piping shall consists of a 4 inch perforated or slotted pipe around installed under the fill area and behind the retaining wall.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All pipe and fittings shall be installed in accordance with manufacturer's recommendations and shall be placed to lines and grades as shown on the plans.

B. Pipe shall be wrapped in a geo-textile filter fabric and placed in a bed of at least four inches of drain rock. Drain rock shall be backfilled to within six inches of the surface with the entire mass of drain rock being wrapped in a geo-textile filter fabric.

C. Provide cleanouts and appurtenances as shown on the plans for future maintenance and cleaning of the drainage system.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Perforated Drain Pipe and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 02530 – GRAVITY SEWER PIPE AND FITTINGS

PART 1 GENERAL

1.01 SUMMARY

A. This section covers gravity sewer pipe materials for sewer mains and service laterals, including fittings, anchors, complete installation and testing.

B. All work shall conform to the latest version of the Oregon Standard Specifications (OSS) Part 00400, except as specified herein and shown on the Plans.

PART 2 PRODUCTS

2.01 MATERIALS

A. All pipe, fittings and appurtenances shall be new and unused.

B. 4-inch through 15-inch PVC Gravity Sewer Pipe and Fittings

1. Unplasticized polyvinyl chloride (PVC) plastic gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage. Pipe shall be colored green for identification as sewer pipe. Pipe shall be furnished in 20-foot laying lengths. Pipe shall meet ASTM D3034 and have an SDR of 35.

2. PVC compounds shall meet the requirements of ASTM D1784, cell classification 12454-B.

3. Bells shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled, and securely locked in place to prevent displacement during assembly. Spigot ends shall be supplied from the factory with beveled ends. Joints shall provide a tight flexible seal meeting the requirements of ASTM D3212. Material used for elastomeric seal in push-on joints shall meet the requirements of ASTM F477.

4. All fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and shall have bell and/or spigot configurations compatible with that of the pipe. Fittings shall meet the same requirements as the pipe.

5. All fittings and appurtenances required to construct laterals and cleanouts shall be PVC and provided by or approved by the same manufacturer as the sewer piping. This shall include all tees, caps, wyes, couplings and other required fittings.

6. Pipe and fittings shall be Ring-Tite PVC Gravity Sewer Pipe and Fittings as manufactured by J-M Manufacturing Company, Inc.; or approved equal.

C. Appurtenances

1. Transition couplings and same diameter couplings for new sewer lines, unless otherwise specified, shall be flexible rubber with stainless steel bands. Fernco, or approved equal. Rotate coupling so type and size wording is visible from top to allow for inspection.

2. PVC pipe connections to concrete manholes shall utilize appropriately sized flexible, watertight seal adapters designed for such use. Adapters shall be tested watertight to a minimum of 10.8 psi during factory testing. Adapters shall be for connections to precast concrete shall be KOR-N-SEAL as manufactured by NPC, Inc.; or approved equal. Adapters for connections at cast-in-place manhole bases shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal

3. New service lateral connection to existing sewers shall utilize one of the following clamp on style saddles:

   a. Molded PVC saddle with neoprene rubber seal to sewer main, gasket branch, and stainless steel straps; conform to ASTM D3034; GPK or approved equal.

   b. Cast ductile iron saddle with virgin SBR gasket and adjustable 3½" wide stainless steel strap; Romac Style "CB" or approved equal.

4. Manufactured tees shall be required for service lateral connections to new mains and lateral reconnections to existing mains where use of saddles is not feasible. Tees shall conform to subsection 2.01.B. above.

5. Cleanouts shall be constructed of the same PVC material as used to construct the service lateral piping. Cleanout size, fittings, and cleanout cover shall be as shown in the Standard Detail Drawings.

D. Concrete shall conform to Oregon Standard Specifications Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.

E. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. PVC gravity pipe shall be installed, stored and handled in accordance with the manufacturer's installation guide, the Uni-Bell PVC Pipe Association Installation Guide for PVC Sewer Pipe, ASTM D2321, and these specifications.

B. Remove material from job site, which in the judgment of the Engineer is damaged, not as specified, or otherwise rejected. Payment will not be made for damaged or rejected materials, their removal, or for repairs to such materials.

C. Preparation of Trench – Excavate and prepare trench for pipe laying to the lines and grades as specified and shown on the Plans. Place any required foundation stabilization and compact pipe bedding prior to laying pipe. Stabilize trench as required and comply with OSHA safety provisions.

D. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material to prevent future bellies.

E. Prior to lowering pipe into the trench, the Engineer and City representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

F. Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipes at all times. When pipe laying is not in progress, seal the open end of the pipe with a watertight plug, or by other approved means to prevent the entry of trench water or other foreign materials into the pipe.

G. Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise directed by the Engineer. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with approved pipe lubricant, as recommended by the manufacturer.

H. Tolerance. For gravity pipelines, vertical deviation from true grade shall not exceed 0.02 feet (0.24 inch). Horizontal tolerance for deviation from line shall be 0.03125 feet (3/8 inch). Depressions or bellies which create the potential for solids deposition are not allowed.

I. Care must be taken to ensure the pipe is not moved and the side support fill is not disturbed when moving sheeting or trench boxes.

J. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

K. Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum density.

L. All pipes shall be thoroughly flushed with water prior to testing. Removal of water and debris shall be accomplished by exposing the pipe on the low end of the gravity main in each section and pumping water from the trench to the ground surface for disposal. The Contractor shall be responsible for the removal of all debris that enters into the sewer system from construction. All costs associated with removal of such debris shall be the responsibility of the Contractor and result in no additional costs to the Owner.

M. Service laterals shall be installed at a minimum 2% slope from the mainline or manhole to the connection with the existing lateral from the building, unless otherwise approved by the Engineer. Provide couplings for connection to existing service laterals. Coordinate with home-owner.

N. Service Lateral Connections

1. Service lateral connections shall include the connection of any new or existing service lateral to the main at locations shown on the Plans. Service laterals shall be connected to the main using new manufactured tees or wyes, as specified. In general, tees will be used where new laterals are being added along new mains or where existing laterals are being replaced and reconnected to the new main.

2. The Contractor shall install new PVC tees or wyes with manufactured bends as shown on the Standard Details. Service lateral piping shall be extended from the new connection to the point where the existing service lateral crosses into the public right-of-way, and connected to the existing piping.

3. The Contractor shall provide a minimum of 1-hour notice to any existing user prior to cutting the user's service lateral and thereby disrupting service. Lateral replacement shall be completed within 4-hours or the Contractor will be required to provide bypass pumping for the affected service.

4. The Contractor shall be responsible for all exploratory excavation and/or video inspection necessary to locate existing service laterals.

5. Service laterals shall be neatly cut at the property line and removed to the point of connection to the mainline. Reconnection to existing lateral piping shall be made using an appropriately sized transition coupling, as specified. The contractor shall install new PVC cleanouts at property line as shown on the Standard Details.

6. Where existing tees on the sewer main are cracked, broken, or otherwise unusable, the Contractor shall install a new tee and necessary mainline piping in order to provide a watertight connection for the lateral.

O. After installation and compaction of backfill, all pipe shall be thoroughly flushed and then subject to either hydrostatic or low-pressure air testing. Pipe will also be tested for deflection and will be video inspected.

3.02 MANHOLE CONNECTIONS

A. Where shown on the Plans or directed by the Engineer, the Contractor shall connect new sewer piping to existing manholes.

B. Core drill the manhole wall using appropriately sized core drill for the new pipe. Jack-hammering will not be allowed. Install pipe in accordance with Section 02535 using KOR-N-SEAL boot.

C. When an existing manhole has a poured-in-place base or other obstruction at the pipe level and core drilling is not feasible, contractor may jackhammer to provide penetration for new or replacement pipe. Install pipe in accordance with Section 02535 using Waterstop Grouting Ring.

D. Install flexible transition couplings on all pipes within 2 feet of the outside walls of manholes. Provide a watertight connection.

E. Modify the base of the manhole in accordance with Section 02535-3.03.

3.03 PLUG AND ABANDON PIPING/LATERALS

A. Install an appropriately sized mechanical plug at least 2-feet into the pipe or lateral designated for plugging or abandonment.

B. Concrete slurry for sealing sewer lines and laterals being abandoned shall consist of 2 sacks of Portland cement per cubic yard of cement sand. Water shall be added at such a ratio as to provide a 4-inch slump.

C. Concrete slurry shall be packed into the end of the pipe up to the mechanical plug and troweled flush with the end of the pipe.

3.04 LOW-PRESSURE AIR TESTING OF GRAVITY SEWER (per UNI-B-6-98 / ASTM F1417)

A. The Contractor shall furnish all equipment, materials and personnel required for properly conducting all required low-pressure air testing under observation of the Engineer. Pressure gauge shall have 0.10 psi increments and an accuracy of 0.0625-psi. Testing equipment must include a pressure relief device designed to relieve pressure at a maximum of 9 psi and must allow continuous monitoring of the test pressure to avoid excessive pressure. All air used shall pass through a single control valve. Only qualified personnel shall be permitted to conduct the test. The Time Pressure Drop Method shall be used.

B. Testing shall be performed in the presence of the Engineer or a City representative. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify Engineer at least 2 working days in advance.

C. Initial Test – A test shall be conducted on the first section of pipe laid by each crew to establish that the pipeline installation is capable of preventing excessive infiltration. The section of pipeline tested shall be at least 300 feet in length. If the test indicates exfiltration exceeding the amount the amount hereinafter specified, all defective materials and/or workmanship shall be corrected and the test rerun until leakage is within the specified limits.

D. If, in the opinion of the Engineer, the water-tightness of the pipe is in question during installation, the Engineer may require the Contractor to test the pipe sections in question. Such testing shall not be considered adequate for final pipe testing, performed after the pipe is installed, backfilled, and cleaned. Thereafter all sewer pipe shall be tested as provided herein.

E. The Contractor may desire to make air tests prior to complete backfilling, for his own purposes; however, acceptance air test shall be made only after installation of all laterals and backfilling has been completed and compacted.

F. It is extremely important that all plugs, including end of service laterals, be installed and braced such that blowouts are prevented (ex. 250 lbs force is exerted on an 8" plug at 5 psig). Exercise care to prevent excessive pressures. Keep workers out of manholes until pressure is released.

G. Testing Procedure

1. Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Each pipe section between manholes shall be tested. Service laterals from the main to the property line shall be included in the test.

2. Check the average height of ground water over the pipe invert. The test pressure required below shall be increased 0.433 psi for each foot of average water depth over the pipe (ex. If groundwater is 2.8 feet above pipe invert, add 1.2 psig to test pressures). Method used to determine groundwater depth shall be acceptable to the Engineer.

3. Air shall be slowly supplied to the plugged pipe until internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe. Do not exceed a total pressure of 9.0 psig.

4. After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize. After the stabilization period, disconnect the air supply.

5. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than average backpressure of any groundwater over the pipe). At a reading of 3.5 psig, or any convenient pressure between 3.5 psig and 4.0 psig (above groundwater pressure), timing shall commence with an accurate stop watch.

6. Acceptance - The tested section shall be considered acceptable if the required testing time has elapsed before a 1.0 psig pressure drop has occurred. If the pressure drops 1.0 psig before the minimum length of time has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.

7. Acceptance criteria is based on an allowable air loss of Q=0.0015 cfm per ft^2 of internal pipe surface area less than 625 ft^2. This results in a total allowable loss of 625Q = 0.94 cfm. The shortest time (T), in seconds, allowed for the air pressure to drop 1.0 psig is calculated with the following formula:

   T = 0.085 (DK/0.0015)

   K = 0.000419DL but not less than 1.0, D = pipe I.D. in inches, and L = length of pipe tested in feet.

8. Contractor shall record and document the testing procedure and results during the testing process. The UNI-Bell "Air Test Data Sheet" or similar approved equal shall be used and submitted to the Engineer. Record the diameter (in), length (ft), start and end manhole numbers, time, date, pressure drop, and groundwater level on inspection form.

Minimum Specified Time Required for 1.0 PSIG Pressure Drop

Pipe ø (in)	T_{min} (min:sec)	L for T_{min} (ft)	T for longer L (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

If no pressure drop (0 psig) has occurred after 1 hour, test may conclude and section passes

9. Service laterals shall be included in test however the length of service laterals may be ignored and the length of main line only used in the above table. If desired, length of service laterals included in test section may be included in the calculation by following the method outlined in UNI-B-6-98 Section 9.4.

3.05 HYDROSTATIC TESTING OF PIPE

A. Hydrostatic testing may be done in lieu of low-pressure air testing.

B. Contractor shall provide all hose, temporary piping, approved pipe plugs, tank trucks, and other equipment, labor and material required to make the hydrostatic tests, and shall pay for the water used, unless otherwise approved by the Engineer. Testing of the pipe shall be conducted in the presence of the Engineer. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify Engineer at least 2 working days in advance.

C. Prior to making exfiltration leakage tests, contractor may fill the pipe with clear water to permit normal absorption into the pipe walls; provided however, that after filling the pipe, leakage testing shall be completed within twenty-four (24) hours after filling. When under test, allowable leakage shall comply with the following requirements:

Leakage shall not exceed 0.04 gallons per hour per inch diameter per one hundred (l00) feet of sanitary sewer pipe, with a minimum test pressure of six (6) feet of water column above the highest section of pipe (including service laterals), or above the active ground water table, whichever is higher as determined by the Engineer. The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed 28 feet of water column, and in no case shall be greater than 500 feet. All service connection footage shall be taken into account in computing allowable leakage. Test duration shall be at least 2 hours. Methods of imposing the water column and measuring the water loss shall be acceptable to the Engineer.

3.06 DEFLECTION TESTING OF FLEXIBLE PIPE

A. In addition to air or hydrostatic testing, the contractor shall conduct deflection tests of sanitary sewers constructed of flexible pipe. Testing will consist of pulling an approved mandrel through the completed pipeline after backfill and compaction to finish grade is complete. Testing shall be conducted in the presence of the Engineer.

B. Diameter of the mandrel shall be at least 95% of the pipe internal diameter. Mandrel shall have at least 6 vanes.

C. Testing shall be done from manhole to manhole. Pipe shall be thoroughly cleaned and flushed prior to pulling the mandrel. Mandrel shall pass smoothly through the pipe without excessive effort.

D. Testing shall be conducted only after at least 30 days have elapsed after backfill and compaction was completed. May be conducted concurrently with video inspection.

3.07 VIDEO INSPECTION OF GRAVITY SYSTEMS

A. All gravity sewer lines constructed as part of the project shall be televised and taped at the end of construction prior to acceptance. Taping shall be conducted after all backfill and compaction, but prior to final surface restoration. All pipes shall be thoroughly flushed by the Contractor immediately prior to the video inspection. A 1-inch target ball shall be placed in front of the camera. The video shall be recorded in color on DVD format. Sufficient light shall be provided to show detail. Camera speed shall not exceed

3 feet per second. Camera shall have a swivel head capable of looking up each service connection. A copy of the video tape and a written TV Inspection Report shall be furnished to the Engineer. Any sections of sewer pipe not meeting specifications or exhibiting defects shall, at the Contractor's expense, be corrected to meet specification. Repaired sections shall be re-televised. All repairs must be completed before acceptance of the project.

B. The sanitary sewer lines constructed as part of the project will also be video inspected near the end of the one year warranty period to determine if any defects exist in the system. The warranty video inspection will be conducted during a season of high groundwater as close to the end of the warranty period as possible. The warranty period will continue to be in effect, regardless of duration, until all video recordings are received and approved. All defects in the system will be corrected at the Contractor's expense.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Gravity Sewer Pipe and Fittings shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Gravity Sewer Pipe & Fittings will be made on a lineal foot basis for each size, backfill class, for depths less than twelve (12) feet, and for depths greater than twelve (12) feet, at the unit prices stated on the Bid Form. Payment shall include compensation for trench excavation, shoring and bracing, pipe zone, pipe, backfill, anchors, fitting, transition couplings, appurtenances, testing, video inspection and all related work. Measurement will be made along the pipe centerline.

2. Payment for Manhole Connections to existing manholes will be made on a unit price basis per each regardless of size at the price stated on the Bid Form. Payment shall include compensation for all materials, equipment and labor for a complete water-tight connection including: coring or jack-hammering, flexible rubber boot or water stop ring, transition coupling, and appurtenances for a complete installation.

END OF SECTION

SECTION 02531 – LOCATOR WIRE AND WARNING TAPE

PART 1 GENERAL

1.01 SUMMARY

A. This section consists of furnishing all labor, material and equipment, and performing all work required for the burying of an insulated copper conductor wire and plastic underground warning tape in the trench with installed non-ferrous and/or nonconductive (plastic, etc.) sewer pipe. See the Standard Detail Drawings for trench cross section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Toning wire shall be No. 12 AWG, solid copper with green colored insulation. Insulation shall be 30 mil thick HDPE designed for direct bury.

B. Underground warning tape shall be 6-inch wide, 4-mil thick, APWA Standard Green color, reading "CAUTION – BURIED SEWER LINE BELOW."

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Wire and warning tape shall be buried the entire length of the trench, placed in accordance with the Standard Detail Drawings, for all nonconductive pipelines.

B. Wire shall be brought to the surface and connected at each manhole and sewer cleanout. Distance between tracer lead access locations shall not exceed 1,000 feet. All joints and/or splices in the wire shall be made with a designed waterproof splice kit. Wire shall be taped to pipe every 5 feet and shall be run straight with a small amount of slack. Wire shall be routed outside each manhole or cleanout riser. Wire shall be exposed inside all cleanout covers and a minimum of 24" of wire provided. At manholes, pass wire into manhole between concrete grade ring and manhole lid frame and provide a minimum of 24" coiled wire.

C. Warning tape shall be placed over the pipe zone material, approximately 15 to 18 inches below finish grade, in accordance with the Standard Detail Drawings. Lay tape flat and untwisted, centered over the pipe and with wording facing upwards.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Locator Wire and Warning Tape shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

a. Payment for locator wire and warning tape shall be included within the lineal footage prices for each size and backfill class of sewer pipe to be installed. No additional compensation will be allowed.

END OF SECTION

SECTION 02535 – MANHOLES AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. This section covers manholes, frames, covers, adapters, and other manhole appurtenances not specifically paid for in other sections, used in the gravity sewer collection system and outfall line. See Standard Detail Drawings.

B. All manholes, frames and covers supplied under this contract shall be from the same manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manholes

1. Manhole riser sections shall be pre-cast reinforced concrete with a minimum wall thickness of 5 inches, conforming to ASTM C 478. Concrete used in forming the sections shall have a minimum compressive strength of 4000 psi at 28 days. Reinforcing steel shall be Grade 60.

2. Manholes shall have precast reinforced concrete bases with shelves, channels and slopes as specified. Precast bases shall have same wall thickness and reinforcement as riser sections.

3. Joints between manhole sections as well as base section shall be tongue and groove with an o-ring gasket or approved equal conforming to ASTM C-443. Preformed gaskets shall be Ram-Nek, Kent-Seal No. 2, or approved equal

4. Manholes shall have yard permeability tests passing ASTM C497-03 prior to delivery. Manhole steps shall be plastic with ½" grade 60 steel reinforcing bars encapsulated with injection molded copolymer polypropylene with serrated surfaces.

B. Frames and Covers

1. All frames and covers shall be heavy duty, gray cast iron designed for H20 traffic loading. Metal used in the castings shall conform to ASTM A48 Class 30. All castings shall be manufactured true to pattern, uniform in quality, free from blowholes, shrinkage, distortion or other defects. Component parts shall fit together in a satisfactory manner and shall have continuously machined bearing surfaces to prevent rocking and rattling. Castings shall be smooth and well cleaned by shotblasting at the factory.

2. Frames and covers shall have skid resistant surface of raised knobs or indentations. Cover shall have the word "SEWER" cast into it. Non-watertight lids shall have two vent holes.

3. Frames and covers shall be manufactured in accordance with the dimensions shown in the Standard Detail Drawings; Olympic Foundry, or approved equal.

C. Manhole Connections

1. Connections to precast manhole sections shall be accurately core-drilled and shall utilize a properly sized flexible rubber boot providing a watertight seal. Adapter shall be factory tested for watertightness up to 10.8 psi. Kor-N-Seal as manufactured by NPC, Inc. or approved equal.

2. Connections to cast-in-place concrete shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal.

D. Grout

1. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes

PART 3 EXECUTION

3.01 MANHOLE INSTALLATION

A. Prepare native soil and place and compact the crushed rock base to 95% maximum dry density as shown in the Standard Detail Drawings. Backfill material around manholes shall be as specified for trenches in Section 02320.

B. Concrete base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

C. Pipe penetrations shall be core drilled to the appropriate size for each pipe entering or exiting the manhole. Jackhammering will not be allowed. Install appropriately sized KOR-N-SEAL boot on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal. Non-shrink grout shall be as specified.

D. Install transition couplings, per Section 02530, within 2 feet of the outside wall of manholes on all pipes; or, a pipe bell shall be located a minimum of 1 foot to a maximum of 2 feet from the outside wall of manholes.

E. All flow channels within precast bases shall be constructed of non-shrink grout with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet. Sides of channels shall be troweled smooth to prevent solids deposition. Ledges or benches shall be sloped towards channel to drain. Provide fine broom finish on ledges.

F. Clean tongue and grooves of base and wall sections, prime and apply joint sealer prior to setting in place. Ensure that joint has fully seated. Use approved flexible joint sealant and same manufacturer's primer. The height of the lowest wall section shall be at least three (3) times the inside diameter of the largest sewer pipe entering the manhole and in no case less than 2-feet. Wall sections shall be plumb vertical.

G. Use eccentric cone top section for manholes greater than 6-feet deep. Use extension rings in accordance with the standard detail.

H. Frame and covers shall be installed so that the cover is exposed and flush with the existing surface. In no case will pavement be raised or lowered to meet the grade of installed manhole frames and covers. Where manholes are installed in sloping areas, the grade of the slope shall intersect the top rim of the cover on the uphill side. Manhole frame shall be sealed to the concrete manhole section with a bed of non-shrink grout on either side of bead of flexible joint sealant. In addition, the frame and cover shall be grouted to the outside of the concrete manhole section.

I. Manhole installations with tilted or otherwise defective bases, wall sections which are not plumb, covers which do not match existing grade properly, or are otherwise not in specification compliance shall be removed by the Contractor and replaced until acceptable.

3.02 MANHOLE VACUUM TESTING

A. Precast concrete manholes shall be tested in accordance with the following procedure. Manhole installations which fail the testing shall be repaired or replaced until passing results are obtained. If flexible joint sealant is pulled out during testing, it shall be repaired. No payment to the Contractor will be made for such repair and/or replacement.

B. Testing shall be done in the presence of the Engineer. Notify Engineer at least 2 working days in advance.

C. All manholes shall be tested for acceptance after the trench has been backfilled, compaction requirements have been met, road base rock has been installed, paving is complete, and concrete manhole collars have been installed. If manhole has passed test and the castings have later been disturbed, manhole shall be re-tested.

D. Thoroughly clean all manholes prior to testing. Remove all debris and do not allow foreign material to enter downstream piping.

E. Contractor shall provide all necessary equipment and personnel to conduct the testing, including vacuum equipment and indicating devices.

F. Procedure:

1. Plug all pipes entering manhole. Secure all plugs to prevent movement while vacuum is being drawn.

2. Testing shall include the joint between the manhole cone or riser ring(s) and the manhole cover frame.

3. Installation and operation of vacuum equipment and indicating devices shall be in accordance with the manufacturer's specifications and instructions.

4. Withdraw air from the manhole until a measured vacuum of 10-inches of mercury (10" Hg) is established in the manhole interior.

5. Record the time it takes for the vacuum to drop to 9-inches of mercury (9" Hg). Acceptance standards are based on this 1-inch of mercury change in negative pressure. Time measured for the 1" Hg pressure change shall be equal to or greater than the values in the following table:

Vacuum Testing Requirements (minimum test times, seconds)

Manhole Depth (ft)	Manhole Diameter (in)				
	42"	48"	54"	60"	72"
8' or less	17	20	23	26	33
10	21	25	29	33	41
12	25	30	35	39	49
14	30	35	41	46	57
16	34	40	46	52	67
18	38	45	52	59	73
20	42	50	53	65	81
22	46	55	64	72	89

6. Hydrostatic testing of manholes may be allowed. Test shall be in accordance with ASTM C497 as modified here. Test will consist of plugging all inlets and outlets and filling the manhole with water to the rim. Leakage in each manhole shall not exceed 0.2 gallons per hour per foot of head above the invert. Leakage will be determined by refilling to the rim using a calibrated or known volume container. Testing duration shall be at least 2 hours. Testing results shall be recorded on a form approved by the Engineer.

3.03 MODIFY EXISTING MANHOLE BASE

A. Modify or reconstruct manhole bases as required by hand forming channels with non-shrink grout to provide smooth flow surfaces from all inlets to the outlet. Non-shrink grout shall be as specified.

B. All flow channels shall be constructed with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet.

C. Shape flow channels to conform to connecting pipe surfaces. Ledges or benches shall be sloped towards channel to drain.

D. Remove all rough sections or sharp edges that might obstruct flow or cause snags.

E. Form base channels in conformance with the standard detail drawings.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Manholes and Appurtenances shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for New Manholes, standard twelve (12) foot depth, will be made on a unit price basis per each, at the price stated in the Proposal. Payment will include all materials and labor required for complete installation, including excavation and backfill around manholes, all precast components, grouting and shaping of base channels, pipe adapters, testing, temporary hard surfacing, and all else related to this item not paid under other sections.

2. Manholes greater than twelve (12) feet in depth shall be paid additionally for each foot of depth over twelve (12) feet.

3. Depth measurements for payment of extra depth of manholes shall be made from the lowest invert pipe elevation to the rim of the manhole at finished grade. Measurement for payment shall be made to the nearest tenth of a foot for each additional foot of depth greater than twelve (12) feet.

4. Payment for Outside Drop Manhole Connections shall be made on a unit price basis per each at the price stated on the Bid Form. Payment shall include all materials, labor and equipment required for complete installation, including but not limited to, excavation and backfill, pipe adapters, fittings, grout, slurry backfill, and temporary hard surfacing.

5. Payment for Modify Existing Manhole Base shall be made on a unit price per each at the price stated on the Bid Form. Payment shall include all materials, labor and equipment required for a complete modification or reconstruction.

6. Payment for Manhole Connections shall be as defined in Section 02530 – Gravity Sewer Pipe & Fittings.

END OF SECTION

SECTION 02536 – PRECAST CONCRETE WETWELL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes precast wetwell walls, bases, frames, cover and related appurtenances.

B. Wetwell materials shall be formed, manufactured and pretested at the factory site. Finished components shall be assembled, sealed at the work location by the Contractor

C. Wetwell sections shall be cast according to Engineer's drawings. Contractor shall make field measurements prior to casting to verify drawings and notify Engineer of any changes required by connections, elevations, mechanical piping, or any other approved appurtenances included as part of the submittals.

1.02 RELATED SECTIONS

A. Section 02535 – Manhole and Appurtenances

B. Section 03110 – Structural Cast-In-Place Concrete Forms

C. Section 03200 – Concrete Reinforcement

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest edition
   1. ASTM A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
   2. ASTM C923 – Resilient Connectors Between Reinforced Concrete Vault Structures and Pipe

B. American Concrete Institute (ACI), latest edition
   1. ACI – 318 – Building Code Requirements for Structural Concrete
   2. ACI – C478 – Precast Reinforced Concrete Manhole Sections

C. Uniform Building Code (UBC) – As amended to the "Oregon Structural Specialty Code" by the Oregon Building Codes Division, year 2008 amendments.

D. Association of State Highway and Transportation Officials (AASHTO), latest edition
   1. AASHTO H-20
   2. AASHTO M-198 – Joints for Circular Concrete Sewers and Culvert Pipe Using Flexible Watertight Gaskets

1.04 SUBMITTALS

A. Manufacturer literature showing all plan and elevation views including all dimensions, reinforcing placement and concrete shall be submitted to the Engineer prior to manufacture.

B. Structural design calculations showing conformance with ACI C478 of walls, base and cover after final shop drawings are coordinated with manufacturers of pump, access hatch and various cover penetrations.

1.05 QUALITY ASSURANCE

A. Precast well manufacturer shall have a minimum of five (5) years of successful experience in the design and assembly of prefabricated concrete structures.

B. Wetwell manufacturer shall guarantee all precast members against defective materials and workmanship for a period of 5 years after the date of project completion. If any materials or workmanship prove to be defective within the guarantee period, they shall be repaired or replaced by the manufacturer at no additional cost to owner.

C. Wetwell manufacturer conduct concrete strength tests on four by eight inch test cylinders from the same concrete batch used for the precast sections. Two tests for each daily mix batch shall be provided, one at 7 day cure and one at 28 day cure. Tests shall be provided to Engineer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be cured and stored in a moist condition for a minimum of 14 days.

B. Materials shall be transported in such a manner to prevent damaging stresses and cracks.

C. Damaged, chipped, or cracked materials shall be repaired and patched to the satisfaction of the Engineer. If the materials cannot be satisfactorily repaired they must be replaced at no-cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete
1. Minimum compressive strength of 4000psi at 28 days.
2. Type II acid resistant cement conforming to ASTM C150.
3. Cover over reinforcing steel, 1" minimum.

B. Walls
1. Walls shall be minimum of 8" thick
2. Tongue and grooved joints with spacing such that pipes piping shall not pass through joints

C. Base
1. Minimum thickness shall be 12"
2. Extend a minimum of 12" beyond walls in all directions

D. Cover
1. Overall dimensions shall conform to those shown in drawings
2. Minimum thickness shall be 12".
3. Overall reinforcement and around penetrations shall be according to AASHTO H-20 Truck loading.

E. Reinforcement
1. Steel shall be ASTM A615 Grade 60.
2. Area of reinforcement shall be according to ACI C478 or as shown in drawings, whichever is more stringent.
3. No steps shall be provided
4. Thickness shall be a minimum of ½" #4 rebar

F. Joints
1. Joints shall be sealed with butyl rubber sealant rope which meets or exceeds AASHTO M-198
2. Exterior joint sealant applied in the form of an adhesive wrap. Exterior joint sealant shall be installed according to manufacturer's instructions including any concrete surface preparation required. EZ-Wrap Butyl Exterior Joint Wrap or approved equal.

G. Connections
1. Connections between walls and ductile iron pipe shall be made using a seal constructed of EPDM rubber links and providing a complete seal between the annular space between the pipe and wall opening. Installation hardware shall be made 316 stainless steel. Manufacturer; Press Seal, Link Seal or approved equal.
2. Gravity connections shall be precast into walls and be formed using an appropriately sized KOR-N-SEAL boot on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal.
3. Inside drops shall be as specified in Section 15125.

H. Grout
1. A grout fillet shall be constructed around the circumference of the wetwell bottom to direct solids to the pumps. The minimum slope shall be 1:1 and shall conform to the construction drawings.
2. Grout shall be either:
   i. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes
   ii. Or 4000 psi Type II concrete mix with a maximum aggregate size of 3/8".

I. Anchors
1. Anchors for pumps shall meet requirements of pump manufacturer. Anchors shall be wedge type, drilled and epoxied into wetwell base prior to pump installation. Anchors, nuts and washers shall be type 316 stainless steel.
2. Minimum size shall be ¾" diameter and embedded a to a minimum depth of 8".

J. Covers
1. Hatch cover shall be H20 rated as specified in Section 08305.

K. Vents
1. Wetwell shall be provided with an atmospheric vent as shown in drawing. Vent shall be 8" diameter and screened with a stainless steel screen.
2. Vents shall be made of stainless steel and welded joints. Vents shall be constructed in a "gooseneck" inverted style.

L. Suction Tube
1. Provide penetration in cover for Vacuum suction tube.
2. Vacuum tube shall utilize the sloped wetwell floor with a tapered vacuum head suction head connected to a vertical pipe and resting on the wetwell floor. Vertical pipe shall be constructed from stainless pipe or HDPE pipe capable of resisting vacuum without collapse.
3. Suction tube shall have cam-lock style fitting with cap, capable of connecting to City cleaning trucks. Coordinate fitting style with City.

4. Suction tube shall be Taylor EZZ Klean as manufactured by Taylor Site Development; or approved equal.

2.02 ACCESSORIES

A. Provide all Accessories necessary for proper placement, spacing, installation.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that ground surface is excavated to a minimum of 12" beyond the limits of the wetwell.

B. The wetwell shall be supported by a minimum of 12" of compacted crushed aggregate. Crushed stone must be level and to the limits shown in the Contract drawings. If further stabilization material is required or greater aggregate depth needed than Contractor shall provide material to depth required.

3.02 PLACEMENT

A. Material sections shall be placed one at a time using lifting hooks cast into the sections.

B. Tolerances shall be
1. ¼" from Plumb
2. ¼" from Level
3. No offsets greater than ¼" at any joint.

C. Install rubber rope sealant and adhesive wrap between sections, taking care to keep joints clean and to make a tight and complete seal.

D. Repair all nicks, chips, depressions and any voids left by removal of lifting devices to satisfaction of the Engineer.

E. Backfill in 6" lifts with Class B aggregate to drawing limits. Protect wetwall during compaction. Place wetwell cover last.

F. Vacuum test finished manhole.

3.03 VACUUM TESTING

A. Vacuum test wetwell in accordance with manhole procedure in Section 02535. Use tables in section to determine time and pressure drop. Vacuum testing shall be completed after backfill is complete and material has settled for a minimum of 30 days.

B. Plug all pipes entering precast sections and any required bracing to prevent plug blowouts.

C. If test fails Contractor shall locate leaks and make repairs with grouting material. Contractor shall continue to make repairs until test passes.

3.04 CLEANING

A. After successful completion of testing the wetwell shall be thoroughly cleaned of all silt and debris. After approval by Engineer proceed with the installation of wetwell mechanical components.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for precast wetwell shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 02537 – MANHOLE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manhole rehabilitation shall include all work necessary to stop inflow and infiltration, repair voids, restore structural integrity, and provide protection against corrosion. Repair methods vary for each manhole as some require sealing rings, patching leaks or re-grouting.

1.02 REFERENCES

A. ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading).
B. ASTM C 94 - Ready-Mixed Concrete.
C. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
D. ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel.
E. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings.
F. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars.
G. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens.
H. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement.
I. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing.
J. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
K. ASTM C 952 - Bond Strength of Mortar to Masonry Units.
L. ASTM C 1244 - Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

1.03 SUBMITTALS

A. Comply with Section 01300 – Submittals.
B. Product Data: Submit manufacturer's product data, including physical properties, surface preparation, repair, application, curing, and field quality control.
C. Manufacturer Qualifications: Submit list of a minimum of 10 manhole rehabilitation projects completed during past 3 years.
D. Applicator Qualifications: Submit qualifications of applicator.

1. Certification stating applicator is factory trained and approved by manufacturer in application of the specified products.
2. List of recently completed manhole rehabilitation projects, including project name and location, names of owner and engineer, and description of products used, substrates, and application procedures.

1.04 QUALITY ASSURANCE

A. Material Qualifications: Minimum of five year history of being used for rehabilitation of sanitary system manholes.

B. Applicator Qualifications:

1. Factory trained and approved by manufacturer in application of the specified products.

2. Employs persons trained for the application of the specified products.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, manufacturer's stock number, color, and federal specification number.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Store materials in a cool dry environment.

C. Handling: Protect materials during handling and application to prevent damage.

1.06 ENVIRONMENTAL CONDITIONS

A. Do not apply materials if ambient temperature is below 40 degrees F.

B. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application.

C. Keep mix temperature at time of application below 90 degrees F.

D. Do not exceed water temperature of 80 degrees F.

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

1. Materials shall be from a single manufacturer.
2. Materials shall be compatible with substrate and with each other.
3. Materials shall be approved by manufacturer.

B. Void Filling Urethanes: Durable, rapid-setting, chemical resistant, expanding foam or gel designed for injection under active water infiltration conditions, forming strong bond to concrete, and curing to form resilient, flexible rubbery gasket.

1. Grout: Hydrophilic foam or gel
2. Minimum Tensile Strength, ASTM D 3574: 80 psi
3. Minimum Bonding Strength: 250 psi
4. Elongation, ASTM D 3574: 250% minimum
5. Corrosiveness: Noncorrosive
6. Toxicity: Nontoxic
7. Avanti AV-330 Safeguard; 3M Scotch-Seal 5600; Strata Tech ST-500 series; Deneef Hydro Active Flex LV; Concresive 1200 series; or approved equal.

C. Reinforced cementitious mortar: Fiber-reinforced, spray-applied, cementitious mortar to fill minor cracks and surface imperfections. Used to surface repair of manhole.

1. Minimum Compressive Strength, ASTM C 109: 8,000 psi at 28 days.

2. Minimum Tensile Strength, ASTM C 496: 500 psi at 28 days.
3. Minimum Flexural Strength, ASTM C 78: 1,000 psi at 28 days.
4. Shrinkage, ASTM C 596: 0 percent at 28 days, 90 percent relative humidity.
5. Minimum Bond, ASTM C 952: 2000 psi at 28 days.
6. Applied Density: 150 plus or minus 5 pounds per cubic foot.
7. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles, no visible damage.
8. Factory Blended: Requires only addition of water at site.
9. Fiber Reinforcement: silica, acrylic fiber, or alkaline-resistant fiberglass rods.
10. Strong-Seal High Performance Mix; Thoroc SP15 Spray Mortar, Emaco S88; or approved equal.

D. Epoxy finish coats: sulfide resistant epoxy mortars, troweled or sprayed onto concrete or mortar surface. Forms a permanent bonded liner to entire surface.
1. Minimum Tensile Strength, ASTM D 638 3,000 psi
2. Minimum Flexural Strength ASTM D 790 4,300 psi
3. Adhesion ASTM D 4541 350 psi
4. Hardness ASTM D 2240 Shore D 70
5. Coating thickness 60 mils
6. Raven 405; Strong Seal Epoxy; Sewer Guard HBS 100, or approved equal.

E. Water: Clean and potable. Test nonpotable water in accordance with ASTM C 94.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive manhole coatings. Notify the Engineer in writing if surfaces are not acceptable. Do not begin surface preparation, repair, or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturer's instructions.

B. Protection: Place covers over invert to prevent extraneous material from entering sewer lines.

C. Cleaning: Clean manhole walls and bench by using a minimum of 1,500 psi water spray to remove contaminants, dirt, debris, and other foreign materials.

D. Remove loose, unsound, and protruding brick, mortar, and concrete.

E. Inspection by Engineer: Before application of each material, surfaces to be sprayed or coated will be inspected by the Engineer. Correct defects or deficiencies identified by the Engineer before application of subsequent material.

3.03 MANHOLE COATING

A. Manholes listed for coating shall be the designated discharge location for the new pump station. Materials shall be as specified in section 2.01. Alternate materials or methods shall be as approved by the Engineer.

B. Voids: Repair and fill voids greater than 2 inches in depth with urethane patching materials. Apply patching material in accordance with manufacturer's instructions.

C. Active Leaks:

1. Stop active leaks with patching material or infiltration control material. Apply material in accordance with manufacturer's instructions.
2. Install weep holes as required to localize infiltration during application of patching material or infiltration control material.
3. Plug weep holes after application with infiltration control material before application of liner material.
4. Severe Infiltration: Drill as required to permit foam or sealant injection. Apply repair compound in accordance with manufacturer's instructions.

D. Advance Notice: Give the Engineer a minimum of 2 days advance notice of start of application.

3.04 INVERT REPAIR

A. Remove loose and unsound materials and wash walls, after surface preparation is complete.

B. Repair bench, invert, or service line using patching material. Apply in accordance with manufacturer's instructions.

C. Repair inverts with visible damage, where infiltration is present, or when vacuum testing is specified.

D. Apply patching material to invert, after blocking flow through manhole and thoroughly cleaning invert.

E. Uniformly trowel patching material onto damaged invert at a minimum thickness of 1/2 inch at invert. Extend out onto bench of manhole sufficiently to tie into liner material.

F. Ensure finished invert surfaces are smooth and free of ridges.

G. Reestablish flow in manhole after a minimum of 30 minutes after application of patching material.

3.05 APPLICATION OF LINER MATERIAL

A. Apply cementitious reinforced liner over entire manhole prior to epoxy coat for existing manholes. For new manhole no coat is required.

B. Equipment: Spray apply liner material using approved equipment designed and manufactured by material manufacturer for the specific application.

C. Mixing:

1. Mix liner material with water in accordance with manufacturer's instructions.
2. Discharge prepared mix into hopper.
3. Continue mixing as liner material is continuously sprayed.

D. Cleaning: Ensure surface is clean and free of foreign material.

E. Saturated Surface: Ensure surface is damp and totally saturated with water without noticeable free water droplets or running water, just before application of liner material. Brick surfaces should be allowed to drain for 2 hours before coating.

F. Spraying: Spray apply liner material in 1 or more passes from bottom of wall to bottom of frame to form a structurally enhanced monolithic liner.

1. Minimum Total Thickness: 1/2 inch.

G. Finishing:

1. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel.
2. Apply brush finish to trowel finished surface.

H. Follow manufacturer's instructions whenever more than 24 hours have elapsed between applications.

3.06 CURING

A. Cure materials in accordance with manufacturer's instructions.

B. Exposure:

1. Minimize exposure of applied materials to sunlight and air movement.
2. Cover structure if time between application of additional coats is to be longer than 15 minutes.
3. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access.
4. Shade manhole while rehabilitation is in process in hot and arid climates.

C. Concrete Curing Compound:

1. Apply concrete curing compound if relative humidity is less than 70 percent within manhole.
2. Apply curing compound in accordance with manufacturer's instructions.

D. Cure Time: Allow a minimum of four (4) hours cure time before subjecting manholes to flows.

3.07 APPLICATION OF EPOXY COATING

A. Apply a continuous coat of epoxy of entire surface of manhole and under rim sealing all joints, bench and pipe penetrations.

B. Apply in accordance with all manufacturer instructions including priming or surface preparation.

C. Measure ph of surface before application to conform to manufacturer requirements

D. Spray or trowel in an even coat maintaining a monolithic liner.

E. Utilize a mil thickness gage during application to ensure an even depth of material and prevent voids from forming.

F. Apply a broadcast of fine dried sand over bench surface to provide footing before epoxy is cured and remains "tacky".

G. Allow finished product to set for at least 24 hours before visual inspection. Flows may resume after 4-8 hours.

3.08 FIELD QUALITY CONTROL

A. Inspection by the Engineer or the waiver of inspection of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

B. Leaks: Visually verify absence of leaks.

C. Vacuum Test: Perform vacuum test in accordance with Section 02535 – 3.03 of these Specifications. Vacuum test shall not be performed earlier than 7 days after application.

3.09 PROTECTION

A. Do not allow traffic for a minimum of 24 hours after final application of liner material.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Manhole Coatings will be made on a unit price basis per each, at the price stated on the Bid Form. Payment will include all materials and labor required for complete rehabilitation, including invert repair, liner construction, testing, and all else related to this item not paid under other sections.

END OF SECTION

SECTION 02740 – ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. This section includes furnishing all materials, labor and equipment necessary to construct asphalt concrete pavement to the lines, grades and cross sections shown or established, including one or more courses and overlays. Work shall be performed in conformance with any applicable State, County or District Standards.

PART 2 PRODUCTS

2.01 DEFINITIONS

A. Hot Mixed Asphalt Concrete (HMAC) – Asphalt concrete is a hot mix of asphaltic cement; well graded, high quality aggregate; mineral filler and additives, as required; plant mixed into a uniformly coated mass, hot laid in on a prepared foundation, and compacted to a specified density.

B. ODOT Standard Specifications – The 2002 Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

2.02 MATERIALS

A. Coarse and fine aggregate shall conform to the qualification requirements of Section 00745.10 of the ODOT Standard Specifications, latest edition.

B. Asphalt Cement – HMAC shall use PBA-2 grade asphalt cement.

C. HMAC shall be ½" Dense Graded Mix, in accordance with Section 00745 of the ODOT Standard Specifications

D. Asphalt Tack Coat shall consist of CSS-1 or CSS-1h emulsified asphalt (EA) conforming to ODOT Standard Specifications, Section 00730.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Unless otherwise specified herein, HMAC shall be mixed, processed, hauled, laid, compacted and finished in accordance with Section 00745 of the ODOT Standard Specifications, latest edition.

B. Notify the Engineer at least 48-hours prior to placement of base aggregate and asphalt concrete pavement to permit inspection.

C. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be achieved asphalt concrete paving operations shall be suspended. Owner shall not be liable for damages or claims of any kind or description due to the suspension of operations by the Engineer. HMAC shall not be placed when the ambient temperature is below 35° F.

D. Adhere to all applicable State and/or OSHA regulations pertaining to road closure, traffic control, and other related safety precautions.

E. To provide for the convenience and safety of the traveling public, pavement replacement shall be performed immediately following the completion of backfilling operations. In the event that pavement replacement cannot be performed as such, the Contractor shall maintain the trench backfill on a daily basis, as directed, until pavement replacement has been completed.

F. Subgrade and aggregate base shall be prepared, compacted and finished in accordance with Section 02720.

G. Pavement Sawcutting

1. Utility trenches in existing pavement areas shall be sawcut immediately prior to repaving. Sawcuts shall be made a minimum of 6-inches outside the limits of the trench, or to the outer extents of pavement damaged as a result of the Contractor's operations, whichever is greater.

H. Tack Coat Asphalt

1. Contact surfaces of manholes, catch basins, gutters and existing pavements shall be treated with a layer of tack coat asphalt. Do not place on wet surfaces.

2. Joints between existing and new AC pavement shall be filled with tack coat asphalt.

3. Apply tack coat asphalt with a pressure distributor capable of uniformly applying the emulsified asphalt at even heat on variable surface widths up to 16-feet, at readily determined and controlled rates from 0.05 to 0.20 gallons per square yard, and with uniform pressure. Pressure distributor shall include a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Pressure distributor shall be equipped with a positive power asphalt pump and full circulation spray bars adjustable both laterally and vertically. Set bar height for triple lap coverage.

4. Minimum surface temperature at the time of placement of tack coat asphalt shall not be less than 50° F.

5. Tack coat shall only be applied to clean dry surfaces. All loose material should be removed by sweeping, flushing with water or other approved methods.

6. Apply tack coat asphalt at the following rates for the indicated surfaces.

Surface	Application Rate (gallons / yd^2)	
	Undiluted	Diluted 1:1 with Water
New HMAC	0.05 – 0.07	0.10 – 0.13
Oxidized HMAC	0.07 – 0.10	0.13 – 0.20
Milled HMAC	0.10 – 0.13	0.20+

7. Tack coat asphalt shall be at a temperature between 140° F and 185° F as recommended by the manufacturer at the time of application.

8. Do not place HMAC on the tack coat until the asphalt separates from the water, but before it loses its tackiness.

I. Asphalt Concrete Pavement

1. HMAC shall be a minimum of 250° F at the time of placement.

2. Storage of HMAC in silos shall not be permitted.

3. Control of line and grade shall be manual.

4. HMAC shall be covered during hauling if rain or cold air temperatures are encountered any time between loading and placement. HMAC will be rejected if any of the following is observed: mix falls below minimum specified temperature; slumping or separating; solidifying or crusting; absorbing moisture. Rejected loads shall be disposed of at the Contractor's expense.

5. Deposit HMAC from the hauling vehicles so segregation is prevented. HMAC shall not be windrowed.

6. Placement

   a. HMAC should be placed using a self-contained, self-propelled paver supported on tracks or wheels that do not contact the mix being placed.

   b. When leveling irregular surfaces and raising low areas, do not exceed 2-inches actual compacted thickness on any one lift.

   c. Place the mix in the number of lifts and courses, and to the compacted thickness for each lift and course as shown on the Plans. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

7. The compacted depth of new asphalt concrete pavement on public streets shall be 2-inches, minimum. Asphalt concrete paving for utility trench patches shall be 2-inches, minimum, or shall match the existing paving, whichever is greater. Asphalt concrete overlays on public streets shall have a minimum thickness of 2-inches. On non-public roads or driveways, match existing thickness, with a minimum thickness of 2-inches. Asphalt concrete pavement in excess of 2-inches thick shall be constructed in multiple lifts of approximately equal thickness. The maximum compacted thickness of any individual lift shall not exceed 2-inches.

8. Pavement shall be placed, shaped, compacted and finished to the grades and cross sections shown on the Plans or established. Taper new overlays at limits to match existing asphalt pavement.

9. HMAC shall be compacted using self-propelled steel wheeled static rollers, vibratory rollers, or pneumatic tired rollers capable of achieving the minimum compaction specified. If vibratory rollers are used, they should be specifically designed for compaction of HMAC, have adjustable amplitude and frequency, and be capable of at least 2000 vibrations per minute. Finish rolling should be performed by a static roller or a vibratory roller in the static mode.

10. Asphalt concrete pavement shall be compacted to a minimum of 92% relative compaction with the theoretical maximum density determined by AASHTO T-209. Testing shall be performed at random locations using a nuclear gauge operated in the back-scatter mode. At least one density test shall be performed every 1000 lineal feet on each spread or a minimum of one test each day of production.

J. No traffic shall come in contact with any newly paved surface until surface has cooled and set sufficiently to prevent marking. The Contractor is responsible for traffic control.

K. Warranty

1. Contractor shall maintain all asphalt concrete paved areas and shall furnish all required materials and workmanship at no additional cost to the Owner for a period of one year following the Owner's acceptance of the complete project.

2. If any newly paved asphalt concrete surfaces settles, cracks, breaks, or becomes otherwise defective within the warranty period as described herein, then the deficiencies or damages in surfacing shall be immediately repaired by the Contractor upon request and in a manner approved by the Engineer.

3. All costs incurred in the repair of deficiencies or damages shall be borne by the Contractor, with no additional compensation allowed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – SCHEDULE I PUMP STATION NO. 4 REPLACEMENT

A. Payment for Asphalt Concrete Pavement shall be included within the lump sum basis for the amount stated on the Bid Form.

4.02 MEASUREMENT AND PAYMENT – SCHEDULE II SEWER PIPE AND FORCEMAIN

B. Measurement and payment for the excavation, disposal, backfill, and other preparation of trenches is included within the lineal foot cost for Trench Excavation, Bedding & Backfill.

C. Utility Trenches – Class "B" backfill or CLSM backfill shall be brought to the surface and used as Aggregate Base. No separate measurement and payment will be made for Aggregate Base.

D. Sawcutting – The cost for sawcutting existing pavement adjacent to new utility trenches shall be considered incidental to the work. No additional compensation will be allowed for sawcutting.

E. Asphalt Concrete Pavement

1. Measurement and payment for Asphalt Concrete Pavement shall be made on a tonnage basis, at the unit price stated on the Bid Form. Payment shall include full compensation for all work necessary to prepare and construct the asphalt concrete pavement. There will be no separate measurement of bituminous cements or additives contained in the mixture or used otherwise in the work. Payment will be made only for material incorporated into the specified limits.

   a. Asphalt Concrete Pavement for utility trenches shall be paid on a tonnage basis, at the unit price stated on the Bid Form. The limits of the trench patching shall be as established herein, including sawcuts. Additional costs for repair of pavement damaged by the Contractor outside the trench and sawcut limits as described herein shall be borne by the Contractor.

2. A separate ticket shall accompany each load delivered to the job site and shall be given to the Engineer before the load is spread. No ticket will be accepted unless it shows the date, ticket number, driver's name, project name, batch number, truck weight, gross weight and tonnage of asphalt.

3. All trucks shall be weighed at least once each day while unloaded and weighed while loaded for each trip. Platform scales furnished by the Contractor shall be tested and certified.

END OF SECTION

SECTION 02820 – FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section includes all labor, materials and equipment necessary to furnish and install chain link fencing and gates as shown on plans.

B. Section includes all labor, materials and equipment necessary to furnish and install cedar wood fence as shown on plans.

1.02 SUBMITTALS

A. Submittals shall meet the requirements of Section 01300. Submittals shall include material specifications indicating materials, dimensions and finish.

PART 2 PRODUCTS

2.01 CHAIN LINK FABRIC, TIES AND TENSION WIRE.

A. Chain link fabric, ties and tension wire shall conform to the requirements of AASHTO M 181 as supplemented and modified by this Specification.

B. Materials for chain link fencing shall be standard commercial products which meet the general requirements of these Specifications.

C. Fabric may be zinc-coated steel meeting Type I, Class D coating requirement, or aluminum-coated steel. Aluminum-coated steel shall be coated with at least 0.40 ounce per square foot. Use only one type on Project.

D. Wire fabric ties, wire ties, and hog rings shall be zinc-coated steel wire. Tension wire shall be # 7 gauge spring wire and have a Class 2 coating. Number 9 gauge galvanized ties or clips shall be provided for attaching tension wires to the fabric.

E. Chain link fence fabric shall be # 9 gauge wire woven in a 2 inch mesh. Fabric shall be the height indicated on the Plans with both edges selveaged, twisted and barbed. Coating shall be applied after fabrication.

F. Line posts shall be round tubular steel having a nominal outside diameter of 2 3/8 inches.

G. End, corner, pull posts and intermediate posts shall be round tubular steel having a nominal outside diameter of 2 7/8 inches.

H. Top rail and post braces shall be round having a nominal outside diameter of 1 5/8 inches.

I. Top of fence shall be terminated with 3 strands of 12.5 gauge barbed security wire.

J. Stretcher bars shall not be less than ¼" x ¾" x length required. Length shall be 1 inch less than the height of the specified fabric. Stretcher bars shall be provided for stretching and securing the fabric at each gate, end, corner and pull post, one for each gate and end post and two for each corner and pull post.

2.02 POST TOPS

A. All posts shall be provided with post tops which will fit over the outside of posts to preclude moisture entry. Caps shall be pressed steel or malleable iron, galvanized.

2.03 POST BRACES

A. A horizontal, galvanized post brace shall extend to each adjacent line post at mid-height of the fabric for each gate, corner, pull and end post.

B. A diagonal ½" diameter truss rod shall also be provided from the line post to the gate, corner, pull, or end post, with a turnbuckle or other equivalent device for tension adjustment. Two diagonal tension truss rods shall be provided for each fence panel adjacent to a gate, end, corner or pull post.

2.04 FENCE GATES

A. Fabric gates used with chain link fence shall be chain link of the same gauge and conforming to applicable requirements of these Specifications. Install stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" O. C.

B. Gate shall be rolling gate as shown on plans.

C. Gate frames shall be fabricated from minimum 1 5/8" diameter steel tubing to match fence framework. Assemble gate frames by welding, or with special fittings and rivets for rigid connections. Provide horizontal and diagonal members as necessary to ensure rigidity and proper gate operation.

D. Install diagonal cross-bracing consisting of 1/2" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

E. Gate Hardware as follows:

a. Provide manufacturer's standard solid rubber-tired rollers for ground supported sliding gates. Include intermediate rollers or casters where required to prevent sag or deflection. Gate shall have top and bottom rear rollers on minimum 1 5/8" diameter tracks. Provide padlockable latch on rolling gate.

2.05 WOOD FENCE

A. Slats shall be #1 grade redwood or cedar. Full cut 1"x4" and 1"x6" dog-ear slats.

B. Top, middle and bottom rails shall be minimum 2"x4" cedar studs 8 feet long. Minimum 3 rails, minimum 6 nails per slat.

C. Corner, end and line posts shall be minimum 4"x4" cedar post. Set cedar posts in concrete minimum 24" deep. Extend concrete 4" above grade and slope concrete away from post to shed water.

D. Assemble with galvanized screw shank nails.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not begin installation and erection before final surfacing and grading is completed.

3.02 POST INSTALLATION

A. Excavation: Auger or hand excavate with post-hole digger holes for posts to diameters and spacing indicated in these Specifications.

a. Excavate Holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times the largest cross-section of post.

b. Excavate hole depths 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

B. Fence Post Setting

a. Line posts shall be placed equidistant at intervals not to exceed 10 feet O.C. The intervals to be measured parallel to the grade of proposed fence and in the line of the fence.

b. Posts shall be set vertically and plumb and encased in cylindrical concrete footings at least 4 times the post diameter, with at least 2" cover on the bottom of the post. Extend the concrete at least 2" above grade and crown to shed water.

C. Rail Installation

a. Connect top rail securely to the posts using boulevard clamps or other suitable means, such that a continuous brace is formed.

D. Chain Link Fabric

a. Chain link fence fabric shall be installed over the outside of the fence framework. Fabric shall be tied to the line posts with # 9 gauge galvanized steel wire spaced at 12-inches maximum.

E. Tension Wires

a. Install tension wires along bottom of fence before stretching fabric and tie to each post. Fasten fabric to tension wire using # 9 gauge wire ties or galvanized steel hog rings spaced at 24" O.C.

F. Gates

a. Install gates plumb, level and secure for full opening without interference. Adjust hardware for smooth operation and lubricate.

G. Stretcher Bars

a. Thread through or clamp to fabric 4" O.C. and secure to posts with metal bands spaced 15" O.C.

H. Brace Assemblies

a. Install braces so posts are plumb when diagonal rod is under proper tension.

3.03 WOOD FENCE INSTALLATION

A. Cedar posts shall be set true to line and grade in concrete bases at least 24 inches in depth. All posts shall be sound and fee from decay, splits, cracks or other defect that would weaken the posts or shorten the expected life of the post.

B. Distance between posts shall not exceed 8 feet.

C. Rails shall be securely fastened to posts with galvanized screw shank nails or galvanized screws.

D. Changes in direction in excess of 20 degrees shall be considered corners and treated as such.

E. A minimum of 6 inches of concrete shall be provided below each post. A minimum of 4 inches of concrete shall be provided around the post above grade. Slope concrete away from post to shed water away from post. End posts and line posts shall have concrete base at least 12 inches in diameter.

F. Fence slats shall face away from the fenced property, i.e. toward the road and neighboring property. Slats shall be placed approximately 2 inches above grade and on straight grade between posts. Slats shall be free from decay or defects that would weaken the slat, reduce its effective life or adversely affect the intended use of the slat. Slats shall be attached with two galvanized screw shank nails into each rail, 6 nails per slat.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Fences and Gates in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 02830 – MODULAR RETAINING WALLS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work shall consist of furnishing and construction of a Keystone Standard, Keystone Compac System, Tensar Mesa; or equal in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the plans.

B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit drainage fill and backfill to the lines and grades shown on the construction drawings section includes all labor, materials and equipment necessary to furnish and install cedar wood fence as shown on plans.

C. Work includes furnishing and installing geogrid soil reinforcement of the type, size, location, and lengths designated on the construction drawings.

1.02 Related Sections

A. Section 02250 Demolition and Site Preparation

1.03 Reference Documents

A. American Society for Testing and Materials (ASTM)

1. ASTM C1372 Specification for Dry-Cast Segmental Retaining Wall Units
2. ASTM D422 Particle-Size Analysis of Soils
3. ASTM D698 Laboratory Compaction Characteristics of Soil -Standard Effort
4. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
5. ASTM D4595 Tensile Properties of Geotextiles - Wide Width Strip
6. ASTM D5262 Unconfined Tension Creep Behavior of Geosynthetics
7. ASTM D6637 Tensile Properties of Geogrids – Single or Multi-Rib
8. ASTM D6638 Connection Strength - Reinforcement/Segmental Units
9. ASTM D6706 Geosynthetic Pullout Resistance in Soil

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 252 Corrugated Polyethylene Drainage Pipe

C. Geosynthetic Research Institute (GRI)

1. GRI-GG4 Determination of Long Term Design Strength of Geogrids
2. GRI-GG5 Determination of Geogrid (soil) Pullout

D. National Concrete Masonry Association (NCMA)

1. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
2. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

1.04 Submittals

A. Contractor shall submit a Manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification and the structure design.

B. Contractor shall submit construction drawings and design calculations for the retaining wall system prepared and stamped by a Professional Engineer registered in the state of the project. The engineering designs, techniques, and material evaluations shall be in accordance with the Manufacturer's Design Manual, NCMA Design Guidelines For Segmental Retaining Walls, or the AASHTO Standard Specifications for Highway Bridges (whichever is applicable to designer).

C. Contractor shall submit a test report documenting strength of specific modular concrete unit and geogrid reinforcement connection. The maximum design tensile load of the geogrid shall be equal to the laboratory tested ultimate strength of geogrid / facing unit connection at a maximum normal force limited by the "Hinge Height" of the structure divided by a safety factor of 1.5. The connection strength evaluation shall be performed in accordance with ASTM D6638 (NCMA SRWU-1).

1.05 Quality Assurance

A. Contractor shall submit certification, prior to start of work, that the retaining wall system (modular concrete units and specific geogrid):

1) Has been successfully utilized on a minimum of five (5) similar projects, i.e., height, soil fill types, erection tolerances, etc.; and

2) Has been successfully installed on a minimum of 1 million (1,000,000) square feet of retaining walls.

B. Owner shall/may provide soil testing and quality assurance inspection during earthwork and wall construction operations. Contractor shall provide any quality control testing or inspection not provided by the Owner. Owner's quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.06 Delivery, Storage and Handling

A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification has been received.

B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2 PRODUCTS

2.01 Definitions

A. Modular Unit - a concrete retaining wall element machine made from Portland cement, water, and aggregates.

B. Structural Geogrid - a structural element formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and function primarily as reinforcement.

B. Unit Drainage Fill - drainage aggregate, which is placed within and immediately behind the modular concrete units.

D. Reinforced Backfill - compacted soil, which is placed within the reinforced soil volume as outlined on the plans.

2.02 Modular Concrete Retaining Wall Units

A. Modular concrete units shall conform to the following architectural requirements:

1. Face color – Owner's Choice.
2. Face finish – Owner's Choice.
3. Bond configuration - running with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 10 feet under diffused lighting.

B. Modular concrete materials shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.

C. Modular concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:

1. Compressive strength: ≥ 3000 psi (21 MPa);
2. Absorption: 8 % (6% in northern states) for standard weight aggregates;
3. Dimensional tolerances: ± 1/8" (3 mm) from nominal unit dimensions not including rough split face, ±1/16" (1.5 mm) unit height - top and bottom planes;
4. Unit size: 8" (203 mm) (H) x 18" (457 mm)(W) x 18" (457 mm)(D) minimum;
5. Unit weight: 100 lbs/unit (45 kg) minimum for standard weight aggregates.

D. Modular concrete units shall conform to the following performance testing:

1. Inter -unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 1500 plf (21 kN/m) minimum at 2 psi (13 MPa) normal pressure;
2. Geogrid/unit peak connection strength in accordance with ASTM D6638 (NCMA SRWU-1): 900 plf (13 kN/m) minimum at 2-psi (13 MPa) normal force.

E. Modular concrete units shall conform to the following constructability requirements:

1. Vertical setback: 1/8" (3 mm) ± per course (near vertical) or 1" (25 mm) + per course per the design;
2. Alignment and grid positioning mechanism - fiberglass pins, two per unit minimum;
3. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

2.03 Shear Connectors

A. Shear connectors shall be 1/2-inch (12 mm) diameter thermoset isopthalic polyester resin-pultruded fiberglass reinforcement rods or equivalent to provide connection between vertically and horizontally adjacent units with the following requirements:

1. Flexural Strength in accordance with ASTM D4476: 128,000 psi (882 MPa) minimum;
2. Short Beam Shear in accordance with ASTM D4475: 6,400 psi (44 MPa) minimum.

B. Shear connectors shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

2.04 Base Leveling Pad

A. Material shall consist of a compacted crushed stone base or non-reinforced concrete as shown on the construction drawings.

2.05 Unit Drainage Fill

A. Unit drainage fill shall consist of clean 1" (25 mm) minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
1 inch (25 mm)	100
3/4-inch (19 mm)	75-100
No. 4	0 - 10
No. 50	0 - 5

C. One cubic foot (0.028 m3), minimum, of drainage fill shall be used for each square foot (0.093 m2) of wall face. Drainage fill shall be placed within cores of, between, and behind units to meet this requirement.

2.06 Reinforced Backfill

A. Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
2-inch (50 mm)	100
3/4-inch (19 mm)	100-75
No. 40	0-60
No. 200	0-35

Plasticity Index (PI) <15 and Liquid Limit <40 per ASTM D-4318.

B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless field tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.

C. Material can be site-excavated soils where the above requirements can be met. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.

D. Contractor shall submit reinforced fill sample and laboratory test results to the Engineer for approval prior to the use of any proposed reinforced fill material.

2.07 Geogrid Soil Reinforcement

A. Geosynthetic reinforcement shall consist of geogrids manufactured specifically for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high-density polyethylene. Polyester geogrid shall be knitted from high tenacity polyester filament yarn with a molecular weight exceeding 25,000 Meg/m and a carboxyl end group values less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking, and stripping.

B. Ta, Long Term Allowable Tensile Design Load, of the geogrid material shall be determined as follows:

Ta = Tult / (RFcr*RFd*RFid*FS)
Ta shall be evaluated based on a 75-year design life.
Ta = 890 minimum.

1. Tult, Short Term Ultimate Tensile Strength shall be determined in accordance with ASTM D4595 or ASTM D6637.
Tult is based on the minimum average roll values (MARV). Tult = 3700 lbs/ft minimum.

2. RFcr, Reduction Factor for Long Term Tension Creep
RFcr shall be determined from 10,000-hour creep testing performed in accordance with ASTM D5262. Reduction value = 2.64 minimum.

3. RFd, Reduction Factor for Durability
RFd shall be determined from polymer specific durability testing covering the range of expected soil environments. RFd = 1.00 minimum.

4. RFid, Reduction Factor for Installation Damage
RFid shall be determined from product specific construction damage testing performed in accordance with ASTM D5818 (GRI-GG4). Test results shall be provided for each product to be used with project specific or more severe soil type. RFid = 1.05 minimum.

5. FS, Overall Design Factor of Safety
FS shall be 1.5 unless otherwise noted for the maximum allowable working stress calculation.

C. The maximum design tensile load of the geogrid shall not exceed the laboratory tested ultimate strength of the geogrid/facing unit connection as limited by the "Hinge Height" divided by a factor of safety of 1.5. The connection strength testing and computation procedures shall be in accordance with ASTM D6638 Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units (NCMA SRWU-1).

D. Soil Interaction Coefficient, Ci
Ci values shall be determined per ASTM D6706 (GRI:GG5) at a maximum 0.75-inch (19 mm) displacement.

E. Manufacturing Quality Control
The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing by an independent laboratory.
The QC testing shall include:
Tensile Strength Testing
Melt Flow Index (HDPE)

Molecular Weight (Polyester)

2.08 Drainage Pipe

A. The drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.09 Geotextile Filter Fabric

A. When required, Geotextile filter fabric shall be 4.0 oz/sy, polypropylene, needlepunched nonwoven fabric.

PART 3 EXECUTION

3.01 Excavation

A. Contractor shall excavate to the lines and grades shown on the construction drawings. Owner's representative shall inspect the excavation and approve prior to placement of leveling material or fill soils. Proof roll foundation area as directed to determine if remedial work is required.

B. Over-excavation and replacement of unsuitable foundation soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.02 Base Leveling Pad

A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings, to a minimum thickness of 6 inches (150 mm) and extend laterally a minimum of 6" (150 mm) in front and behind the modular wall unit.

B. Soil leveling pad materials shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557.

C. Leveling pad shall be prepared to insure full contact to the base surface of the concrete units.

3.03 Modular Unit Installation

A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.

B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.

C. Install shear/connecting devices per manufacturer's recommendations.

D. Place and compact drainage fill within and behind wall units. Place and compact backfill soil behind drainage fill. Follow wall erection and drainage fill closely with structure backfill.

E. Maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed two courses.

3.04 Structural Geogrid Installation

A. Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.

B. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction design drawings or as directed by the Engineer.

C. The geogrid shall be laid horizontally on compacted backfill and attached to the modular wall units. Place the next course of modular concrete units over the geogrid. The geogrid shall be pulled taut, and anchored prior to backfill placement on the geogrid.

D. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps between adjacent pieces of geogrid are not permitted.

3.05 Reinforced Backfill Placement

A. Reinforced backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack in the geogrid and installation damage.

B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches (150 mm) where hand compaction is used, or 8 - 10 inches (200 to 250 mm) where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density as required.

C. Reinforced backfill shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum, + 0%, - 3%.

D. Only lightweight hand-operated equipment shall be allowed within 3 feet (1m) from the tail of the modular concrete unit.

E. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches (150 mm) is required prior to operation of tracked vehicles over the geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

F. Rubber tired equipment may pass over geogrid reinforcement at slow speeds, less than 10 MPH (15 KPH). Sudden braking and sharp turning shall be avoided.

G. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.06 Cap Installation

A. Cap units shall be glued to underlying units with an all-weather adhesive recommended by the manufacturer.

3.07 As-built Construction Tolerances

A. Vertical alignment: ± 1.5" (40 mm) over any 10' (3 m) distance.

B. Wall Batter: within 2 degrees of design batter.

C. Horizontal alignment: ± 1.5" (40 mm) over any 10' (3 m) distance.
Corners, bends & curves: ± 1 ft (300 mm) to theoretical location.

D. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

3.08 Field Quality Control

A. Quality Assurance - The Owner shall/may engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve the Contractor from securing the necessary construction control testing.

B. Quality assurance should include foundation soil inspection. Verification of geotechnical design parameters, and verification that the contractor's quality control testing is adequate as a minimum. Quality assurance shall also include observation of construction for general compliance with design drawings and project specifications. Quality assurance is best performed by the site geotechnical engineer.

C. Quality Control – The Contractor shall engage inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform testing and inspection services.

D. Quality control testing shall include soil and backfill testing to verify soil types and compaction and verification that the retaining wall is being constructed in accordance with the design plans and project specifications.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Modular Retaining Walls in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 02900 – LANDSCAPE RESTORATION AND CLEANUP

PART 1 GENERAL

1.01 SUMMARY

A. This section covers the work necessary to reseed, restore and cleanup the site. Work shall include the removal of all construction equipment, rubbish, construction debris, and unused materials of any kind resulting from project activities.

B. Site cleanup shall include the clean up of all pavement surfaces, whether new or existing within the limits of the project and replacement of pavement markings.

PART 2 PRODUCTS

2.01 RESEEDING MATERIALS

A. Grass seed shall be from blue tag stock and from the latest crop available. Deliver each variety in standard containers labeled in accordance with Oregon State laws and U.S. Department of Agriculture rules and regulations under the Federal Seed Act. Provide with label showing seed variety, percentage of purity, germination, maximum weed content, date of test within nine months of date of delivery, and as set forth in the General Seed Certification Standard by the Oregon State University Certification Board. Mold or other evidence of container having been wet or otherwise damaged will be cause for rejection of each lot of seed. Grass seed may be delivered to the project as a mixture provided each variety of grass seed in the mixture is identified and labeled as specified.

B. Where imported topsoil is required, provide natural, fertile, friable topsoil, representative of local productive soil, and 90% free of clay lumps or other foreign matter larger than 2-inches in diameter, not frozen or muddy, with pH 5.0 to 7.0, and not less than 3% humus as determined by loss of ignition of moisture-free samples dried at 100° C. Gravel portion (particles larger than 2 mm) shall not exceed 15% of total volume. Topsoil shall be free of quack grass, horsetail and other noxious vegetation and seed. Should such regenerative material be present in the soil, all resultant growth, both surface and root, shall be removed by the Contractor within 1-year of acceptance of the work at no expense to the Owner.

C. Provide a lime compound of ground dolomitic limestone not less than 85% total carbonates and magnesium, ground so that 50% passes a number 100 sieve and 90% passes a number 20 sieve. Coarser material will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing the number 100 sieve.

D. Furnish fertilizer in moisture-proof bags marked with weight and the manufacturer's certified analysis of the contents showing the percentage for each ingredient. Furnish fertilizer in a dry condition free from lumps and caking, in granular or palletized form, of standard commercial grade conforming to all State and Federal regulations and to the standards of the Association of Official Agricultural Chemists.

E. Provide all other materials required to accomplish the work specified.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Surface Dressing

1. Slopes, sidewalk areas, planting areas, easements and roadways shall be smoothed and dressed to the required cross section and grade by means of a grading machine insofar as it is possible to do without damaging the work or existing improvements, trees and shrubs. Supplement machine dressing by hand work as directed.

2. Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. Grade all areas true to line and grade as shown or as approved. Where the existing planting is below sidewalk and curb, fill and dress the area to the walk regardless of limits shown. Wherever fill material is required in the planting area, make finished surface high enough to allow for final settlement.

B. Remove and dispose of all excavated or construction materials, equipment, and rubbish of all kinds resulting from the work. Where brush and trees beyond the limits of the project have been disturbed or damaged, remove and dispose of or restore same, as directed, at no expense to the Owner.

C. Clean all drainage facilities such as inlets, catch basins, culverts and open ditches of all excess material or debris resulting from the work, to the satisfaction of the Owner.

D. Clean all pavement surfaces, whether new or existing within the limits of the project. Clean existing improvements such as curbs, gutters, walls, sidewalks, castings for manholes, monuments, water gates, lamp poles, vaults, signs, and other similar installations as approved. Flush the street with a pressure type flusher as approved. Hand sweep or flush all sidewalks as directed.

E. Fused thermoplastic stop bar and pavement markings shall be installed following manufactures recommendations for installation. Pavement surface shall be free of dirt, grease, moisture or any other foreign material prior to the placement of striping and pavement markings.

F. Unless otherwise specified by Engineer, disturbed areas adjacent to roadways shall be restored with Gravel Surfacing as specified in Section 02340.

G. Restoring Planted Areas

1. Hand rake and drag all formerly grassed and/or planted areas leaving disturbed areas free from rocks, gravel, clay, or any other foreign material and ready, in all respects, for seeding. The finished surface shall conform to the original surface, be free draining and free from holes, rough spots, or other surface features detrimental to a seeded area.

2. Plant grass seed only at times when local weather and other conditions are favorable to the preparation of the soil and to the germination and growth of grass. Sow grassed areas evenly with a mechanical spreader at a rate of one pound per 300 square feet, roll with cltipacker to cover seed, and water with fine spray. Method of seeding may be varied as approved, however, responsibility to establish a smooth, uniformly grassed area will not be waived.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – SCHEDULE I AND II

A. Payment for Landscape Restoration & Cleanup will be made on a lump sum basis at the price stated on the Bid Form. Payment shall include all materials and labor required to complete the work described herein.

B. Payment for miscellaneous pavement markings, thermoplastic stop bars, and striping shall be considered incidental and cost shall be included within the lump sum cost of Site Cleanup & Landscape Restoration. A separate payment item will not be made for this item.

END OF SECTION

DIVISION 3- CONCRETE
TABLE OF CONTENTS

SECTION 03110 – STRUCTURAL CAST-IN-PLACE CONCRETE FORMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Concrete formwork required for all project structural concrete.

B. Formwork design, placement, proper securing and support, and removal.

C. Coordination for various wall and slab penetration locations and sizes including sleeve positioning for casting in place.

D. Positioning of anchor bolts, grating and vault lid frames, and other imbedded items.

1.02 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete

B. Section 03200 – Concrete Reinforcement

C. Section 03150 – Concrete Accessories

D. Hangers and Inserts for Mechanical and Electrical Work: Divisions 15 and 16

1.03 REFERENCES

A. American Concrete Institute (ACI) 318, Chapter 6 – Formwork, Embedded Pipes, and Construction Joints.

B. ACI 347R-88 – Guide to Formwork for Concrete.

1.04 QUALITY ASSURANCE

A. Forms shall be constructed by laborers experienced in concrete formwork erection.

B. Ensure that forms are smooth, vertically plumb or horizontally flat as applicable, and properly spaced to provide finished concrete structures as shown on the drawings.

C. Resulting work which is not in conformance with applicable contract specifications shall be promptly removed and replaced.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect form materials from damage that may affect finish appearance or form stability.

B. Keep forms clean and free from deleterious materials.

1.06 PROJECT CONDITIONS

A. Refer to drawings to estimate quantities and locations involved.

B. All exposed edges shall be properly formed and chamfered where shown.

C. Conduct required excavation and provide excavation support as necessary.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Lumber Plank
1. Species: Douglas Fir or Hemlock
2. Casting Face Texture: Smooth
3. Casting Face Appearance: No loose Knots or Knot Holes; maximum Knot size 1-1/2 inch and well scattered
4. Size: Support Concrete at rate poured
5. Extent of Work: Provide at Footing. Flatwork perimeters, curbing, and Pedestals, unless otherwise indicated.

B. Plywood Forms
1. Material: APA B-B Plyform grade Plywood Class 1
2. Thickness: As required by Concrete placement rate
3. Extent of Work: Provide at all other Concrete Work

C. Steel

2.02 ACCESSORIES

A. Form Ties
1. Manufacturer: Bowman, Burke, Dayton, JEF, or approved
2. Type: Plastic Cone as recommended by Manufacturer for conditions of use
3. Break-back Distance from Concrete Face: 1-inch
4. Do not use wire ties and wood spacers

B. Form Release Agents
1. Non-staining, VOC compliant, water-based Form Release Compound. Should be opaque in color to aid in full coverage.
2. W.R. Meadows "Duogard II", or approved equal.

C. Form Joint Caulking
1. Manufacturer and Brand: Sonneborn Sonolac, Dap Acrylic Latex, or approved

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that reinforcing steel is properly placed according the spacing and tolerances required, and that proper inspection has been conducted.

B. Ensure waterstops are installed as required when placed prior to formwork.

C. Review plans for wall and slab penetrations and imbedded items.

D. Remove debris and foreign matter from formwork. Clean form contact surfaces. Replace with new material when necessary or when directed.

E. Remove loose rust and foreign matter from reusable hardware prior to installation into Formwork.

F. Re-use Forms only when contact surfaces equal original use and forms have been adequately cleaned.

3.02 INSTALLATION

A. Comply with ACI 318 and ACI 347.

B. Carefully conform to the shapes, lines and dimensions of the drawings. Ensure that edges are chamfered where shown. Form any Surface Indentations shown on the Drawings.

C. Arrange to provide concrete cold joints as indicated on the drawings.

D. At forms for exposed concrete, fill form panel joints with Form Joint Caulking Compound, and strike compound flush with panel on face adjacent to exposed Concrete, or cover joints with thin, smooth, plastic, pressure-sensitive tape.

E. At forms for exposed concrete, seal Form Ties against leakage with Form Joint Caulking Compound.

F. Make form joints tight to prevent leakage. Minimize the number of form joints used.

G. Ensure that formwork is properly supported, tied, and braced to prevent deflection and maintain shape (see allowable tolerances for formwork).
   1. Provide bracing as required to meet load requirements.
   2. Protect against undermining or settlement when placed on ground.
   3. Anchor as required to prevent upward or lateral Formwork movement during Concrete placement.
   4. Locate ties equidistant and symmetrical. Align vertically and horizontally.

H. Provide Access Openings as required for cleaning and inspection of Forms and Embedded Items prior to placing Concrete. Locate where not exposed to view.

I. Provide Openings and Chasings of Slabs and Walls for Mechanical and Electrical Work. Sizes and locations are directed by Mechanical and Electrical Trades and Drawings.

J. Anchor Bolts: Set with templates to assure accurate bolt positioning

K. During Concrete placement, in areas where Formwork develops weakness, settlement, or distortion, stop concrete placement, remove placed concrete, and remove or strengthen Formwork.

L. Reposition to true alignment prior to, during, and after Concrete placement, if necessary.

3.03 ALLOWABLE TOLERANCES FOR FORMWORK

A. Variation from Plumb: 1/4 inch in 10 feet maximum

B. Variation of Building Lines: 1/4 inch in any Bay or 20 feet maximum

C. Variation in Cross-Sectional Dimensions: Minus 1/8 inch; plus 1/4 inch

D. Variation in Surface Tolerance: 1/8 inch in any 10 feet measured with 10-foot straightedge.

E. Maximum Deflection of Form facing between Supports: 0.00025 x Span

F. Wall Locations: Accurately size and locate within 1/8 inch.

3.04 FORM TREATMENT

A. All forms shall be adequately treated with form release agent to prevent concrete damage during form removal.

B. Prior to each use: Apply form coating to contact surfaces in accordance with Manufacturer's instructions. Conduct surface preparation in accordance with manufacturer's instructions prior to coating forms.

C. When treating previously set forms, carefully prevent coatings from covering reinforcing steel, waterstops, imbedded items, or existing concrete.

D. Prevent coatings from collecting in puddles.

3.05 FORM REMOVAL

A. Leave forms and shoring in place until concrete has attained sufficient strength to safely support own weight and imposed loads.

B. Remove forms at time and in manner to insure safety of structure, and without concrete surface damage.

C. At exposed concrete, form removal time shall be uniform to avoid color differences.

D. Remove top forms from any sloping concrete surfaces as soon as concrete is self-supporting. Repair and finish, if necessary, and cure immediately.

3.06 CLEANING AND REPAIRING

A. Including Work of other Trades, clean, repair, and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by Work of this Section.

B. Remove debris from Project Site upon Work completion, or sooner if directed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for concrete formwork shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 03152 – PREMOLDED EXPANSION JOINT FILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Premolded Expansion Joint Fillers.

1.02 REFERENCES

A. ASTM D 1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
B. ASTM D 1752
C. AASHTO M 213
D. Corps of Engineers: CRD-C 508
E. FS – Federal Specification

1.03 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete

1.04 QUALITY ASSURANCE

A. Manufacturer shall demonstrate five years (minimum) continuous, successful experience in production of items covered in this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect materials during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fiber Expansion Joint

1. Resilient, flexible, non-extruded, expansion-contraction joint filler. Cellular fibers securely bonded together, uniformly saturated with asphalt.
2. Compliance: ASTM D 1751; AASHTO M 213; FS HH-F-341 F, Type I.
3. Recovery when compressed to half width: 70% minimum
4. Use: exterior expansion joints in sidewalks, drives, and between adjoining structures.

B. Flexible Foam Expansion Joint

1. Synthetic isomeric polymer foam, closed-cell, non-gassing. Gray in color.
2. Compliance: ASTM D 5249; ASTM D1752 5.1-5.4.
3. Recovery: 99% minimum
4. Use: interior expansion joints.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions at locations shown on the drawings and as directed.

B. Position joint filler against forms, at interrupting objects, and against abutting structures before placing concrete.

C. Install joint filler ½-inch below concrete surface.

D. Seal with flexible joint sealant.

E. Protect from traffic or damage until sealant has fully cured.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT –

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for expansion joint fillers shall be included as a portion of the lump sum cost for the Project as stated on the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 03200 – CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes reinforcement for concrete including deformed steel bars, welded-wire-fabric, and fiber reinforcement.

B. Supply, detail shop drawings, and place reinforcement.

C. Provide reinforcing to the sizes and dimensions shown on the drawings and according to approved shop drawings for rebar placement.

1.02 RELATED SECTIONS

A. Section 03110 – Structural Cast-In-Place Concrete Forms

B. Section 03300 – Cast-In-Place Concrete

C. Hangers and Inserts for Mechanical and Electrical Work: Divisions 15 and 16

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest edition
   1. ASTM A 615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
   2. ASTM A 185 – Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
   3. ASTM A 82 – Specification for Steel Wire, Plain, for Concrete Reinforcement

B. American Concrete Institute (ACI), latest edition
   1. ACI 315 – Details and Detailing of Concrete Reinforcement
   2. ACI 318 – Building Code Requirements for Reinforced Concrete

C. Uniform Building Code (UBC) – As amended to the "Oregon Structural Specialty Code" by the Oregon Building Codes Division, year 2008 amendments.

D. Concrete Reinforcing Steel Institute (CRSI)
   1. CRSI Manual of Standard Practice, 1997
   2. CRSI Reinforcing Bar Detailing, 1999
   3. CRSI 63 – Recommended Practice for Placing Reinforcing Bars
   4. CRSI 65 – Recommended Practice for Placing Bar Supports

1.04 SUBMITTALS

A. Certified Mill Test Reports for steel.

B. Detail and placement drawings. Submit in accordance with Section 01300 at least 14 days prior to reinforcement fabrication.
   1. Reinforcing steel shall be detailed in accordance with the "ACI Detailing Manual" (SP-66), ACI Committee 315; CRSI; and in conformance with the project drawings.
   2. Shop drawings shall include sufficient plan, section, and elevation drawings of all beams, walls, slabs, footings, columns, and other shapes to clearly show all reinforcement details, spacing, and sizes.
   3. Bends, splices, hooks, ties and all other details shall be shown. Drawings shall indicate any fieldwork required.

4. Shop drawings shall show steel specifications and conformances.

C. Samples of all proposed bar supports with a written description of where each support is proposed to be used.

1.05 QUALITY ASSURANCE

A. Coordinate with other Trades affecting or affected by Work of this Section.

B. Bends, hooks, laps, splices, cover, and other details shall conform to UBC, Chapter 19; and ACI 318, except where more stringent requirements are shown in the drawings or specified herein.

C. Perform reinforcement work in accordance with CRSI Documents 63 and 65.

D. Conduct field measurements as necessary prior to fabrication. Conform to the approved detail and placement drawings.

E. All materials shall be new, unused, specifically manufactured for the intended purpose.

F. Any welding shall be conducted by persons with Welder Certification in accordance with AWS D1.4.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered properly bundled and labeled to show grade, size and location. Deformed bars shall be marked with the letter "S" per ASTM A 615. Deliver with suitable hauling and handling equipment.

B. Properly store to protect from moisture. Cover steel with waterproof covering and store so that materials are not against unprotected earth.

C. Handle material carefully to protect from cuts, nicks, kinks, deformation, and other damage. Ensure worker safety.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. Reinforcing Bars for Concrete
1. All structural reinforcement shall be deformed bars.
2. Deformed billet steel; ASTM A 615, Grade 60 or Grade 40

B. Welded Wire Fabric
1. Use only where shown.
2. Supply flat sheets; ASTM A 185 with wire conforming to ASTM A 82
3. 6-inch by 6-inch mesh spacing
4. Wire Size: W1.4, unless otherwise shown on drawings.

2.02 ACCESSORIES

A. Provide all Accessories necessary for proper Reinforcement placement, spacing, support, and fastening. Bricks, broken CMU, spalls, rocks or similar materials shall not be used for support of reinforcing steel.

B. Tie Wire: 16-gauge minimum, black annealed steel; acceptable patented system.

C. Bar Supports, Bolsters, Chairs and Spacers
   1. Sized and shaped for strength and support of reinforcement during installation and placement of concrete. Use only approved materials.
   2. High density concrete dobies. Compressive strength equal or greater than concrete to be placed. No plastic or low cement content dobies accepted.
   3. Chairs: Stainless steel. With plastic tips when used at surfaces that will be exposed to view.
   4. Spacers: Plastic wheel type. Preco Barspan Wheels, or approved equal.
   5. Plastic Shims may be used to support plastic spacers.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that surfaces to receive Reinforcement are accurately sized and located, square, plumb, rigid, secure, and otherwise accurately prepared.

B. Prior to starting Work, notify General Contractor about defects requiring correction.

C. Reinforcement shall be free from mud, oil or other nonmetallic coatings that decrease bond.

D. Remove surface rust and mill scale with wire brush. Heavily rusted bars shall not be used.

E. Do not start Work until conditions are satisfactory.

3.02 PLACEMENT

A. Perform reinforcement work in accordance with CRSI Documents 63 and 65, and fabricate in compliance with ACI 315.

B. Conform to approved placement and detail drawings and specified tolerances herein.

C. Reinforcement shall be accurately placed and adequately supported before concrete is placed, and shall be secured against displacement within the tolerances of this section.

D. All reinforcement shall be bent cold unless otherwise permitted by the Engineer.

E. Reinforcement partially embedded in concrete shall not be field bent unless approved by the Engineer.

F. Do not weld splices, crossing bars, or other locations.

G. Splices: Locate splices not indicated on the drawings at points of minimum stress. Development length and splices shall conform to UBC Section 1912. At wire mesh, lap one full mesh plus 2-inches. Clear distance between spliced bars shall conform to UBC Section 1907.6. Splices of adjacent bars shall be staggered. Use greater splice lengths where shown in the drawings.

H. Spacing: Comply with UBC Section 1907.6, contract drawings, and approved shop drawings.

I. Protective Concrete Cover: Comply with UBC Section 1907.7.1 minimums. Provide greater cover where shown in the drawings.

J. Bars in slabs shall be supported on well-cured concrete blocks or approved metal chairs.

K. Tolerances:
1. Concrete Cover: Plus or minus ¼ inch.
2. Spacing Between Bars: ¼ inch.

L. Bar relocation to avoid interference with other reinforcement, conduits or embedded items: 1 bar diameter, unless otherwise approved by Engineer.

M. Reinforcement Around Openings: Unless otherwise shown on the drawings, place at least double the area of steel removed by the opening around the opening and extend on each side sufficiently to develop bond in each bar. At square or rectangular openings, place at least one diagonal bar at each corner.

3.03 PROTECTION

A. Protect other Work against damage and discoloration caused by Work of this Section.

B. Protect placed reinforcement from subsequent movement and inclement weather until concrete is placed.

3.04 FIELD QUALITY CONTROL

A. The Engineer shall be notified when reinforcing steel is ready for inspection. Inspection must occur before any concrete is placed.

B. Notify Engineer at least 48 hours in advance and allow sufficient time for inspection.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for concrete reinforcement work shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes work required to supply, place, finish and cure cast-in-place concrete, including mix design, certifications, submittals and testing.

B. Furnish and install vapor barrier and sand base under floor slabs-on-grade.

C. Installation of inserts, sleeves, anchor bolts, grounding cable and other items embedded in concrete, but furnished under other sections.

D. Rinsing out of transit mix trucks, washing or wetting of concrete, site cleanup, or other activity related to water at the site shall be in conformance with all EPA requirements for the prevention of water runoff to storm water sewers or creeks.

1.02 RELATED SECTIONS

A. Section 03110 – Structural Cast-In-Place Concrete Forms
B. Section 03152 – Premolded Expansion Joint Fillers
C. Section 03200 – Concrete Reinforcement
D. Section 07920 – Joint Sealants

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest editions
   1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field
   2. ASTM C33 – Specification for Concrete Aggregate
   3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
   4. ASTM C94 – Standard Specification for Ready-Mixed Concrete
   5. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete
   6. ASTM C150 – Standard Specification for Portland Cement
   7. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
   8. ASTM C260 – Standard Specification for Air Entrained Admixtures for Concrete
   9. ASTM C309 – Standard Specification for Liquid Membrane – Forming Compounds for Curing Concrete
   10. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
   11. ASTM C618 – Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

B. American Concrete Institute (ACI), latest editions
   1. ACI 301 – Standard Specification for Structural Concrete in Buildings
   2. ACI 304R – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
   3. ACI 305R – Recommended Practice for Hot Weather Concreting
   4. ACI 306R – Recommended Practice for Cold Weather Concreting
   5. ACI 309R – Guide for Consolidation of Concrete
   6. ACI 318 – Building Code Requirements for Reinforced Concrete
   7. ACI SP-15 – Field Reference Manual *(have copy on-site)*

1.04 SUBMITTALS

A. Contractor is responsible for the design of the concrete mix that shall conform to ASTM C94 and the requirements of this section.

B. Certified Mix Design: Prior to delivery of concrete, and allowing sufficient time for review, submit three copies of mix design, for each type of concrete, showing all materials used and proportions matching units specified. Submittal shall allow for easy comparison to the specifications and shall show all material compliances. Submittal shall clearly identify the mix as proposed for this project, with project name shown.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.
B. Conform to ACI 305R in hot weather.
C. Conform to ACI 306R in cold weather.
D. Installer Qualifications: Concrete work shall be finished by persons with at least 5 years experience with work of similar scope and quality.
E. No chloride containing admixtures shall be used.
F. On-Site water addition to concrete will not be permitted.
G. Conduct field-testing as specified.
H. Admixtures shall be added in strict conformance with the manufacturer's instructions.

1.06 DELIVERY

A. Concrete shall be scheduled and delivered in a timely manner in accordance with ASTM C94 and ACI 304R. Ensure that forms and reinforcement are complete and ready to accept concrete prior to scheduling delivery.

B. When installing a continuous pour section, ensure that trucks arrive and concrete is placed with no greater than 45 minutes elapsing between lifts.

PART 2 PRODUCTS

2.01 PORTLAND CEMENT

A. Conforming to ASTM C150. Type I and Type II where designated.

B. Use same brand and source of cement throughout the project.

2.02 WATER

A. Water used for mixing shall be clean and potable.

2.03 AGGREGATE

A. Aggregates shall be natural materials conforming to ASTM C33 as modified herein.

B. Aggregates shall be nonreactive as defined in ASTM C33 and tested per ASTM C289.

C. Aggregate shall contain no soil, friable particles, organic matter, or other deleterious materials. Aggregate shall be washed prior to use in the concrete mix.

D. Aggregates shall contain no chert, limestone, or shale.

E. Coarse Aggregate:
1. Use coarse aggregate from only one source for exposed concrete in a single structure.
2. Coarse aggregate shall be smooth, rounded and uniform. No more than 15% shall be elongated (max. dimension 5 times min. dimension).
3. Coarse aggregate shall be durable, sound and hard.
4. Maximum Size: 1-inch, but not more than one-fifth of narrow dimension between sides of Formwork, one-fourth depth of slab, nor three fourths of narrowest distance between Reinforcing Steel.

F. Fine Aggregate:
1. Use fine aggregate from only one source for exposed concrete in a single structure.
2. Fine aggregate shall not exceed 40% by weight of combined aggregate total, except when coarse aggregate maximum size is ½-inch or less.
3. Fine aggregate shall be durable, sound, clean and hard.
4. Sand Equivalent of 75 minimum per ASTM D2419.

G. Combined (Coarse and Fine) Gradation per ASTM C136:

US Standard Sieve	% Passing by Weight
1½-inch	100
1-inch	90-100
3/8-inch	45-75
No. 4	33-50
No. 8	28-44
No. 16	23-38
No. 30	10-22
No. 200	0-2

2.04 ADMIXTURES

A. General:
1. When two or more admixtures are used, they shall be certified by the manufacturer(s) to be compatible.
2. Chlorides are not permitted in any form.
3. Air Entraining and Water Reducer admixtures are required.
4. All admixtures shall be added at the batch plant, unless otherwise specified.

B. Fly Ash:
1. Conforming to ASTM C618, Class F except maximum ignition loss shall not exceed 30% by weight.
2. Fly ash may be used to replace up to 15% by volume of the Cement content, provided that the mix strength is substantial by test data.
3. Fly ash shall be produced from a single known and consistent source.

C. Midrange Water Reducer:
1. Shall conform to ASTM C494, Type A and F.
2. Master Builders, Inc. "PolyHeed" Series; or approved equal.

D. High-Range Water Reducer (Superplasticizer):
1. Shall conform to ASTM C494, Type F or G; and ASTM C1017, Type I or II.
2. Master Builders, Inc. "Rheobuild"; or approved equal.

E. Air-Entraining Admixture:
1. Shall conform to ASTM C260.
2. Master Builders, Inc. "MicroAir", "MB-AE 90"; or approved equal.

F. Fibrous Concrete Reinforcement: Shall be "Fibermesh MD" added at a minimum of 1.5 pounds per cubic yard. Use where specified or shown on the drawings.

G. Others: Only as approved and deemed necessary.

2.05 BONDING AGENT

A. Required where new concrete is poured against existing concrete, and on embedded items with less than 1½-inches of cover.

B. 100% solids, two component epoxy bonding compound meeting ASTM C881, Type II, Grade 2, Class B or C materials except as modified herein.

C. Properties:
1. Bond Strength @ 14 days (ASTM C882) – 1800 psi minimum
2. Tensile Strength @ 7 days (ASTM D638) – 4400 psi minimum
3. Tensile Elongation @ 7 days (ASTM D638) – 1.49% maximum

D. Master Builders, Inc. "Concresive Liquid PL"; or approved equal.

2.06 CURING COMPOUNDS AND SEALERS

A. Evaporation Reducer: Spray applied monomolecular film that reduces the rate of surface moisture evaporation, minimizes plastic shrinkage, and does not effect the cement hydration process. Master Builders, Inc. "Confilm"; WR Meadows "Sealtight Evapre"; or approved equal.

B. Exterior Use Liquid Membrane-Forming Curing Compound: Shall conform to ASTM C309, Type I, Class B and ASTM C1315, Type 1, Class A. WR Meadows "CS-309-25"; or approved equal.

C. Interior Use Liquid Membrane-Forming Curing Compound: Water-base acrylic curing and sealing compound conforming to ASTM C309, Type I, Class B and ASTM C1315, Type 1, Class A. WR Meadows "Vocomp-25-1315"; or approved equal.

D. Concrete Sealer: Non-yellowing, acrylic co-polymer solution meeting ASTM C309, Type 1, Class B and ASTM C1315, Type 1, Class A. WR Meadows "TIAH 1315"; or approved equal.

2.07 CONCRETE HARDENERS

A. Liquid concrete densifier and hardener, chemical resistant, colorless, with 100% active chemicals. WR Meadows "Liqui-Hard"; or approved equal.

2.08 VAPOR BARRIER

A. ASTM D2103 – Polyethylene Film and Sheeting, 6 mils thickness.

2.09 STRUCTURAL REPAIR MORTAR

A. Shrinkage compensated, rheoplastic, one-component, cementitious based, hand or low velocity spray applied material suited for repairing distressed horizontal, vertical or overhead concrete.
1. Compressive Strength @ 24 hours (ASTM C109) – 3500 psi min.
2. Flexural Strength @ 28 days (ASTM C348) – 1300 psi min.

3. Freeze Thaw Resistance @ 300 cycles (ASTM C666-A) – 90% RDF min.
4. Modulus of Elasticity @ 28 days (ASTM C469) – $4.3x10^6$ psi

B. Master Builders, Inc. "Emaco S" Series; or approved equal.

2.10 STANDARD CONCRETE MIX

A. Use: Footings, Interior Slabs, Exterior Walks

B. Mix Design Requirements:
1. Cement: Portland Cement, Type I or II, ASTM C150
2. Water / Cementitious Materials Ratio: 0.45-0.50 by weight
3. Strength: 3500 psi minimum, ASTM C39
4. Air Content: 2.5-3% by volume, ASTM C231
5. Water Reducer: Mid or High-Range
6. Maximum slump at time of placement: 8-inches

PART 3 EXECUTION

3.01 PREPARATION

A. Examine all reinforcement, formwork, waterstops, premolded joint fillers, and other embedded items to ensure they are accurately placed, properly secured and cleaned.

B. Ensure that inspection of reinforcement is complete and installation approved.

C. Ensure concrete mix design and test certifications have been submitted and approved.

D. Ensure that all required materials and equipment are on-site and operable.

E. Ensure that subgrade and base rock are properly placed and compacted. Place vapor barrier and leveling sand at slab-on-grade locations. Sprinkle subgrades and other porous surfaces with water to reduce adsorption.

F. Apply form release agent to formwork.

G. Apply bonding agent where required.

H. Notify General Contractor of work requiring correction. Do not start work until conditions are satisfactory.

I. Review for various locations to receive different types of concrete mixes.

J. Notify Engineer at least 24 hours in advance of concrete placement.

3.02 VAPOR BARRIER AND SAND COVER

A. Place vapor barrier on top of rock base under all interior slabs-on-grade. Barrier shall be continuous under construction joints. The edges of the vapor barrier shall be lapped and taped, and all projections through it shall be taped and sealed.

B. The vapor barrier shall be covered with a sand cover, 2-inches thick or as shown on the drawings. At the time of placing concrete, the sand shall be damp but excess water shall not be trapped on top of the vapor barrier.

3.03 CONCRETE PLACEMENT

A. Comply with ACI 304 and ASTM C94, and ACI 305R and 306R as required.

B. Convey and place by methods with will prevent material separation, segregation, and loss.

C. Deposit concrete continuously or in layers so that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or other planes of weakness. Where seams are unavoidable, provide construction joints as directed.

D. Do not convey pneumatically placed concrete through aluminum pipe.

E. Do not retemper concrete, or add water on-site for other reasons.

F. Use trunks or tremies when pouring walls to ensure concrete does not drop or fall more than 4 feet. Place in layers not exceeding 2 feet in depth.

G. Screed all slabs to true levels or slopes, true within ¼ inch per 10 feet. Evenly slope to any drain at 3/16 inch per foot, unless otherwise shown on Drawings.

H. When mean temperature exceeds, or is expected to exceed 80°F during placement and finishing operations, steps shall be taken in accordance with ACI 305R to reduce concrete temperature and water evaporation. Slabs will be fog sprayed from the completion of screeding until curing is begun (except during troweling). Submit detailed hot weather concreting procedure to Engineer for approval at least 2 days prior to planned placement.

I. When mean temperature falls below, or is expected to fall below 40°F, comply with ACI 306R. Concrete shall be protected from freezing by means acceptable to the Engineer. Submit detailed cold weather concreting procedure to Engineer for approval at least 2 days prior to planned placement.

3.04 CONSOLIDATION

A. Employ mechanical, high frequency vibrators to consolidate concrete around reinforcement, into corners and angles of formwork, and to exclude rock pockets, air bubbles and honeycomb.

B. Vibration shall be in accordance with ACI 309. Vibrator frequency shall be between 8000 and 12000 rpm.

C. Hold Vibrator in one spot no longer than 15 seconds; keep in constant motion, insert and withdraw at points approximately 18 inches o.c.

D. Maintain vibrator in vertical position when penetrating concrete walls. At slabs, hold vibrator perpendicular to the surface at all times.

E. Vibrate each successive lift. Extend vibrator into previous lift to avoid seams.

F. Transporting concrete with vibrator is not permitted.

G. Maintain spare vibrator at jobsite during concrete placement.

3.05 CONTROL JOINTS

A. Form to true, straight lines, with adjacent slab sections flush at Joints. Make panels as close to square as possible.

B. Conform to ACI 302 and the Project Drawings. If not shown, submit control joint layout plan to Engineer for approval.

C. Joints shall be formed by tooling into fresh concrete. The joint shall be perpendicular to the concrete surface and ¼ of the thickness of the slab. Zip strips not allowed.

D. Fill joint as specified in Section 07920.

E. Extend Reinforcement through Joints, unless otherwise shown on Drawings.

F. If necessary, and approved by Engineer, joint may be saw cut as soon as concrete has sufficiently hardened to prevent dislodging of aggregates. Saw continuous slots perpendicular to surface and ¼ of slab thickness. Must be complete within 12 hours of concrete placement.

3.06 FINISHES

A. Rough Form Finish
   1. Finish resulting after form removal with fins or projections exceeding ¼-inch removed, and with tie holes and defective areas repaired and patched.
   2. Location: Formed concrete surfaces not exposed to view in the finished structure.

B. Standard Smooth Finish
   1. As-cast surface with all fins and projections completely removed and smoothed, and with all tie holes and defective areas repaired and patched for a uniform, smooth appearance.
   2. At unformed surfaces, such as tops of walls, strike-off smooth and finish with a texture matching adjacent surfaces.
   3. Location: Formed surfaces exposed to view in the finished structure.

C. Float Finish
   1. After placing slabs, do not work the surface until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float, or by hand-floating if area is small or inaccessible to power units.
   2. Check the level of the surface plane to a tolerance not exceeding ¼-inch in 10 feet when tested with a 10-foot straightedge placed on the surface in not less than two different angles from a reference point. Cut down high spots and fill low spots. Uniformly slope surfaces to drain where shown on the drawings.
   3. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture. Do not overfinish.
   4. Location: Monolithic slab surfaces that are to receive a trowel finish and other finishes.

D. Trowel Finish
   1. After floating, begin the first trowel finish operation using a power driven trowel. Consolidate the concrete surface by the final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8-inch in 10 feet when tested with a 10-foot straightedge.

2. Do not absorb wet spots with neat cement or cement-sand mixture, and do not use chemical dryers.
3. Location: Monolithic slab surfaces exposed to view, or to be covered with resilient floor covering, or to receive liquid hardener treatment.

E. Nonslip Broom Finish
1. After concrete has received floating finish specified above, provide light brushing with fiber-bristle broom perpendicular to traffic flow.
2. Location: Exterior walks and other horizontal walking surfaces.

3.07 CONCRETE SURFACE REPAIRS

A. After removal of forms, repair and patch defective areas with specified repair mortar.

B. In honeycomb and rock pocket areas, saw cut area and remove material down to solid concrete. Saw cut edges perpendicular to the concrete surface. Thoroughly clean out loose material, saturate area with water to a saturated surface dry condition and brush-coat the area to be patched with a slurry coat of structural repair mortar. Place additional mortar to patch the area before the slurry coat has dried. Smooth and blend to surrounding surface. Do not feather edges.

3.08 CONCRETE CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete from rapid moisture loss before and during finishing operations with a fog spray or evaporation reducer. Apply evaporation reducer in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Curing shall begin as soon as the finishing operation has been completed and the surface will not be damaged by the curing method. Curing shall be maintained for not less than 7 days.

C. Curing Methods: Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, or combinations thereof, as specified herein.

1. Moist Curing. Use one of the following methods
   a) Keep concrete surface continuously wet by covering with water
   b) Use continuous water-fog spray
   c) Cover concrete with absorptive cover (burlap cloth, 9 oz./s.y.), thoroughly saturate with water, and keep continuously wet. Completely cover all concrete and lap edges 4-inches. Place moisture retaining cover (polyethylene film) over absorptive cover.

2. Moisture-Retaining Cover. Cover all surfaces completely with polyethylene sheets, lap edges at least 3-inches, and seal with waterproof tape. Immediately repair any holes or tears with sheet material and tape.

3. Curing Compound. Use specified compound and apply in accordance with manufacturer's instructions. Apply within 1 hour of final finishing operations or form removal. Maintain continuity of coating and protect from damage during curing period. If finish materials are to be applied later, follow manufacturer's instructions for compound removal.

D. Exterior Structural Concrete: Cure for 7 days with moist cure or moisture-retaining cover. After 7 day period, apply specified or approved sealing compound to surfaces that will be exposed in the finished structure.

E. Exterior Sidewalks and Ramps: Cure for 7 days with moist cure or moisture-retaining cover. After 7 day period, apply specified or approved sealing compound to surfaces that will be exposed in the finished structure. Or; cure for 7 days using specified or approved exterior curing/sealing compound.

F. Interior Slabs to be Covered (with resilient flooring): Cure for 7 days with moist cure or moisture-retaining cover. Or; cure for 7 days using specified or approved interior curing/sealing compound. Ensure compound compatibility with adhesives.

G. Interior Slabs Exposed and Other Exposed Interior Concrete: At interior slab locations that will remain uncovered, interior curbs, equipment pads, etc., cure for 7 days with moist cure or moisture-retaining cover. After 7days, or as recommended by the manufacturer, apply liquid chemical hardener. Follow manufacturer's instruction for hardener application. Apply at least two coatings unless otherwise recommended by the manufacturer and approved. Protect adjoining work from overspray and remove all excess hardener from surface of floor slab.

H. Protect all surfaces from damage until curing is complete and sealers and hardeners have dried.

3.09 CORRECTION OF DEFECTIVE WORK

A. Remove and replace any concrete which shows excessive cracks or severe damage. Remove and replace slabs which do not drain properly, or are improperly finished, and other defective concrete as directed.

B. Should concrete fail to meet the minimum specified 28 day strength as determined by tests on both the regular and spare cylinders, the concrete will be deemed defective and shall be removed and replaced. Contractor shall bear the entire cost of such testing, removal, redesign, and replacing of defective concrete.

C. Concrete which has improper water/cement ratios, and/or improper air contents shall be removed and replaced as directed.

D. Contractor shall bear all costs for removal and replacement of defective work.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for concrete and other work in this section shall be included as a portion of the lump sum bid item for the Control Building, as stated in the Bid Form. No separate measurement or payment for these quantities will occur.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Grout shall be included within the respective unit prices for each type of pipe, manholes, services and associated appurtenance items. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 03480 – PRECAST UTILITY VAULT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies all work necessary to furnish and install complete precast utility vaults.

B. Vault shall be provided as shown in Plans.

1.02 SUMMARY

A. Vaults shall be provided as shown in Plans and specified herein. Vaults shall be provided complete with access doors and accessories as specified or as shown on the Plans. Vault shall be installed according to manufacturer's recommendations and as indicated in the Plans.

1.03 REFERENCE

A. Section 02000 – Site Work

B. Section 03600 – Non-Shrink Grout

1.04 QUALITY ASSURANCE

A. Manufacturer shall specialize in manufacture of precast utility vaults and shall have at least 5 years experience fabricating and installing precast, in-ground vaults.

B. Vault and doors shall be manufactured to withstand H20 wheel loading in off street locations. All doors shall be H20 rated unless otherwise specified on the Plans or in these Specifications. Calculations shall be made available to Engineer upon request.

1.05 WARRANTY

A. Warranty shall meet the standard warranty requirement as outlined in the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Strictly follow manufacturer's recommendations regarding deliver, unloading and handling of vault sections.

B. Contractor shall schedule delivery of vault to minimize storage time and to avoid construction delays.

1.07 SUBMITTALS

A. Submit product data in accordance with Section 01300.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The precast utility vault shall be manufactured by Utility Vault Oldcastle; or approved equal.

a. Flow meter vault Oldcastle Utility Vault 507-LA or Oldcastle Valve Pit vault constructed to Contract drawings; or approved equal.

b. Valve vault Oldcastle Valve Pit vault constructed to Contract drawings; or approved equal.

2.02 CONSTRUCTION

A. Vault

a. Vaults shall be precast reinforced concrete base, sections and flat top lids. All components shall be structurally sufficient for the intended use. Flat top lids and access doors shall withstand H20 wheel loading.

b. Vault shall be ordered with reinforcement set to accommodate pipe penetrations as shown in the Plans.

c. Joints shall utilize rubber gaskets conforming to ASTM C443. Install per manufacturer's recommendations.

d. Assembled vault shall be made watertight.

B. Access Door

a. Access doors shall be sized as indicated on the Plans.

b. Access door shall be constructed of galvanized steel, reinforced to withstand AASHTO H-20 wheel loading in off-street locations. Cover shall be diamond-tread plate.

c. Latch shall be stainless steel slam lock with fixed interior handle.

d. Handle shall be a recessed stainless steel handle.

e. Each door shall be equipped with spring lift assistance and automatic hold-open arms with grip handle release. Each door shall be easily opened by one person with one hand operation. Door shall lock open in the 90° position.

f. Finish shall be mill finish with bituminous coating applied to the exterior of the frame in all areas expected to come into contact with concrete.

g. Hatch shall be capable of withstanding H20 wheel loads in off-street locations. The hatch frame shall be cast into the vault lid by the manufacturer.

h. Access hatch clear openings shall be as shown on Plans.

i. Access hatch shall be equipped with integral fall protection grates that remain in closed position when doors are opened.

C. Ladder

a. Ladder shall be painted using the interior paint system for Structural Steel outlined in Section 09900.

b. Mounting brackets shall be hot-dipped galvanized.

c. Anchor bolts shall be stainless steel.

D. Pipe Penetrations

a. Pipe penetrations shall be core drilled to sizes indicated on the Plans or as necessary. Jack-hammering is not allowed.

b. Pipes shall be sealed to opening with Kor-N-Seal flexible coupling, or equal.

c. Grout shall be installed in a workmanlike manner to insure filling of all voids in the joint, and in accordance with Section 03600.

d. Pipe penetrations shall be made watertight.

PART 3 EXECUTION

3.01 INSTALLATION

A. Excavation for vault shall comply with the pertinent sections of Section 02315 Trench Excavation, Bedding & Backfill and Section 02316 Excavation & Select Backfill.

B. Provide shoring, bracing, dewatering and foundation stabilization as specified and as required.

C. Place and compact minimum eight (8) inches of aggregate base as shown in the details and plans.

D. Install vault in accordance with manufacturer's instructions.

E. Precast concrete base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

F. Clean tongue and grooves of base and top section, apply rubber gasket per manufacturer's instructions.

G. Backfill as specified, per Plans, and as follows:

a. Backfill around the vault should consist of good compactable material such as ¾-inch minus pea gravel, crushed rock, clean sand, or approved class "A" backfill material, free from organic matter. In no case shall the material be saturated soil or contain rock larger than 2-inches. No voids shall remain between the vault walls and native soil of excavation.

b. Backfilling should not be done until the vault is completely assembled making certain to place backfill evenly around vault and compact backfill progressively in one foot lifts from the bottom to the top surface.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Pre-cast Utility Vault and related items, shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. Payment shall include compensation for all materials and labor required to complete the work described herein.

END OF SECTION

SECTION 03600 GROUT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes various types of grout as may be required for the project as shown on the Drawings and as required.

B. Work includes supply, preparation, mixing, application, finishing and curing of grout.

1.02 RELATED SECTIONS

A. Section 03200 – Concrete Reinforcement
B. Section 03300 – Cast-In-Place Concrete
C. Miscellaneous Sections of Divisions 5 and 11 for anchor bolts, base plates and other materials to be grouted or bonded in place.

1.03 REFERENCES

A. ASTM C1107 - Standards Specification for Packaged Hydraulic-Cement Grout (Nonshrink)
B. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars – Modified
C. ASTM C1090 - Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout
D. ASTM C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
E. ASTM C827 – Test Method for Early Volume Change of Cementitious Mixtures
F. ASTM C882 – Test Method for Bond-Strength of Epoxy-Resin Systems Used with Concrete.
G. ACI 351 - Grouting for Support of Equipment and Machinery

1.04 SUBMITTALS

A. Submit list of each type of grout proposed for each location to be grouted. Include manufacturer's specifications, use recommendations, surface preparation and application instructions, and protection of adjacent surfaces.

B. Submit three copies of submittal package. Grout shall be approved prior to use.

1.05 QUALITY ASSURANCE

A. Grout Manufacturer shall be consulted when questions arise during selection of a particular grout for application. Grout used shall be as recommended by the manufacturer for each type of application.

B. Grout shall be mixed, placed and cured in strict conformance to the manufacturer's instructions. Surfaces to be grouted shall be carefully prepared according to the manufacturer's instructions. Improper surface preparation and curing are the most common causes of grout failure and problems.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's sealed containers with contents clearly labeled.

B. Store materials in a dry area at a temperature between 40 and 100°F.

PART 2 PRODUCTS

2.01 STANDARD NON-SHRINK GROUT

A. Non-metallic, non-bleeding, cement based non-shrink grout meeting ASTM C1107, Grades B or C. Pumpable and pourable with positive expansion per ASTM C827.

B. Compressive Strength at Flowable Consistency per ASTM C109: 2500 psi at 1 day, 5000 psi at 3 days, and 8000 psi at 28 days (minimums).

C. Use: Grouting around pipe and conduit penetrations in concrete slabs, and other locations where non-shrink grout is called for and other specified grouts are not required.

D. Manufacturers: Dayton Superior Corp. "1107 Advantage Grout"; ThoRoc " 621 Construction Grout; EUCO "NS Grout"; or approved equal.

2.02 PRECISION NON-SHRINK GROUT

A. High performance, non-metallic, non-bleeding, non-gaseous, chloride-free, cement based non-shrink grout meeting ASTM C1107, Grade C. Pumpable and pourable, vibration resistant, and heat and thermal shock resistant. Positive expansion per ASTM C827 and ASTM C1090.

B. Expansion: 0.01-0.07% at 1 day and 0.02-0.07% at 28 days when tested per ASTM C1107 in Fluid State.

C. Compressive Strength at Fluid Consistency per ASTM C1107: 4000 psi at 1 day, 6000 psi at 3 days, and 9000 psi at 28 days (minimums).

D. Use: Under base plates of equipment and other items where grout base is shown in the drawings or required.

E. Manufacturers: Dayton Superior Corp. "Sure-Grip High Performance Grout", "1107 Advantage Grout"; EUCO "Hi-Flow Grout"; or approved equal.

2.03 DRY PACK GROUT

A. Cement based, non-shrink, noncorrosive, non-metallic, high density, high strength grout for dry pack applications. Meets COE CRD-C-621.

B. Compressive Strength per ASTM C109: 3000 psi at 1 day, 6500 psi at 7 days, and 8000 psi at 28 days (minimums) at damp pack consistency.

C. Use: Pipe penetration patches in precast concrete, overhead applications and other areas where poured or pumped grout use is not practical.

D. Manufacturers: Dayton Superior Corp. "Sure-Grip Grout Dri-Pak"; W.R. Meadows "Pac-It"; EUCO "Dry Pack Grout"; or approved equal.

2.04 EPOXY GROUT

A. Multi-component, pre-proportioned epoxy grout. High impact and vibration resistance.

B. Compressive Strength per ASTM D695 at 50°F: 9200 psi at 1 day and 12000 psi at 14 days

C. Tensile Strength per ASTM D638 at 10 days: 2600 psi minimum

D. Flexural Strength per ASTM D790 at 14 days: 5000 psi minimum

E. Bond Strength per ASTM C882 at 14 days: 2200 psi minimum (to concrete)

F. Water Absorption per ASTM D570: 0.3%

G. Use: Deep pour applications (more than 4-inch thick), grouted rods and anchor bolts.

H. Manufacturers: Dayton Superior Corp. "Sure-Grip Epoxy Grout"; or approved equal.

2.05 ACCESSORIES

A. Aggregate: Washed pea gravel, maximum 3/8-inch size.

B. Water: Clean potable water.

C. Curing Compound: Water based, acrylic as recommended by grout manufacturer.

PART 3 EXECUTION

3.01 MIXING

A. Mix materials in accordance with the manufacturer's instructions.

B. Where grout depth will exceed 2-inches, add aggregate at a maximum rate of 25 pounds per 55 pound bag.

C. Do not retemper mix.

3.02 PREPARATION

A. Carefully prepare all surfaces to be grouted in accordance with the manufacturer's recommendations and as specified. Concrete must be cured for 28 days before placing grout.

B. Clean surfaces to remove loose and foreign material by waterblasting, mechanical abrasion, or sandblasting. Surface shall be free of dirt, oil, curing compounds and laitance.

C. Remove unsound concrete by chipping or grinding. Grind or sandblast steel surfaces to remove all rust, mill scale and paint.

D. Install forms to contain liquid grout. Seal joints and corners.

3.03 INSTALLATION – CEMENTITIOUS GROUTS

A. Follow manufacturer's instructions.

B. Just prior to grouting, thoroughly saturate concrete surfaces for 24 hours; remove excess water.

C. Place grout continuously by most practical means. Work from one side to avoid entrapped air.

D. Grout may be rodded or tamped, but do not vibrate.

E. Apply curing compounds to exposed grout in accordance with manufacturer's instructions or cure with wet burlap for 3 days. Curing shall commence immediately after placement.

3.04 INSTALLATION – EPOXY GROUTS

A. Follow manufacturer's instructions.

B. Allow surfaces to dry completely before grouting.

C. Place grout continuously by most practical means. Work from one side to avoid entrapped air.

D. For grout depths exceeding 3 inches, place grout in maximum 3-inch lifts; allow each lift to cure before placing next lift.

E. Consolidate material to eliminate voids and air pockets.

F. Lightly mist exposed grout with solvent, then steel trowel to smooth surface. Do not apply curing compounds.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Grout and other work in this section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Grout shall be included within the respective unit prices for each type of pipe, manholes, services and associated appurtenance items. No separate measurement or payment will be made for these quantities and items.

END OF SECTION