

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 LOCATION OF WORK:

- A. The work of this Contract is located in the City of Bangor, Maine on Court Street approximately between Bean Court and Boynton Street.

1.02 SCOPE OF WORK:

- A. The work to be performed under this Contract consists of furnishing all tools, labor, equipment, and for furnishing all transportation and services, including fuel, power, water, and essential communications, and for the performance of all labor, or other operations required for the fulfillment of the Contract in strict accordance with the specifications, drawings, and other Contract Documents as herein before defined, all of which are made a part hereof; and including such detail sketches as may be furnished by the Engineer from time to time during construction in explanation of said Contract Documents. The work shall be complete, and all work, materials, and services not expressly shown or called for in the Contract Documents which may be necessary for the complete and proper construction of the work in good faith shall be performed, furnished, and installed by the Contractor as though originally so specified or shown, at no increase in cost to the Owner.
- B. The Work includes, but is not necessarily limited to, the following major items:
 - 1. Installation of a new drainage system along Court Street within the intersections of Bean Court and Boynton Street. This work will consist of approximately 1,000 feet of new stormwater pipes, new drain manholes, new catch basins, new catch basin laterals, and removal of existing catch basins. This work will include erosion control, traffic control, and coordination with the City and utility companies.
 - 2. Installation of approximately 800 linear feet of new sanitary sewer and connection to existing system. This work will consist of removal of the existing 24" brick sewer, installation of new sanitary sewer pipe, installation of new sanitary sewer laterals and new sanitary sewer manholes. This work will include erosion control, traffic control, and coordination with the City and utility companies.
 - 3. Construction of special storm drain and sanitary sewer structures for connection of the existing 24-inch brick Boynton Street sanitary sewer, connection to the existing storm drain on Court Street, and connection to the existing brick sewer at the upstream end of Court Street.

- C. Street resurfacing, curb replacement and sidewalk installation shall not be included in the Contract. Final cleanup shall include fine grading of roadway subbase material in preparation for resurfacing to be performed by others.
- D. As part of this contract, the Contractor shall furnish all labor, equipment, and materials to reconstruct manholes where shown on the drawings.
- E. Temporary control of vehicular and pedestrian traffic within the limits of work.
- F. General Requirements:
 - 1. Contractor shall plan his operations such that existing items such as, but not limited to, street telephones, overhead wires, street signs, sidewalks, curbstone, pavement, trees and hanging branches, bushes, fences, walls, and building foundations are not disturbed. The Contractor shall repair or replace, at his own expense and to the satisfaction of the Engineer, any existing items that are damaged as a result of his operations. No additional payments will be made for any actions necessary to complete this work to the satisfaction of the Engineer.
 - 2. Access to abutters, in public and private ways, along the construction route must be made available at all times during construction.
 - 3. Damage to water services will be replaced to the tree belt at the Contractor's expense.
- G. Refer to Article 7 of the General Conditions for additional requirements.

1.03 WORK SEQUENCE:

- A. The Contractor shall work with the City and the Engineer to determine the accessibility of the roads under construction. The Contractor shall maintain accessibility of the roads as deemed necessary by the City.
- B. The Contractor shall construct work in phases or stages as required to accommodate Owner's occupancy requirements. The Contractor shall coordinate construction schedule and operations with Owner.
- C. The Contractor shall sequence the work as follows:
 - 1. Install erosion control/construction measures.
 - 2. Redirect traffic that affects construction and install traffic barriers and traffic management, as required.
 - 3. Clean and television inspect all newly constructed sanitary sewers as part of this project.

4. Install drains, drain manholes, new sanitary sewer and sewer manholes. Coordinate and relocate other utilities as necessary. This will require installation of temporary and permanent service connections, with minimal effect to the service. The drainage system will be constructed from the most downstream point to the most upstream point. Television inspection of newly constructed sewer and drainage system will be required.
1. Remove existing catch basins as required. Install new catch basins and connect laterals to new drainage system.
2. Test all new and relocated utilities, prior to connection into existing system.
3. Restoration of growth.
4. Final cleaning and fine grading of roadway subbase material, for the entire roadway width. Final paving will not be part of this contract.

1.04 CONTRACTOR'S USE OF PREMISES:

- A. Contractor shall limit the use of the premises for the performance of the Work and storage of materials and equipment to allow for the Owner's use in operating and maintaining the pumping stations.
- B. Contractor shall coordinate with Owner necessary access for normal maintenance requirements.
- C. Contractor shall assume full responsibility for security of all his and his subcontractors materials and equipment stored on the site.
- D. If directed by the Owner, Contractor shall move any stored items which interfere with operations of Owner.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work, at no additional cost to the owners.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 MEASUREMENT AND PAYMENT:

The following subsections describe the measurement of and payment for the work to be done under the items listed in the BID.

Each unit or lump sum price stated in the BID shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications.

The prices for those items which involve excavation including but not limited to pipes, manholes, catch basins, and lump sum structures shall include compensation for disposal of surplus excavated and unsuitable material, installation of all earth support bracing, sheeting to remain in place, as specified, protection and support of all existing utilities (as needed), dewatering, furnishing and installing non-woven geotextile, where required; compaction, and protection of physical features, erosion control, bedding, and backfilling and CCTV of the new sanitary sewer pipes.

The prices for those items which involve excavation include handling uncontaminated and contaminated water (generated by dewatering or stockpile drainage) and treatment of uncontaminated water (generated by dewatering or stockpile drainage).

In all items involving excavation, the price shall be based on doing the entire excavation in earth. Where rock is excavated, the price therefore, shall be in addition to the cost of excavating earth, and no deduction will be made in the amount for earth excavation.

The prices for all pipe items (drains and sewer), lump sum items, and manholes shall constitute full compensation for furnishing, laying, bedding, jointing, and testing pipe; earth excavation and backfill; cleaning up; and screened gravel.

For pipelines less than 24 inches in diameter, if the pipe for which payment is requested has not been successfully tested, 10 percent of the amount requested for such pipe items may be withheld until the pipe has been tested and meets the test requirements. For pipelines 24 inches in diameter or greater, the amount that may be withheld is 2 percent of the amount requested.

The prices bid shall constitute payment for all work incidental thereto. Unless identified within the individual item description, the price shall not include work specifically identified for payment under other items.

1.02 LIMITS OF NORMAL EXCAVATION:

1. In determining the quantities of excavation to which unit prices shall apply, the limits of normal width and depth of excavation shall be as described below, unless other limits are indicated on the Drawings or specified.

For other structures, except manholes as noted below, the normal width shall be measured between vertical planes 1 ft. outside the neat lines of the several parts of the structure, except that the width at any elevation shall be measured as not less than the width at a lower elevation. The normal depth shall be measured to the underside of that part of the structure for which the excavation is made.

No additional width or depth of trenches excavated in earth or rock shall be allowed at standard circular manholes.

Wherever bell holes are required for jointing pipe, they shall be provided without additional compensation over and above that resulting from measurements as above described.

1.03 THE MEASUREMENT AND PAYMENT FOR THE BID ITEMS 1 THROUGH 14 ARE AS FOLLOWS:

1. MOBILIZATION / DEMOBILIZATION

- A. The lump sum price for Item 1 shall constitute full compensation for initiating the contract, obtaining all permits, bonds and insurance, exclusive of the cost of materials, for mobilizing all machinery, tools, and other equipment to carry on and complete the work.
- B. The lump sum price for this item shall not exceed THREE percent (3%) of the total amount of the base bid (Items 2 through 21), excluding this item. Payment for this item shall be payable when the Contractor is operational on the site. For purposes of the SRF policy, "operational" shall mean the substantial commencement of work on site.

2. SEDIMENTATION AND EROSION CONTROL:

- A. The lump sum price for Item 2 shall constitute full compensation for sedimentation and erosion control measures not included for payment under 1.01c, Excavation.
- B. This Item shall be paid in proportion to percentage of Work completed at time of requisition.

3. TRAFFIC MANAGEMENT PLAN AND MAINTENANCE AND PROTECTION OF VEHICULAR AND PEDESTRIAN TRAFFIC

- A. The lump sum price for Item 3 for traffic management plan during construction shall constitute full compensation for the following: develop and implement a traffic management plan including furnishing, positioning, adjusting, re-positioning, storage, removing, resetting, or moving to access work area of all devices such as traffic cones, high level warning devices, temporary concrete barrier, temporary-impact attenuator, temporary fencing, etc. signage, concrete jersey barriers necessary to minimize traffic disruption and protect safety of the job site and work crews, reflectorized drums, special lighting unit, temporary impact attenuator (shoulder and medium, incapable redirection/removed and reset), temporary steel road plates, traffic cones, high level warning devices, temporary fence and sign supports, furnishing and installing temporary pavement markings and pavement markings removal (paint) as needed; and all other items incidental thereto and not specifically included for payment under other items.
- B. This Item shall be paid in proportion to percentage of Work completed at time of requisition.

4. FLAGGING HOUR

- A. The unit price for Item 4 per Flagger Hour shall constitute full compensation for all costs all costs associated with flagging personnel including hiring, transporting, equipping, supervising, and the payment of all flaggers and all overhead and incidentals necessary to complete the work and provide satisfactory traffic control.
- B. The number of hours to be paid for under this Item shall be equal to the actual number of hours onsite and on station for flaggers.

5. CALCIUM CHLORIDE FOR DUST CONTROL

- A. Calcium chloride for dust control shall be measured by the pound of calcium chloride furnished and applied for dust control during construction.
- B. The unit price for Item 5 shall constitute full compensation for the furnishing and applying calcium chloride for dust control during construction.

6. TEMPORARY SEWER BYPASS CONNECTION AND REMOVAL

- A. The lump sum price for Item 6 shall constitute full compensation for installing, maintaining, and dismantling the temporary sanitary sewer bypass system, including all equipment, labor and materials required to install and maintain the temporary bypass during construction.

7. CONSTRUCTING STORM DRAINS AND SANITARY SEWERS

- A. The lengths of storm drains and sanitary sewers to be paid for under the appropriate subdivisions (Items 7.1 through 7.5) of this item shall be measured by the linear foot with the lengths of manhole inverts (as measured between the inside walls of the manholes) being deducted. Measurement for catch basin laterals shall be measured by the linear foot with the lengths of catch basins to drain manhole inverts (as being measured between the inside walls of the catch basin and manhole) being deducted where catch basins and manholes are located.
- B. The unit prices for the appropriate subdivisions of this item shall constitute full compensation for constructing drains, complete, as indicated on the drawings and as specified including cutting and plugging of specified drains and all existing catch basin laterals, reconnecting existing and new drains to new drain manholes but confirming prior to the work that the lines are not sanitary or combined, removal and disposal of existing drains, abandoning of existing sewers, drains and combined brick sewers as necessary, bends, branches, fittings, removal and disposal of material in the pipe and CCTV inspections of the new sanitary sewers.
- C. The unit prices for the appropriate subdivisions of this item shall constitute full compensation for constructing sewers and building sewer laterals and connections, complete, as indicated on the drawings and as specified including bends, branches, fittings, removal and disposal of material in the pipe. The work under the appropriate subdivision of these Items shall also include reconnecting existing sewer lines to new sewer manholes, and removal and disposal of existing sanitary sewer lines, abandoning existing sewer lines as indicated.

8. CONSTRUCTING PRECAST CONCRETE STRUCTURES

- A. Manholes (4-, and 6-foot diameter) to be furnished and installed under Item 8.1 and 8.2 shall be measured by the vertical foot from the invert of the manhole base at its center to the bottom of the frame. Only one bid item will be used for each distinct manhole location, corresponding to the diameter at its base.
- B. The unit prices include the manhole, base, walls, cones, risers, transition segments and flat slab tops, frames and covers, jointing, grouting, manhole rungs, cutting, removal and disposal of pavement, excavation, bedding, backfill, testing, pipe connections, brick invert and shelves, and brick work to adjust frames.
- C. Catch basins to be furnished and installed under Item 8.3 shall be measured by the vertical foot from the invert of the catch basin sump at its center to the bottom of the frame. Only one bid item will be used for each distinct catch location, corresponding to the diameter at its base.

- D. The unit price for new catch basins shall constitute full compensation for furnishing and installing the catch basins, including 4-foot deep sumps, bases, barrels, cones, jointing, grouting, manhole ramps, hoods for outlet pipes, cutting and removal of pavement, excavation, bedding, testing, backfilling, restoration of surface, restoration of physical features, pipe connections, frames and covers including brick work to adjust frames complete, as indicated in the drawings and as specified.
- E. The number of existing manholes or catch basins to be abandoned in place to be paid for under Item 8.4 shall be equal to the actual number of manholes or catch basins abandoned in place.
- F. The unit price for this item shall constitute full compensation for abandonment of existing manholes or catch basins, complete, as specified and as shown on the drawings, including but not limited to removal and disposal of structure to a maximum of 4-feet below existing grade, restoring existing grade using appropriate fill, excavation, disposal of frames and covers, disposal of unsuitable material and all required fill materials.
- G. The number of existing catch basins to be modified to complete the proposed connections for this contract to be paid for under Item 8.5 shall be equal to the actual number of manholes or catch basins abandoned in place.
- H. The unit price for this item shall constitute full compensation for modify the catch basin, complete, as specified and as shown on the drawings, including but not limited to coring catch basin, connection to the catch basin, patching/plugging of existing pipe penetration, restoring existing grade using appropriate fill, excavation, disposal of unsuitable material and all required fill materials.

9. MISCELLANEOUS EARTH EXCAVATION BELOW NORMAL DEPTH:

- A. The quantity of miscellaneous earth excavation below normal depth (limit of normal excavation) to be included for payment under this item shall be the number of cubic yards of unsuitable material excavated, measured to the depths and lengths ordered, and to the width between payment limits for normal excavation for trenches associated with pipelines as indicated on the drawings.
- B. The unit price for this item shall constitute full compensation for excavation below normal depth for trenches associated with pipelines. Handling and disposal of unsuitable material excavated under this item shall be paid under separate bid items.

10. CHANGE IN QUANTITY OF EARTH EXCAVATION AND BACKFILL DUE TO PIPE DEPTH CHANGES:

- A. Should a change in the depth of the pipe be ordered or should the depths of the pipe be changed by changes in alignment or by differences between the ground surface

indicated on the drawings and that encountered during the work, and should such changes increase or decrease the quantity of excavation and backfill upon which the pipes are based, adjustments shall be made therefore under this item.

- B. The quantity of earth excavation and backfill to be considered under this item shall be the additional number of cubic yards excavated and backfilled, or that quantity of excavation and backfill omitted in accordance with the requirements of the Engineer and as specified above.
- C. The quantity to be considered under this item shall be cumulative; that is, an increase on any part of the work offset a decrease on any other part of the work, and the final adjustment shall be based on the net increase or decrease for this item.
- D. If the quantity of earth excavation and backfill work performed is greater than that indicated on the drawings, the Contractor shall be paid under this item.
- E. If the quantity of earth excavation and backfill performed is less than that indicated on the drawings, the Owner will receive credit for such decrease at the unit price for this item.
- F. The unit price for this item shall constitute full compensation for making additional excavations and backfilling such excavations, as specified.

11. TEST PITS

- A. The quantity of earth excavation and backfill for test pits to be paid for under the appropriate subdivision of Item 11 (Items 11.1 through 11.3) shall be the actual number of test pits excavated and backfilled, measured to the extent of the work done as ordered by the Engineer for test pits. No payment to be made if the excavation is done in conjunction with performance of other work items, except for rock excavation and removal and concrete excavation and removal.
- B. The unit price for the appropriate subdivision of this item shall constitute full compensation for excavation and backfill for test pits, including measure test pits with the Engineer and sketch of test pits with measurements (width, depth) and utilities shown. This work includes cutting and removal pavement, excavation, excavation support, dewatering, backfilling, restoration of surface and features.
- C. Contractor to submit an exploratory excavation plan at the preconstruction meeting, based on identified test pit locations. This bid item includes additional, unlocated test pits to be used at Owner's discretion.
- D. The Contractor shall perform exploratory excavation to verify size and location

of existing utilities, prior to installation of any segment of water main, sanitary sewer, or storm drain.

12. ROCK EXCAVATION AND DISPOSAL

- A. Where rock is encountered, it shall be uncovered but not excavated until measurement has been made by the Engineer, unless in the opinion of the Engineer, satisfactory measurement can be made in some other manner.
- B. The quantity of rock to be paid for under this item shall be the number of cubic yards of rock, measured in place before excavation, within the payment limits indicated on the drawings and as defined in this Section, unless rock excavation beyond such limits has been authorized in writing by the Engineer, in which case measurements shall be made to the authorized limits.
- C. Excavated rock which has not been disposed of shall not be included for payment.
- D. The bidder shall include in his bid for items involving excavation, the cost of doing the entire excavation as earth, the price for this item is intended to cover the difference between the cost of rock excavation and the cost of earth excavation. The price for this item shall be paid in addition to any payment made for earth excavation.
- E. The unit price for this item shall constitute full compensation for rock excavation and disposal, for all necessary backfilling, and for furnishing all additional material needed for backfilling.

13. REMOVAL AND DISPOSAL OF BITUMINOUS CONCRETE PAVEMENT

- A. The quantity of bituminous concrete pavement to be paid for under Item 13 shall be equal to the actual number of square yards of bituminous concrete pavement removed and disposed of between the limits of the existing curbing, including that pavement within the limits of trenches for all items which require excavation, as directed by the Engineer, as shown on the Contract Drawings and as specified in the Contract Documents.
- B. The unit price for removal and disposal of bituminous concrete pavement shall constitute full compensation for the removal and legal disposal of bituminous concrete pavement, including all equipment, transportation and disposal fees, the removal of existing curbing, and all other items not explicitly listed to prepare the roadway for final fine grading.

14. BANK-RUN GRAVEL:

- A. Bank-run gravel ordered for backfill of trenches above normal depth shall be paid for under this item. The quantity of bank-run gravel used as backfill for trenches above normal depth shall be measured by the cubic yard to the depth and length ordered and to the width between payment limits for normal excavation as indicated on the drawings. Bank-run gravel outside the limits of normal excavation shall be furnished, placed, and compacted at the Contractor's expense, and no measurement will be made for such gravel.
- B. Bank-run gravel ordered to be used at other locations shall be measured after compaction and paid for under this item as the number of cubic yards of gravel actually placed and compacted as directed.
- C. Bank-run gravel used to backfill rock excavations will not be measured for payment under this item.
- D. The unit price for this item shall constitute full compensation for furnishing, placing, and compacting bank-run gravel, as specified.

15. CRUSHED STONE OR SCREENED GRAVEL

- A. Screened gravel below normal depth shall be paid for under Item 15. The quantity of screened gravel backfill below normal depth to be paid for shall be the same as that number of cubic yards of earth excavation below normal depth measured for payment under the appropriate subdivision of "Miscellaneous Earth Excavation Below Normal Depth", which said gravel replaces.
- B. Additional crushed stone or screened gravel used for support of existing utilities or ordered to be used at other locations shall be paid for under this item. The quantity to be paid for shall be the number of cubic yards, measured in place after compaction, of additional crushed stone or screened gravel within the limits directed by the Engineer.
- C. Crushed stone or screened gravel used for bedding pipe, to backfill unauthorized excavations, for any drainage purpose, or as indicated on the drawings for work for which appropriate payment items have been provided, shall not be measured for payment under this item.
- D. The unit price for this item shall constitute full compensation for furnishing, placing, and compacting crushed stone or screened gravel, as specified.

16. SELECT BORROW

- A. Select borrow ordered by the Engineer for backfill of trenches above normal

depth shall be paid for under this item. The quantity of select borrow used as backfill for trenches above normal depth shall be measured by the cubic yard to the depth and length ordered and to the width between payment limits for normal excavation as indicated on the drawings. Select borrow outside the limits of normal excavation limits shall be furnished, placed, and compacted to the satisfaction of the Engineer at the Contractor's expense, and no measurement will be made for such borrow

- B. Select borrow ordered to be used by the Engineer at other locations shall be measured after compaction and paid for under this item as the number of cubic yards of borrow actually placed and compacted as directed.
- C. Select borrow used to backfill rock excavations will not be measured for payment under this item.
- D. The unit price for this item shall constitute full compensation for furnishing from an acceptable borrow pit, placing, and compacting select borrow, as specified.

17. FINE GRADING OF ROADWAY SUBBASE

- A. The quantity of fine grading of roadway subbase to be paid for under the appropriate subdivision of this item shall be equal to the actual number of square yards graded to the satisfaction of the Engineer.
- B. The unit price for fine grading of roadway subbase shall constitute full compensation for the finish fine grading of the roadway subbase to the grades ordered and directed by the Engineer, as specified in the Contract Documents and as shown on the drawings.

18. LOAM AND SEED

- A. The quantity of loam and seed to be paid for under this item shall be equal to the actual number of square yards loamed and seeded, as directed by the Engineer, as specified in the Contract documents and as shown on the Contract Drawings.
- B. The unit price for loam and seed shall constitute full compensation for furnishing and placing loam and seed as directed by the Engineer, as specified in the Contract Documents and as shown on the Contract Drawings.

19. CONTROLLED LOW STRENGTH MATERIAL (CLSM):
 - A. The quantity of controlled low strength materials (CLSM) to be paid for under the appropriate subdivision of this Item (Items 19.1 and 19.2) shall be equal to the actual number of cubic yards placed as directed by the Engineer.
 - B. Controlled low strength materials used for the plugging of existing drain and sewer connections shall not be paid for under this item.
 - C. The unit price for this item shall constitute full compensation for furnishing and placing the controlled low strength material as directed by the Engineer.
 - D. No measurement shall be made under this item for controlled low strength material used as indicated on the drawings for work which appropriate payment items have been provided or for controlled density fill used to backfill unauthorized excavation.

20. MISCELLANEOUS 4,000 PSI CONCRETE:
 - A. The quantity of 4,000 psi concrete to be measured for payment under this item shall be the actual number of cubic yards placed as directed by the Engineer.
 - B. No measurement shall be made under this item for 4,000 psi concrete used as indicated on the drawings for work which appropriate payment items have been provided or for concrete used to backfill unauthorized excavations.
 - C. The unit price for this item shall constitute full compensation for furnishing and placing 4,000 psi concrete as specified.

21. CONSTRUCTING SPECIAL STORM DRAIN AND SANITARY SEWER STRUCTURES:
 - A. The lump sum price for the Boynton Street Sanitary Sewer Connection shall constitute full compensation for constructing the sanitary sewer junction structure at station 5+51 for connection of the Boynton Street 24-inch brick sewer to the proposed 24" sanitary sewer on Court Street, as depicted on the plan sheets, the special details, and as specified. This work includes all proposed piping, the proposed junction structure, complete, as indicated on the drawings and as specified; including but not limited to excavation, tie-in and connections to structures, pipes, fittings, inverts, channels, shelves, manhole risers, frames, covers, finish to grade, maintaining sewer and storm flows, bypass pumping, dewatering, masonry plugs, removal/disposal of existing structures and materials in manholes, and protection and restoration of physical features, erosion control. In addition, this work includes cutting and removal of

pavement, trenching, decking, bedding, backfilling (including CLSM), dust control, magnetic location tape.

- B. The lump sum price for the Sanitary Sewer Connection (SMH-6) shall constitute full compensation for constructing the sanitary sewer junction structure at station 7+30 for connection of the proposed sanitary sewer to the existing brick combined sewer on Court Street. This work includes all proposed piping and the proposed sanitary sewer manhole, complete, as indicated on the drawings and as specified; including but not limited to excavation, tie-in and connections to structures, pipes, fittings, inverts, channels, shelves, manhole risers, frames, covers, finish to grade, maintaining sanitary flows, bypass pumping, dewatering, masonry plugs, removal/disposal of existing structures and materials in manholes, and protection and restoration of physical features, erosion control. In addition, this work includes cutting and removal of pavement, trenching, decking, bedding, backfilling (including CLSM, if required), dust control, magnetic location tape.

- C. The lump sum price for the Storm Drain Connection (DMH-1) shall constitute full compensation for constructing the storm drain junction structure at station 0+00 for connection of the proposed storm drain to the existing storm drain on Court Street, as depicted on the plan sheets, the special details, and as specified. This work includes all proposed piping and the proposed drain manhole, complete, as indicated on the drawings and as specified; including but not limited to excavation, tie-in and connections to structures, pipes, fittings, inverts, channels, shelves, manhole risers, frames, covers, finish to grade, maintaining storm flows, bypass pumping, dewatering, masonry plugs, removal/disposal of existing structures and materials in manholes, and protection and restoration of physical features, erosion control. In addition, this work includes cutting and removal of pavement, trenching, decking, bedding, backfilling (including CLSM, if required), dust control, magnetic location tape.

END OF SECTION

SECTION 01040

COORDINATION

PART 1 - GENERAL

1.01. SUMMARY

A. Section Includes

1. Project Management
2. Coordination

B. Related Work

1. Section 01046 Control of Work.
2. Section 01063 Miscellaneous Requirements.

C. Related Work Not Included

1. Operation of existing facilities will be performed by the City unless otherwise specified. The City will assist in arranging operation of any existing facilities or equipment required by the Contractor to connect to existing facilities.

1.02. SUBMITTALS

At a minimum the contractor shall implement the following:

- A. Incorporate the requirements of this Section, as well as Work which may impact the existing system operation, or the operations of any adjacent utility, in the project schedule submitted under Section 01310.
- B. Submit to the affected utility company, the City, and the Engineer, in writing, all requests for temporary shutdowns of facilities or interruption of operations. No utility system shutdowns or interruptions to existing operations will be permitted except as outlined in this Section. Submit requests at least 2 weeks prior to the beginning of the Work requiring shutdown or interruption. No shutdown shall occur without the approval of the utility company and the City.
- C. At the pre-construction conference, supply to the City of Bangor, and Engineer the office telephone and cell number of a responsible person who may be contacted during off-hours for emergencies 24 hours a day, seven days a week.
- D. Prepare a list of phone numbers for all Project personnel and submit to the Engineer at the pre-construction conference. Include Contractor, City Engineer, and City personnel including police, fire, and ambulance.

1.03. PROJECT MANAGEMENT

- A. The Contractor shall retain a full-time Superintendent, satisfactory to the City and Engineer. The Superintendent shall not be changed except with the consent of the City and Engineer. The Superintendent shall be in full charge of the Work. At the request of the Engineer, the Contractor shall submit a resume to verify the qualifications of the superintendent.
- B. The Contractor shall complete the Work in a continuous, uninterrupted operation. Use sufficient personnel and adequate equipment to complete the Work within the Contract Time.

1.04. COORDINATION

- A. Do not interfere with the operation of the existing utilities, unless otherwise approved by the City.
- B. Perform all coordination necessary to complete connections to the existing pipelines.
- C. Coordinate with appropriate utility companies, as well as with the City, where the Work crosses or is adjacent to existing utilities.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01. GENERAL

- A. Notify DigSafe at 1-888-DIGSAFE or 811 at least 72 hours prior to any digging, trenching, rock removal, demolition, borings, grading, landscaping, or any other earth moving operations.
- B. Furnish all labor, materials, tools and equipment necessary to provide temporary light, ventilation, safety personnel and equipment, gas monitoring equipment, supports and braces necessary to perform the work in a safe and secure manner. Observe all safety regulations.

3.02. COORDINATION WITH THE CITY'S OPERATIONS

- A. Notify the City and Engineer, in writing, a minimum of 5 working days in advance of commencing Work on site.
- B. Notify the City and Engineer, in writing, a minimum of 5 working days before commencing any work which may affect the City's operations.
- C. Perform all construction activities so as to avoid interference with operations of the existing utility systems and the work of others.

- D. Coordinate the following operations with the City and the Engineer:
 - 1. Timing and duration of activities that impact existing utilities.
- E. The City has the authority to order the Work stopped or prohibited which could unreasonably result in stopping the necessary functions of the existing utilities. Any costs delays associated with these work stoppages due to the Contractor's operation shall be borne the Contractor.

3.03. SEQUENCE OF CONSTRUCTION

- A. Constructing the proposed improvements while maintaining existing operations will require a specific sequence of construction. Refer to Section 01010 for a suggested sequence of construction. The Contractor will be allowed as much flexibility as possible in scheduling the construction activities. Provide a detailed construction schedule as required in Section 01310.
- B. Insofar as possible, all new constructed public sewers and drains shall be tested by the Contractor and in operating condition before the final tie-ins are made to connect new pipe to existing pipe.

3.04. TEMPORARY CONSTRUCTION ACTIVITIES

- A. The Contractor shall be responsible for providing and maintaining all temporary facilities, including bypass pumping facilities, sewer/drain collection and service systems, required to complete the work of this Contract.
- B. The Contractor shall submit for approval by the City and the Engineer detailed information including calculations, shop drawings, catalog cuts for all proposed temporary facilities and temporary pipelines and services.
- C. All temporary work shall be removed by the Contractor following the construction of the permanent work.

3.05. SHUTDOWNS

- A. Rescheduling or reactivation of any temporary shutdowns may be required if an emergency occurs in the utility system.

END OF SECTION

SECTION 01045

CUTTING, CORING AND PATCHING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. This Section covers the cutting, coring, rough and finish patching of holes and openings in existing and new construction.
- B. All cutting, coring, and rough patching shall be performed by the Contractor. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.

1.02 RELATED WORK:

- A. Section 02050: Demolition and Alterations
- B. Section 03346: Cast-In-Place Concrete for Utility Work

1.03 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400.
- B. Adhere strictly to the manufacturer's current printed recommendations regarding temperature at time of application for all work involving epoxy, cement base coating and protective coating.
- C. Use only products of the specified Repair Mortar System Manufacturer(s) or equal.
- D. Any changes in the specified repair mortar work methods shall be allowed only with the written approval of the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete repair mortar shall be a non-shrink, commercial formulation requiring only the addition of water with minimum 28-day compressive strength of 5,000 psi.
- B. Provide a non-shrink cementitious repair mortar material as manufactured by:
 - 1. Sika Repair 224 manufactured by Sika Corp.,

2. EMACO S88CI manufactured by Master Builder, Inc.,
3. Underlayment F-120 by Sauereisen, Inc.,
4. Or equal.

C. Materials for finish patching shall be equal to those of adjacent construction.

PART 3 - EXECUTION

3.01 GENERAL:

- A. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- B. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. No structural members shall be cut without approval of the Structural Engineer of Record and all such cutting shall be done in a manner directed by him. No holes may be drilled in beams or other structural members. All work shall be performed by mechanics skilled in this type of work.
- C. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.

3.02 CUTTING:

- A. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.
- B. Corners of square or rectangular openings shall be cored. Do not overcut corners of openings. Corners shall be chipped out square, if required, so as not to cause cracking at the corners.
- C. Provide for control of slurry generated by sawing operation on both sides of element.
- D. When cutting reinforced concrete, the cutting shall be done so as not damage bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- E. Adequate bracing and/or shoring of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
- F. Provide equipment of adequate size to remove cut panel.

3.03 CORING:

- A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeve, equipment or mechanical seals to be installed.
- B. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.
- C. Slurry or tailings resulting from coring operations shall be removed from the area following drilling.

3.04 PATCHING:

- A. Prepare surfaces to receive cementitious repair mortar in accordance with manufacturer's instructions.
- B. Mix the cementitious repair mortar material components in accordance with the manufacturer's instructions. Concrete surfaces should be surface saturated dry (SSD) with no standing water prior to mortar application.
- C. Work a wet scrub coat of the mortar per the manufacturer's recommendations into the pores and voids in the substrate and over the substrate prior to mortar application by trowel.
- D. Apply the cementitious repair mortar using a steel trowel to work the material into the surface. Fill voids from deepest to shallowest areas as the application work proceeds. Strictly follow the manufacturer's application requirements.
- E. Once the repair areas are filled with repair mortar, strike off the mortar level with the surrounding concrete substrate. Do not leave a broom finish. Finish with a steel trowel until closed up at the surface and flat.
- F. Cure the repair mortar in strict accordance with the manufacturer's instructions.

END OF SECTION

SECTION 01046

CONTROL OF WORK

PART 1 - GENERAL

1.01 PLANT AND HOURS OF CONSTRUCTION:

- A. Furnish plant and equipment which will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the Contract Time. If at any time such plant appears to the Engineer to be inefficient, inappropriate, or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character, or increase the plant equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.
- B. Normal construction activity shall take place only between the hours of 7 a.m. to 6 p.m., excluding Saturdays, Sundays, and legal holidays. Work outside the above time periods will be permitted only on an emergency basis and only with the approval of the Owner.

1.02 OCCUPYING PRIVATE LAND:

- A. The Contractor shall not (except after written consent from the proper parties) enter or occupy with men, tools, materials, or equipment any land outside the rights of way or property of the Owner. A copy of the written consent shall be given to the Engineer.

1.03 PIPE LOCATIONS:

- A. Exterior pipelines will be located substantially as indicated on the Drawings, but the right is reserved to the Owner, acting through the Engineer, to make such modifications in location as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings, etc., are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 DIMENSION OF EXISTING STRUCTURES

- A. Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.05 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, fencing, caution signs, lights, and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.
- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

1.06 TEST PITS:

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor at the direction of the Engineer. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer.

1.07 INTERFERENCE WITH AND PROTECTION OF STREETS:

- A. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefor from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefor.
- C. The Contractor shall, at least 24 hours in advance, notify the Police and Fire Departments in writing, with a copy to the Engineer, if the closure of a street or road is necessary. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

1.08 CARE AND PROTECTION OF PROPERTY:

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act,

omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer.

1.09 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.
- B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Total Price Bid in the Bid Form.
- D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the City is required, he may direct the Contractor, in writing, to perform the work. Work so ordered will be paid at the Contract unit prices, if applicable, or as extra work under Article 11 of the Supplementary Conditions. If relocation of a privately owned utility is required, the City will notify the Utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the City and Utility, and shall have no claim for delay due to such relocation. The Contractor shall notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays, and Legal holidays) before excavating in any public way. Contractor shall also notify Maine Dig Safe, telephone number 1-888-DIGSAFE or 811 at least 72 hours prior to start of work.
- E. UTILITY CONTACT INFORMATION

	Phone	Fax
Dig Safe	811; 1-888-DIGSAFE	N/A
Public Works	992-4500	942-6631
Water District	947-4516	735-0090
Electrical Department	992-4504	942-6631
Sewer Department	992-4513	942-6631
Police/ Fire Dispatch	947-7384	N/A

Capital Ambulance	262-3115	262-3137
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1.10 INSPECTION OF WORK AWAY FROM THE SITE:

- A. If work to be done away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, the Contractor shall give notice to the Engineer of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the inspection can be made.

1.11 COOPERATION WITHIN THIS CONTRACT:

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with General Contractor and his Subcontractors or trades, and shall assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.12 CLEANUP AND DISPOSAL OF EXCESS MATERIAL:

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and as neat a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations, and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws, and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.
- C. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors, and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the Contractor will be required to remove the fill at his own expense and restore the area impacted.

END OF SECTION

SECTION 01063

MISCELLANEOUS REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The Contractor shall conform to all miscellaneous requirements as herein specified.

1.02 RELATED SECTIONS

- A. Manual on Uniform Traffic Control Devices (MUTCD).
- B. Maine Department of Transportation, Standard Specification, Latest Edition

1.03 TRAFFIC MANAGEMENT PLAN

- A. The Contractor shall submit a traffic management plan for approval by the Owner depicting the proposed methods of protecting both vehicular and pedestrian access during construction, and identifying the signage proposed and the necessary detours and lane closures.
- B. Traffic Management Plan shall meet all applicable requirements of the Maine Department of Transportation.
- C. For control of moderate traffic, the Contractor shall provide an adequate number of flagmen. Provide trained and equipped flag persons to regulate traffic during construction operations as directed by Engineer.
- D. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Owner will furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by construction operations. Such officers shall be in addition to the watchmen required under other provisions of the contract.
- E. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Contractor, as required, shall furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by his construction operations. The Contractor will submit the invoices to the City of Bangor and the City will pay the police details directly.

- F. Provide barrels, message boards as necessary to control the traffic through the work area and to direct cars around any detour.

The employment or presence of traffic flagmen, special officers, or police shall in no way relieve the Contractor of any responsibility or liability which is his under the terms of the contract.

- G. All signs, traffic cones, drums, flares, and flag person equipment as approved by local jurisdictions.
 - 1. Traffic signage and devices shall conform with MUTCD as related to work zones.
 - 2. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations in accordance with MUTCD.
 - 3. Relocate as Work progresses, to maintain effective traffic control.
- H. Contractor shall be responsible for construction parking control.
 - 1. Control vehicular parking to prevent interference with pedestrians, public vehicular traffic, public parking, and access by emergency vehicles, and Owner's operations.
 - 2. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas.
 - 3. Prevent parking on or adjacent to access roads or in non- designated areas.
- I. Lights should be used to illuminate work area, equipment crossings, and other areas as necessary during night and other hours of low visibility times as directed by Engineer.
- J. Consult with authority having jurisdiction in establishing public thoroughfares to be used for haul routes and site access.
- K. Remove traffic management control equipment and devices when no longer required.
- L. Repair damage caused by installation or removal of traffic management controls.

1.04 INTERFERENCE WITH EXISTING WORKS:

- A. State and Federal regulations require that at all times during construction work under this Contract, existing utilities remain operational until the new utilities are accepted and on line.

- B. The Contractor shall at all times conduct his operations so as to interfere as little as possible with existing works. The Contractor shall develop a program for review and approval, in cooperation with the Engineer and interested officials, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations therefrom are expressly permitted. All work of connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand.
- A. The Contractor shall make such minor modifications in the work relating to existing structures as may be necessary, without additional compensation.
- B. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting his operations to meet the above requirements.
- C. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting his operations to the need for continuous flow of sewage.

1.05 MAINTAINING FLOWS:

- A. It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage. To this end, the Contractor shall at his own expense, provide, maintain, and operate all temporary facilities such as dams, pumping equipment, conduits, and all other labor and equipment necessary to intercept the sewage flow before it reaches the points where it would interfere with his work, carry it past his work, and return it to the existing sewer below his work.
- B. The Contractor shall at his own cost, provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and shall immediately cart away and removal all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- C. Existing Wastewater Flows
 - 1. Existing flows vary significantly from hour to hour and season to season. Peak flows are influenced by rain events and groundwater depths. The Contractor shall conduct operations to be prepared for these variable flow conditions.

1.06 BURIED UTILITY WARNING AND IDENTIFICATION TAPE:

- A. Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED WATER PIPING BELOW or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

1.07 PROTECTION AGAINST ELECTROLYSIS:

- A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials.

1.08 HEALTH AND SAFETY:

- A. All work shall be performed in accordance with all applicable local, state, and federal health and safety requirements and regulations and in accordance with the Contractors Health and Safety Plan.

1.09 CONFINED SPACE ENTRY:

- A. Entry into confined spaces shall be in accordance with OSHA 29 CFR 1910.146 and all other applicable requirements.
- B. The Contractor shall supply all necessary equipment for confined space entry.
- C. The Contractor shall submit documentation that all personnel entering confined spaces have been properly trained in confined space entry procedures.

1.10 ESTABLISHMENT OF PROPERTY/EASEMENT LINES:

- A. The Contractor shall be responsible for the setting out of the locations of the property lines and easement lines that border the locations of the work.

PART 2 – PRODUCTS

NOT USED

PART 3 – END OF SECTION

NOT USED

SECTION 01080

ABBREVIATIONS AND DEFINITIONS

PART 1 - GENERAL

1.01 ABBREVIATIONS:

- A. Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth opposite each. Abbreviations for trade associations and standards organizations are listed in Section 01090.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANS	American National Standard
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gage
AWPA	American Wood-Preservers' Association

AWWA	American Water Works Association
CS	Commercial Standard
IBR	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers, Inc.
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Services Administration, Washington, D.C.
IPS	Iron Pipe Size
JIC	Joint Industry Conference Standards
NBS	National Bureau of Standards
NEC	National Electrical Code; latest edition
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Thread
OS&Y	Outside screw and yoke
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
Stl. WG	U. S. Steel Wire, Washburn and Moen, American Steel and Wire or Roebling Gage
UL	Underwriters' Laboratories
USS Gage	United States Standard Gage
WOG	Water, Oil, Gas
WSP	Working steam pressure
125-lb. ANS or 250-lb. ANS	American National Standard for Cast-Iron Pipe Flanges and Flanged Fittings, Designation B16.1-1975, for the appropriate class

1.03 DEFINITIONS:

- A. Wherever the words defined in this section or pronouns used in their stead occur in the Contract Documents, they shall have the meanings herein given.

As Directed, as Required, Etc.

Wherever in the Contract Documents, or on the Drawings, the words "as directed," "as ordered," "as requested," "as required," "as permitted," or words of like import are used, it shall be understood that the direction, order, request, requirement, or permission of the Engineer is intended. Similarly, the words "approved," "acceptable," "suitable," "satisfactory," and words of like import shall mean approved by, acceptable to, suitable to, or satisfactory to the Engineer.

Provide

Wherever in the Contract Documents the word "provide" is used, it shall mean to furnish (or supply) and install.

Elevation

The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the datum adopted by the Engineer.

Rock

The word "rock," wherever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding two (2) cu. yd. in volume, or solid ledge rock which, in the opinion of the Engineer, requires, for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock which 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 exterior to the maximum limits of measurement allowed, which may fall into the excavation, will be measured or allowed as "rock."

Earth

The word "earth", wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as above defined.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 QUALITY ASSURANCE:

- A. Should specified reference standards conflict with the Contract Documents, refer to paragraph 3.02 of the General Conditions.

1.02 SCHEDULE OF REFERENCES:

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AABC	Associated Air Balance Council 1000 Vermont Avenue, N.W. Washington, DC 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ABMA	American Bearing Manufacturers Association 1101 Connecticut Avenue, N.W., Suite 700 Washington, DC 20036
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601
AGA	American Gas Association
AGC	Associated General Contractors of America 1957 E Street, N.W. Washington, DC 20006

AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AIA	American Institute of Architects 1735 New York Avenue, N.W. Washington, DC 20006
AISC	American Institute of Steel Construction Eighth Floor 400 North Michigan Avenue Chicago, IL 60611
AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036
AITC	American Institute of Timber Construction 333 W. Hampden Avenue Englewood, CO 80110
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
APA	American Plywood Association Box 11700 Tacoma, WA 98411
API	American Petroleum Institute 1220 L. Street, N.W. Washington, DC 2005
ARI	Air-Conditioning and Refrigeration Institute 1501 Wilson Boulevard Arlington, VA 22209
ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191

ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASPA	American Sod Producers Association 4415 West Harrison Street Hillside, IL 60162
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWI	Architectural Woodwork Institute 2310 South Walter Reed Drive Arlington, VA 22206
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society 550 LeJeune Road, N.W. Miami, FL 33135
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, VA 22091
BOCA	BOCA International Headquarters Office 4051 West Flossmoor Road Country, Club Hills, IL 60478-5795
CDA	Copper Development Association 57th Floor, Chrysler Building 405 Lexington Avenue New York, NY 10174

CLFMI	Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue, N.W. Washington, DC 20036
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195
DHI	Door and Hardware Institute 7711 Old Springhouse Road McLean, VA 22101
EJCDC	Engineers' Joint Contract Documents Committee American Consulting Engineers Council 1015 15th Street, N.W. Washington, DC 20005
EJMA	Expansion Joint Manufacturers Association 25 North Broadway Tarrytown, NY 10591
FGMA	Flat Glass Marketing Association 3310 Harrison White Lakes Professional Building Topeka, KS 66611
FM	Factory Mutual System 1151 Boston-Providence Turnpike P.O. Box 688 Norwood, MA 02062
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WRSIS) Washington Navy Yard, Building 197 Washington, DC 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
JIC	Joint Industrial Council c/o National Machine Tool Builders Association 79-1 Westpark Drive McLean, VA 22102

IBR	Institute of Boiler and Radiator Manufacturers a/k/a Hydronics Institute P.O. Box 218 35 Russo Place Berkeley Heights, NJ 07922
ICBO	International Conference of Building Officials 5360 S. Workman Mill Road Whittier, CA 90601
ICEA	Insulated Cable Engineers Association Box 1568 Carrollton, GA 30112
IEEE	Institute for Electrical and Electronics Engineers 3 Park Ave 17 th Floor New York, NY 10016-5997
IMIAC	International Masonry Industry All-Weather Council International Masonry Institute 815 15th Street, N.W. Washington, DC 20005
MBMA	Metal Buildings Manufacturer's Association 1230 Keith Building Cleveland, OH 44115
MEC	Massachusetts Electric Code
MIL	Military Specifications Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NCMA	National Concrete Masonry Association P.O. Box 781 Hendron, VA 22070

NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEC	National Electric Code
NECA	National Electrical Contractors Association 3 Belhesda Metro Center Suite 1100 Bethesda, MD 20814
NEMA	National Electrical Manufacturers' Association 1300 N 17 th Street Suite 1847 Rosslyn VA 22209
NETA	InterNational Electrical Testing Association 106 Stone St. P.O. Box 687 Morrison, CO 80465
NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, DC 20036
NSWMA	National Solid Wastes Management Association 1730 Rhode Island Avenue, N.W. Washington, DC 20036
NTMA	National Woodwork Manufacturers Association 205 W. Touhy Avenue Park Ridge, IL 60068
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077
PCI	Prestressed Concrete Institute 201 North Wells Street Chicago, IL 60606

PS Product Standard
 U.S. Department of Commerce
 Washington, DC 20203

RIS Redwood Inspection Service
 One Lombard Street
 San Francisco, CA 94111

RCSHSB Red Cedar Shingle and Handsplit Shake Bureau
 515 116th Avenue
 Bellevue, WA 98004

SDI Steel Deck Institute
 P.O. Box 9506
 Canton, OH 44711

SDI Steel Door Institute
 712 Lakewood Center North
 14600 Detroit Avenue
 Cleveland, OH 44107

SIGMA Sealed Insulating Glass Manufacturers Association
 111 East Wacker Drive
 Chicago, Il 60601

END OF SECTION

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The work covered by this Section consists of furnishing all labor materials and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching, or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in Section 01568.
- D. These Specifications are intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Maine Department of Environmental Protection and local Conservation Commission.
- F. Schedule and conduct all work in a manner that will minimize the level of noise escaping the site, especially at night and on weekends.

1.02 APPLICABLE REGULATIONS:

- A. Comply with all applicable Federal, State, and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS:

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectional acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION:

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer, and incorporate permanent control features into the project at the earliest practicable time.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EROSION CONTROL:

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures such as siltation basins, hay check dams, mulching, jute netting, and other equivalent techniques shall be used as appropriate. Offsite surface water shall be diverted around the site to a downstream channel ahead of siltation barriers. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 PROTECTION OF STREAMS, WETLANDS, AND SURFACE WATER:

- A. Care shall be taken to prevent or reduce to a minimum any damage to any stream, drainage ditch, storm drain or sewer from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will

reduce the quality of the water in the stream, shall not be directly returned to the stream or separated storm drain system. Such water will be diverted through a settling basin or filter before being directed into the streams.

- A. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water, or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- B. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action drawing or plan approved by the Maine Department of Environmental Protection. Contractor shall submit to copies of approved contingency drawings or plans to the Engineer.

3.03 PROTECTION OF LAND RESOURCES:

- A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of construction, that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment, dumping or other operations, protect such trees by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly before beginning operations near them.
- D. Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition. The Engineer will decide what method of restoration shall be used and whether damaged trees shall be treated and healed or removed and disposed of.

All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in. in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner

by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.

- E. The locations of the Contractor's storage, and other construction building, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and shall require written approval of the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.
- F. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling, and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as described in Section 01568, or as approved by the Engineer.
- G. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY:

- A. Burning. The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control. The Contractor will be required to maintain all excavations, embankments, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded, and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of chlorides may be permitted with approval from the Engineer.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.05 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION:

- A. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.06 NOISE CONTROL:

- A. The Contractor shall make every effort to minimize noises caused by his operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with State and Federal (OSHA) regulations.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION CONFERENCE:

- A. In addition to the preconstruction conference required by Article 2.06 of the General Conditions, a preconstruction conference will be held between the Contractor, the Engineer, and the Owner to review the Contractor's proposed methods of complying with the requirements of the Contract Documents.
- B. Contractor will be notified of the time, date and place where the preconstruction conference will be held.

1.02 PROGRESS MEETINGS WITH ENGINEER:

- A. In addition to other regular project meetings for other purposes (as indicated elsewhere in the Contract Documents), hold general progress meetings once each month with times coordinated with preparation of payment requests. Meeting dates shall be established by the Engineer. Require every entity then involved in the planning, coordination or performance of work to be properly represented at each meeting. Include (when applicable) consultants, separate contractors (if any), principal subcontractors, suppliers/manufacturers/fabricators, governing authorities, insurers, special supervisory personnel and others with an interest or expertise in the progress of the work. Review each entity's present and future needs including interface requirements, time, sequence, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, submittals, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule. Determine how behind-time work will be expedited, and secure commitments from the entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within the Contract Time. Review everything of significance which could affect the progress of the work.
- B. Within seven days after each progress meeting date, the Engineer will forward copies of the minutes-of-the-meeting, to the Contractor.
- C. Immediately following each progress meeting where revisions to the Progress Schedule/Critical Path Schedule have been made or recognized (regardless of whether agreed to by each entity represented), revise the Schedule. Reissue revised Schedule within 10 days after meeting. At intervals matching the preparation of payment requests, revise and reissue the Schedule to show actual progress of the work in relation to the latest revision of the Schedule.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals.
 - 1. Shop Drawings, Product Data and Samples.
 - 2. Contractor's Responsibilities.
 - 3. Submission Requirements.
 - 4. Review of Shop Drawings, Product Data, Working Drawings and Samples.
 - 5. Distribution.
 - 6. General Procedures for Submittals.
 - 7. Certificate of Design.
 - 8. Certificates of Compliance.
 - 9. Schedules.
- B. Additional general submission requirements are contained in Paragraph 6.17 of the General Conditions.
- C. Detailed submittal requirements will be specified in the technical specifications section.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES:

- A. Shop Drawings:
 - 1. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to: custom-prepared data such as fabrication and erection/installation (working) drawings of concrete reinforcement, structural details and piping layout, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications as applicable to the work.

2. All shop drawings shall be submitted using the transmittal form furnished by the Engineer.
3. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
4. The Contractor shall check all subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
5. All details on shop drawings submitted for approval shall show clearly the relation of the various parts of the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval

1.03 CONTRACTOR'S RESPONSIBILITIES:

- A. The Contractor shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
 1. Field measurements
 2. Field construction criteria
 3. Catalog numbers and similar data
 4. Conformance with the Specifications
- B. Each shop drawing, sample, and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in. X 17-in. and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Engineer a copy of each submittal transmittal form for shop drawings, product data and samples at the time of submittal of said drawings, product data and samples to the Engineer.

- C. If a shop drawing shows any deviation from the requirements of the Contract Documents, the Contractor shall make specific mention of the deviations in the Transmittal Form furnished by the Engineer and provide a description of the deviations in a letter attached to the submittal.
- D. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will not have responsibility therefor.
- E. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- F. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.
 - 1. Manufacturer's printed installation instructions, a part of product data submitted to the Engineer will not be reviewed and are for informational purposes only.

1.04 SUBMISSION REQUIREMENTS:

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- B. All submittals shall be submitted sufficiently in advance of construction requirements to provide no less than fourteen working days, excluding Saturdays, Sundays and legal holidays for review from the time received at the Engineer's reviewing office. For submittals of major equipment, that require more than fourteen days to review, due to its sheer complexity and amount of detail and also requiring review by more than one engineering discipline, a letter will be sent by the Project Manager or his/her designee to the Contractor informing him/her of the circumstances and the date it is expected the submittal will be returned to the Contractor.
- C. Number of submittals required:
 - 1. Shop Drawings: Unless otherwise stated in the respective Specifications Sections, submit six (6) copies.
 - 2. Product Data: Unless otherwise stated in the respective Specifications submit six (6) copies.
 - 3. Samples: Submit the number stated in the respective Specification Sections.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The Project title and number.
3. Contractor identification.
4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the specification section number, page and paragraph(s).
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8-in. X 3-in. blank space for Contractor and Engineer stamps.

E. Each shipment of drawings shall be accompanied by a transmittal form furnished by the Engineer providing a list of the drawing numbers and the names mentioned above.

F. Submittals shall be separated by specification section. Do not combine submittals for different specification sections under the same transmittal.

1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES:

A. The Engineer's review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract plans and specifications or from departures therefrom. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

- B. The review of shop drawings, data, and samples will be general. They shall not be construed:
1. as permitting any departure from the Contract requirements;
 2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
 3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.
- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting an exception.
- D. Two (maximum) copies of shop drawings or product data will be returned to the Contractor via First Class United States Postal Service. Samples will not be returned.
- E. Submittals will be returned to the Contractor under one of the action codes indicated and defined on the transmittal form furnished by the Engineer.
- F. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing, on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.
- G. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered "Rejected" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.06 DISTRIBUTION:

- A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed 6.

1.07 GENERAL PROCEDURES FOR SUBMITTALS:

- A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval resubmittal (if required), coordination with other submittals, inspection, testing (off-site and on-site), purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

1.08 CERTIFICATE OF DESIGN:

- A. If specifically specified in other Sections of these Specifications, the Contractor shall submit the applicable Certificate of Design for each item required, and in the form attached to this Section, completely filled in and signed and sealed by a registered professional engineer.

1.09 CERTIFICATES OF COMPLIANCE:

- A. Certificates of Compliance as specified in the specifications shall include and mean certificates, manufacturer's certificates, certifications, certified copies, letters of certification and certificate of materials.
- B. The Contractor shall be responsible for providing Certificates of Compliance as specified in the technical specifications. Certificates are required for demonstrating proof of compliance with specification requirements and shall be executed in 3 hard copies or 1 electronic copy unless otherwise specified. Each certificate shall be signed by an official authorized to certify on behalf of the manufacturing company and shall contain the name and address of the Supplier, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Supplier from furnishing satisfactory material, if after tests are performed on selected samples, the material is found not to meet the specific requirements.

1.10 SCHEDULES:

- A. Provide all schedules specified in Articles 2.05 B, 2.07, 14.01 and elsewhere in the General Conditions.

END OF SECTION

CERTIFICATE OF DESIGN

The undersigned hereby certifies that he/she is a Professional Engineer registered in the state of _____ and that he/she has been employed by (Name of Contractor) _____ to design _____ in accordance with Specifications Section _____ for the (Name of Project) _____. The undersigned further certifies that he/she has performed similar designs previously and has performed the design of the _____; that said design is in conformance with all applicable local, state, and federal codes, rules, and regulations and professional practice standards; that his/her signature and Professional Engineer (P.E.) Stamp have been affixed to all calculations and drawings used in, and resulting from, the design; and that the use of that stamp signifies the responsibility of the undersigned for that design.

The undersigned hereby certifies that he/she has Professional Liability Insurance with limits of \$1,000,000.00 and a Certificate of Insurance is attached.

The undersigned hereby agrees to make all original design drawings and calculations available to the Town/City of _____ or Owner's representative within seven (7) days following written request therefore by the Owner.

P.E. Name

Contractor's Name

Signature

Signature

Title

Title

Address

Address

SECTION 01310

CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. CONTRACTOR shall prepare and submit to ENGINEER for review within 14 days after Notice to Proceed, a construction progress schedule.
- B. No work shall be done between 6:00 p.m. and 7:00 a.m. nor on Sundays or legal holidays without written permission of OWNER. However, emergency work may be done without prior permission.
- C. Night work may be established by CONTRACTOR as regular procedure with written permission of OWNER. Such permission, however, may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for proper prosecution and control of work at night.

1.02 FORM OF SCHEDULES:

- A. Prepare schedules in form of a horizontal bar chart.
 - 1. Provide separate horizontal bar for each trade or operation.
 - 2. Horizontal Time Scale: Identify first work day of each week.
 - 3. Scale and spacing to allow space for notations and future revisions.
- B. Format of Listings: Chronological order of start of each item of work.
- C. Identification of Listings: By major specification section numbers.

1.03 CONTENT OF SCHEDULES:

- A. Construction Progress Schedule:
 - 1. Show complete sequence of construction by activity.
 - 2. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to, the following:

- a. Shop drawing receipt from supplier/manufacturer submitted to ENGINEER, review and return to supplier/manufacturer.
 - b. Material and equipment order, manufacturer, delivery, installation, and checkout.
 - c. Preconstruction survey and monitoring
 - d. Erosion Control devices
 - e. Prepare Health and Safety Plan
 - f. Traffic Management Plan
 - g. Maintain existing flows in all sewer and drain systems
 - h. Perform test pits to confirm existing utilities horizontal and vertical locations
 - i. Backfilling, grading, seeding, sodding, landscaping, fence construction, and paving.
 - j. Sewer and drain installation.
 - k. Connection to existing sewers.
 - l. Subcontractor's items of work.
 - m. Final cleanup.
 - n. Allowance for inclement weather.
 - o. Demolition.
 - p. Miscellaneous concrete placement.
3. Show projected percentage of completion for each item as of first day of each month.

1.04 SCHEDULE REVISIONS:

- A. Every 14 days CONTRACTOR shall revise construction schedule to reflect changes in progress of work.
- B. Indicate progress of each activity at date of submittal.
- C. Show changes occurring since previous submittal of schedule.

1. Major changes in scope.
2. Activities modified since previous submittal.
3. Revised projections of progress and completion.
4. Other identifiable changes.

D. Provide a narrative report as needed to define:

1. Problem areas, anticipated delays, and impact on schedule.
2. Corrective action recommended and its effect.
3. Effect of changes on schedules of other CONTRACTORS.

1.05 SUBMITTAL REQUIREMENTS:

- A. For initial submittal of construction schedule and subsequent revisions thereof, furnish six copies of schedule to ENGINEER.

END OF SECTION

SECTION 01400

QUALITY ASSURANCE

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. This section covers Quality Assurance and Control requirements for this contract.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors, and suppliers and for assuring the quality specified in the Technical Specifications is achieved.
- C. Refer to the Article 6 - Contractor's Responsibilities, paragraphs 6.01, 6.02, and 6.03.

1.02 CONTRACTOR FURNISHED TESTING LABORATORY SERVICES:

- A. An independent commercial testing laboratory acceptable to the Engineer shall perform all tests that require the services of a laboratory to determine compliance with the Contract Documents. The laboratory shall be staffed with experienced technicians, properly equipped, and fully qualified to perform the tests in accordance with the specified standards.
- B. Preliminary Testing Services: The Contractor shall be responsible for all testing laboratory services in connection with concrete materials and mix designs, the design of asphalt mixtures, gradation tests for structural and embankment fills, backfill materials, and all other tests and engineering data required for the Engineer's review of materials and equipment proposed to be used in the Work. The Contractor shall obtain the Engineer's acceptance of the testing laboratory before having services performed, and shall pay all costs for services.
- C. The Contractor shall not retain any testing laboratory against which the Owner or the Engineer have reasonable objection, and if at any time during the construction process the services become unacceptable to the Owner, or the Engineer, either the Owner or the Engineer may direct in writing that such services be terminated. The request must be supported with evidence of improper testing or unreasonable delay. If the Engineer determines that sufficient cause exists, the Contractor shall terminate the services and engage a different testing laboratory.
- D. Transmittal of Test Reports: Written reports of testing and engineering data furnished by the Contractor for the Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.
- E. The Contractor's testing laboratory shall furnish four copies of a written report of each test performed by laboratory personnel within three days after each test is completed.

Distribution shall be two copies of each test report to the Engineer's Representative, one copy to the Owner, and one copy for the Contractor.

1.03 OWNER FURNISHED TESTING AND INSPECTION SERVICES:

- A. The Owner will employ the services of an independent testing agency to conduct and perform all quality control tests of materials of construction in the field or in the laboratory during and after their incorporation in the Work. Field sampling and testing shall be performed in the general manner indicated in the specifications, with minimum interference with construction operations.
- B. The Contractor shall furnish a construction schedule and a minimum of 48 hour notice of readiness for testing and inspection of the work. The Engineer shall determine the exact time and location of field sampling and testing, and may require such additional sampling and testing as necessary to determine that materials and equipment conform with data previously furnished by Contractor and with the Contract Documents.
- C. The Contractor shall schedule the work to permit adequate time for testing and re-testing should test results not conform to the contract documents. Lack of testing or inspection which is attributable to insufficient notice by the Contractor or failure of the Contractor to cooperate, will be cause for rejection of the work.
- D. The Contractor shall deliver materials in sufficient quantities to the Owner's testing agency as may be required. Laboratory testing shall be performed within a reasonable time, consistent with the specified standards.
- E. The Contractor shall furnish material samples and cooperate in the field sampling and testing activities, interrupting the work when necessary. The Contractor shall furnish personnel, facilities and access to assist in the sampling and testing activities.

1.04 QUALITY ASSURANCE:

- A. Codes and Standards: Refer to Article 3 - Contract Documents: Intent, Amending, Reuse, paragraph 3.03 of the General Conditions.
- B. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer
- C. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the Engineer

authorizes such use.

- D. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.

1.05 OFFSITE INSPECTION:

- A. When the specifications require inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, such services shall be performed by the Owner's independent testing laboratory, or inspection organization acceptable to Engineer in conjunction with or by the Engineer.
- B. The Contractor shall give appropriate written notice to the Engineer not less than 30 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

1.06 MATERIALS AND EQUIPMENT:

- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless approved otherwise by the Engineer.

1.07 SHOP AND FIELD TESTING:

- A. The Contractor is responsible for providing advance notice of and access for the shop and field testing specified in the technical specification sections.
- B. The Contractor and its Subcontractor shall permit inspections, tests, and other services as required by the Contract Documents.
- C. Contractor shall provide twenty one days written notice to the Engineer so that the Engineer may schedule and witness off site and on site tests. The Engineer's witnessing of tests does not relieve the Contractor and/or Subcontractors of their obligation to comply with the requirements of the Contract Documents.

1.08 CERTIFICATION FORMS AND CERTIFICATES:

- A. The Contractor shall be responsible for submitting the certification forms and certificates in conformance with the requirements specified in Section 01300 - Submittals.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 QUALITY CONTROL:

- A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.
- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, instrument calibration, surveying) shall be maintained in the Contractor's field office, available for inspection by the Engineer. Copies shall be made available to the Engineer upon request.
- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The Contractor shall provide all temporary facilities for the proper completion of the work, as required and as specified.

1.02 SANITARY REGULATIONS:

- A. The Contractor shall provide adequate sanitary facilities for the use of those employed on the Work. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points and in such manner as may be required.
- B. The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or on adjacent property.

1.03 WATER SUPPLY:

- A. For all necessary operations at the site of the work (except as noted in the next paragraph below) the Owner, without charge therefor, shall provide reasonable quantities of water at the then existing pressure from a mutually convenient hydrant of the water distribution system. The Contractor shall furnish all necessary pipe or hose extensions to conduct the water to the points of use and shall exercise due care not to waste water. The Contractor shall not contaminate the water supply through the use of City approved backflow preventers and shall comply with all applicable regulations and code requirements.
- B. The Owner reserves the right to limit, suspend, or terminate the supplying of water as set forth above should it consider such action to be necessary on account of damage to the distribution system, the necessity of conserving water, or other emergency. In this event, the Contractor shall obtain water from some other approved source, at his own expense.

1.04 TEMPORARY HEAT:

- A. If temporary heat is required for the protection of the Work, the Contractor shall provide and install suitable heating apparatus, shall provide adequate and proper fuel, and shall maintain heat as required.

- B. Temporary heating apparatus shall be installed and operated in such manner that finished work will not be damaged thereby. After the permanent heating system has been installed, tested, and made ready for operation, the Contractor may, at his own risk and expense, use it for providing heat for protection of the Work. He shall provide and pay for all fuel and care necessary, and, when the Work is ready for acceptance, he shall, at his own expense, put the system into first-class condition, even to the extent of replacing worn or damaged parts as directed.

1.05 ELECTRICAL ENERGY:

- A. The Contractor shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the Work and during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. The Contractor shall provide sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.

1.06 PRECAUTIONS DURING ADVERSE WEATHER:

- A. During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.
- B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

END OF SECTION

SECTION 01568

EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide all work and take all measures necessary to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected working area as to prevent damage to any stream or wetlands.

1.02 REFERENCE:

- A. The Contractor shall use proper erosion control procedures. The contractor shall explicitly follow any direction from the City as well as state, local and federal regulations as to the placement of erosion control structures. Temporary and permanent erosion control shall be installed in accordance with the current Maine DEP Best Management Practices Manual for Erosion and Sedimentation Control prior to disturbing any earth.

1.03 SUBMITTALS:

- A. Two weeks prior to the start of the work, submit to Engineer, for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction.

1.04 QUALITY ASSURANCE:

- A. All work shall be performed in accordance with all applicable Federal, State, and Local regulations and permits associated with the project.
- B. Sedimentation and erosion control best management practices shall be installed, at a minimum, as shown on drawings, and prior to the start of any clearing of vegetation or excavation of materials, to protect waterbodies or wetlands in the vicinity of the project.
- C. Additional erosion control shall be implemented as necessary in the event that the erosion and sedimentation control system as shown on the plans is not sufficient enough to protect erosion or sedimentation to nearby wetlands as a result of contractor's means and methods for restoration activities.
- D. The sedimentation and erosion control system shall be maintained fully functional and shall not be removed until disturbed areas are stabilized by seeding, natural establishment

or other means necessary as directed by the Engineer.

- E. All stockpiled materials shall be located in designated upland portions of the site and shall not impact waterbodies and wetlands in the vicinity of the project.
- F. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.
- G. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.
- H. If construction materials are washed away during construction, remove materials from fouled areas.
- I. Stabilize diversion outlets by means acceptable to Engineer.
- J. Engineer has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct immediate permanent or temporary pollution control measures to prevent contamination of any stream or wetlands, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

PART 2 – PRODUCTS

2.01 BALES:

- A. Straw or other suitable material acceptable to Engineer.

2.02 WOOD STAKES:

- A. 2 in. by 2 in. by 3 ft.

2.03 SYNTHETIC FILTER FABRIC:

- A. Synthetic filter fabric to be a pervious sheet of propylene, nylon, polyester or ethylene filaments and shall be certified by the manufacturer or supplier as conforming to the following requirements:

<u>Physical Property</u>	<u>Requirements</u>
Filtering Efficiency	75% (min.)
Tensile Strength at 20% (max.) Elongation	Extra Strength – 50 lbs./lin. in. (min.) Standard Strength –

30 lbs./lin. in. (min.)

Flow Rate 0.3 gal./sq. ft./min. (min.)

- B. Burlap to be 10 ounce per square yard fabric.
- C. Posts or stakes for filter fences either 2 x 2 or 2 x 3 or 2 x 4 inch studs or 0.5 pounds (minimum) per linear foot.

2.04 FILTERING DEVICE:

- A. Filtrexx® Siltsoxx, or equivalent as approved by the Engineer, shall meet the following minimum specifications:

<u>Physical Property</u>	<u>Requirements</u>
Total Suspended Solids Removal	78%
Tensile Strength	26 lbs/square inch
Flow Rate	11.3 gallons per minute per foot
Density	32 lbs/ft

- B. Compost media inside Filtrexx® Siltsoxx or equivalent shall not contain noxious non-native weed seeds or other invasive plant parts (roots, rhizomes, etc.). For areas where filtering device is proposed to remain permanently, device may be seeded at the time of installation with a seed mix approved by the Engineer.

2.05 CATCH BASIN SEDIMENTATION CONTROL:

- A. Provide and maintain siltsack, or equivalent product as approved by the Engineer, at each existing and newly installed catch basin throughout duration of construction.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Do not discharge chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste into or alongside any body of water or into natural or man-made channels.
- B. Soil and sedimentation control measures consisting of silt fence and Filtrexx® Siltsoxx or equivalent approved by the Engineer shall be placed in areas as depicted on Drawings. Modifications to the location of perimeter filtering devices shall be approved by the Engineer. Filtering devices shall be installed prior to ground disturbance. Erosion and sediment controls to be placed surrounding the base of all deposits of stored and/or

excavated materials and topsoil.

Following work in an area, disturbed ground shall be stabilized as soon as practicable. In areas of the site where construction activities have temporarily or permanently ceased, stabilization measures shall be initiated within 7 days.

3.02 INSTALLATION:

- A. Install sediment and erosion controls in all locations as directed, surrounding base of all deposits of stored excavated material outside of disturbed area, and where directed by the Engineer.
- B. Install checks immediately before site is cleared and before trench excavation. Locate checks, surrounding stored material, approximately 6 ft. from material.
- C. Hold silt socks in place with two 2 in. by 2 in. by 3 ft. stakes so that each bale is butted tightly against adjoining bale thereby precluding shortcircuiting of erosion check.
- D. Construct earth berms or diversions to intercept and divert runoff water from critical areas.
- E. Discharge silt-laden water from excavations onto filter fabric mat and/or baled hay or straw sediment traps to ensure that only sediment-free water is returned to watercourses.
- F. Do not place excavated soil material adjacent to water-course in manner that will cause it to wash away by high water or runoff.
- G. Prevent damage to vegetation by excessive watering or silt accumulation in the discharge area.
- H. Do not dump spoiled material into any streams, wetlands, surface waters, or unspecified locations.
- I. Prevent indiscriminate, arbitrary, or capricious operation of equipment in streams, wetlands or surface waters.
- J. Do not pump silt-laden water from trenches or excavations into surface waters, streams, wetlands, or natural or man-made channels leading thereto.
- K. Prevent damage to vegetation adjacent to or outside of construction area limits.
- L. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in streams, wetlands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.

M. Do not alter flow line of any stream unless indicated or specified.

END OF SECTION

SECTION 01570
MAINTENANCE AND PROTECTION OF VEHICULAR
AND PEDESTRIAN TRAFFIC

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide construction parking control, flag persons, flares and lights, haul routes, traffic signs and signals and removal of all materials as indicated and in compliance with Contract Documents.

1.02 REFERENCES:

- A. Manual on Uniform Traffic Control Devices (MUTCD).
- B. Maine Department of Transportation, Standard Details, Highways and Bridges.

1.03 DEFINITIONS:

- A. MDOT: Maine Department of Transportation
- B. MUTCD: Manual on Uniform Traffic Control Devices

1.04 SUBMITTALS:

- A. Submit the following shop drawings in accordance with Section 01300.
 - 1. Traffic Management Plan.

1.05 QUALITY ASSURANCE:

- A. Comply with the requirements specified in Section 01400.

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS AND DEVICES

- A. Traffic Control Signals: As approved by local jurisdiction.
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdiction.
- C. Flag Person Equipment: As required by local jurisdiction.

PART 3 - EXECUTION

3.01 GENERAL TRAFFIC CONTROL REQUIREMENTS

- A. For control of moderate traffic, the Contractor shall provide an adequate number of flagmen employed at his own expense.
- B. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Owner will furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by construction operations. Such officers shall be in addition to the watchmen required under other provisions of the contract.
- C. The Contractor will be billed by the Owner for the cost of such special officers and will be reimbursed under the appropriate item in the BID.
- D. Whenever and wherever, in the opinion of the Engineer, traffic is sufficiently congested or public safety is endangered, the Contractor, as required, shall furnish uniformed special officers to direct traffic and to keep traffic off the highway area affected by his construction operations. Such officers shall be in addition to the watchmen required under other provisions of the contract.
- E. To reimburse the Contractor for this additional expense, the Owner shall pay to the Contractor, in addition to the contract prices, the cost of such special officers. Such cost shall consist of the actual wages paid to such officers, plus the premium paid by the Contractor to insure these special additional men under his Workmen's Compensation Policy, plus the amount paid by the Contractor for such special officers on account of Social Security or other direct assessment on his payroll by Federal or other properly authorized public agencies. In taking out Workmen's Compensation coverage, the Contractor shall specifically include in the classification of workmen all such special officers.
- F. The cost of such special officers will be paid for under the appropriate item in the BID. The Contractor shall insure these special officers under his Workmen's Compensation Policy and in taking out his Workmen's Compensation coverage the Contractor shall specifically include in the classification of workmen all such special officers. In addition, the Contractor shall make all necessary payments for such special officers on account of Social Security or other direct assessment on his payroll by Federal or other properly authorized public agencies.
- G. The employment or presence of traffic flagmen, special officers, or police shall in no way relieve the Contractor of any responsibility or liability which is his under the terms of the contract.

3.02 CONSTRUCTION PARKING CONTROL:

- A. Control vehicular parking to prevent interference with pedestrians, public vehicular traffic, public parking, and access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non- designated areas.

3.03 FLAG PERSONS

- A. Provide trained and equipped flag persons to regulate traffic during construction operations as directed by Engineer.

3.04 NIGHT AND OTHER HOURS OF LOW VISIBILITY:

- A. Lights should be used to illuminate work area, equipment crossings, and other areas as necessary during low visibility times as directed by Engineer.

3.05 HAUL ROUTES:

- A. Consult with authority having jurisdiction in establishing public thoroughfares to be used for haul routes and site access.

3.06 TRAFFIC SIGNS AND SIGNALS:

- A. Traffic signage and devices shall conform with MUTCD as related to work zones.
- B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations in accordance with MUTCD.
- C. Relocate as Work progresses, to maintain effective traffic control.

3.07 MDOT REQUIREMENTS:

- A. Meet all applicable requirements of the Maine Department of Transportation.

3.08 REMOVAL:

- A. Remove equipment and devices when no longer required.
- B. Repair damage caused by installation.
- C.

3.09 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 01600

CONTROL OF MATERIALS

PART 1 - GENERAL

1.01 APPROVAL OF MATERIALS:

- A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.
- B. As specified in Section 01300, the Contractor shall submit to the Engineer, data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.
- C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.
- D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.
- E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, the Contractor shall provide such samples of workmanship or finish as may be required.
- F. The materials and equipment used on the work shall correspond to the approved samples or other data.

1.02 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS:

- A. The requirements of this Paragraph shall constitute the standards for the material and equipment specified herein. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements.

B. Bolts, Anchor Rods and Nuts:

1. All necessary bolts, anchor rods, nuts, washers, plates and bolt sleeves shall be furnished by the contractor in accordance herewith. Anchor rods shall have suitable washers and hexagonal nuts.
2. All anchor rods, nuts, washers, plates, and bolt sleeves shall be galvanized unless otherwise indicated or specified.
3. Unless otherwise specified, stud, tap, and machine bolts, and nuts shall conform to the requirements of ASTM Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A325. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to ANSI Standard B1.1 for Unified Inch Screw Threads (UN and UNR Thread Form).
4. Bolts, anchor rods, nuts, and washers, specified to be galvanized, shall be zinc coated, after being threaded, by the hot-dip process in conformity with the ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip, Designation A123, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153, as is appropriate.
5. Bolts, anchor rods, nuts, and washers specified to be stainless steel shall be Type 304 or Type 316 stainless steel, as indicated.
6. Anchor rods shall be set accurately. They shall be carefully held in suitable templates of acceptable design. Where indicated on the Drawings, specified, or required, anchor bolts shall be provided with square plates at least 4 in. by 4 in. by 3/8 in. or shall have square heads and washers and set in the concrete forms with suitable pipe sleeves, or both. If anchor are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be done by the Contractor and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking.

C. Protection Against Electrolysis:

1. Where dissimilar metals are used in conjunction with each other, provide insulation between adjoining surfaces to eliminate direct contact and any resultant electrolysis. Provide bituminous insulation, heavy bituminous coatings, nonmettalic separators or washers, impregnated felt, or other means to provide insulation.

END OF SECTION

SECTION 01610

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 GENERAL:

- A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY:

- A. Transport and handle items in accordance with manufacturer's printed instructions.
- B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
- C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.
- F. Provide equipment and personnel to unload all items delivered to the site.
- G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e. Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

1.03 STORAGE AND PROTECTION:

- A. Store and protect products and equipment in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer by him. Instructions shall be carefully followed and a written record of this kept by the Contractor for each product and pieces

of equipment.

- B. Arrange storage of products and equipment to permit access for inspection. Periodically inspect to make sure products and equipment are undamaged and are maintained under specified conditions.
- C. Provide protective maintenance during storage consisting of manually exercising equipment, inspecting mechanical surfaces for signs or corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer necessary for its protection and all other precautions to assure proper protection of all equipment stored and for compliance with manufacturers' requirements related to warranties.
- D. Store loose granular materials on solid flat surface in a well-drained area. Prevent mixing with foreign matter.
- E. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulation of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in manner to reduce breakage, cracking and spalling to a minimum.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 CLOSEOUT PROCEDURES

- a. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- b. Provide submittals to Engineer that are required by governing or other authorities.
- c. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- d. Submit record drawings including all ties and elevation information recorded for underground facilities.

1.02 FINAL CLEANING:

- A. During its progress, the work and the adjacent areas affected thereby shall be cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.
- C. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- D. Upon completion of the work, the Contractor shall remove from the sites of the subsurface explorations all of his plant, machinery, tools, equipment, temporary work,

and surplus materials; shall, unless otherwise directed or permitted in writing, remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

- E. The Contractor shall thoroughly clean all materials and equipment installed by him and his sub-contractors, and on completion of the work shall deliver it undamaged and in fresh and new-appearing condition. All mechanical equipment shall be left fully charged with lubricant and ready for operation.
- F. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1.02 RELATED WORK:

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 Project Closeout.
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Division 2 through 16.
- D. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

1.03 SUBMITTALS:

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Engineer for approval prior to final execution.

- D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
- E. At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- F. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-in. by 11-in. paper.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.
- H. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer, supplier, and manufacturer.
- I. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name, address, and telephone numbers of the Contractor and equipment supplier.
- J. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.
- K. Schedule of Special Warranties

None

1.04 WARRANTY REQUIREMENT:

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of

Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- A. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.
- B. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- C. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- D. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.05 DEFINITION:

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

SECTION 02050

DEMOLITION AND ALTERATIONS

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Demolish and alter existing facilities as indicated on drawings, as specified, and as directed by Engineer.
- B. Remove, salvage, or otherwise dispose of minor site improvements as specified in Section 02100.

1.02 RELATED WORK:

- A. Section 02100: Site Preparation
- B. Section 02210: Earth Excavation, Backfill, Fill and Grading.

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 - 1. Submit to Engineer for review, a demolition plan describing proposed sequence, methods, and equipment for demolition and disposal of each structure.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Demolish and remove existing construction, utilities, equipment, and appurtenances without damaging integrity of existing structures, equipment, and appurtenances that are to remain.
- C. Store equipment to be salvaged for relocation where directed by Engineer, and if necessary, protect from damage during work.
- D. Repair or remove items that are damaged. Repair and install damaged items at no additional compensation and to condition at least equal to that which existed prior to start of work.
- E. Exercise all necessary precautions for fire prevention. Make acceptable fire extinguishers available at all times in areas where demolition work by burning torches is being done.

Do not burn demolition debris on or near site.

- F. Protect persons and property throughout progress of work. Proceed in such manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel.
- G. Maintain circulation of traffic within area at all times during demolition operations.
- H. Obtain permission from Engineer before abandoning or removing any existing structures, materials, equipment and appurtenances.
- I. Make necessary arrangements with and perform work required by utility companies and municipal departments for discontinuance or interruption of utility services due to demolition work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 DEMOLITION:

- A. Provide three reference points for each survey marker and monument removed, established by a licensed civil engineer or land surveyor and record locations and designations of survey markers and monuments prior to removal.
- B. Store removed markers and monuments during demolition work, and replace upon completion of work. Reestablish survey markers and monuments in conformance with recorded reference points. Forward letter to Engineer signed by licensed civil engineer or land surveyor verifying reestablishment of survey markers and monuments.

3.02 DEMOLITION:

- A. Confine apparatus, storage of materials, demolition work, new construction, and operations of workmen to areas that will not interfere with continued use and operation of entire facility. Provide and maintain lights, barriers, and temporary passageways for free and safe access.
- B. Wet down work during demolition operations to prevent dust from arising. Provide maximum practicable protection from inclement weather for materials, equipment, and personnel located in partially dismantled structures. Provide shoring or bracing where necessary to prevent settlement or displacement of existing or new structures. Do not overload floors. Complete demolition work on upper levels before disturbing supporting members on lower levels.
- C. Clean cellars and tanks of materials unsuitable for fill, where below-grade portions of structures are not indicated to be removed. Demolish foundation walls to a depth of not

less than two-feet below existing ground level. Break cellar and tank floors into pieces having area not more than four-square feet with well-defined cracks through full depth of floor. Provide holes having area at least one-square foot through floors at intervals of ten-feet lengthwise and crosswise.

- A. Fill cellars and tanks with acceptable solid fill resulting from removal operations and/or with suitable borrow material to level of adjacent ground. Place and compact fill in accordance with applicable requirements of Section 02210. Do not place solid fill from removal operation above an elevation one-foot below final grade.
- B. Cap or plug with brick and mortar, as indicated, pipes and other conduits abandoned due to demolition.

3.03 SALVAGE:

- A. Materials, equipment, and appurtenances removed, that are not designated for relocation, become property of Contractor. Haul from site and dispose of at no additional compensation.
- B. Salvage fire hydrants for future use by City. Store in vicinity of original location and place so as not to interfere with construction.

3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02100
SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide labor, material, tools and equipment to prepare site as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

PART 2 - PRODUCTS

2.01 WOOD CHIPS:

- A. Chip from cleared wood.
- B. Provide additional wood chips as directed by Engineer.
- C. DO NOT PERMIT use of elm wood and elm bark as wood chips.

PART 3 - EXECUTION

3.01 EXISTING TREES AND VEGETATION:

- A. Avoid cutting or injuring trees and vegetation outside easement line and outside areas to be cleared as indicated, without Engineer's permission.
- B. Accept responsibility for damages outside these lines.
- C. Remove trees within permanent and temporary easement as designated by Engineer.

3.02 EXISTING STRUCTURES AND PROPERTY:

- A. Remove existing signs, posts, catchbasin frames and grates, manhole frames and covers, and granite curbing within construction path unless directed otherwise.
- B. Store at a site designated by Owner, items in reusable condition as determined by Engineer.
- C. For work in loamed areas, strip loam to one side to avoid mixing with excavation materials. Do not take loam from site.

3.03 CLEARING:

- A. Cut or remove trees, brush, and other vegetable matter such as snags, bark and refuse, from areas to be cleared. Clear ground to width of permanent easement unless otherwise directed.
- B. Cut trees, stumps, and stubs to be cleared, except where clearing done by machinery, as close to ground surface as practicable, but no more than 6 in. above ground surface for small trees and 12 in. for larger trees.
- C. Bury elm bark, at least 1 ft. deep, or burn in incinerators off site with antipollution controls and fire prevention controls, to prevent spread of Dutch Elm disease as required by applicable laws.

3.04 CLEARING IN WOODED AREAS:

- A. Chip and stockpile wood cleared at location directed by Owner. Do NOT PERMIT use of elm wood and elm bark as wood chips.
- B. Chip and spread wood cleared at locations and cover as indicated. Do NOT PERMIT use of elm wood and elm bark as wood chips.
- C. Supply and spread wood chips.

3.05 GRUBBING, STRIPPING, DISPOSAL:

- A. Remove stumps and roots larger than 3 in. in diameter to a depth of 12 in., and roots larger than 1/2 in. in diameter to a depth of 6 in. Measure depths to cut from existing ground surface or proposed finished grade, whichever is lower.
- B. Strip stumps, roots, foreign matter, topsoil, loam and unsuitable earth from ground surface. Utilize topsoil and loam insofar as possible for finished surfacing. Do not take loam from site.
- C. Promptly dispose off site material from clearing and grubbing not reused or stockpiled. In doing so, observe all applicable laws, ordinances, rules and regulations. Do not consider work completed until final cleaning, unless otherwise directed.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Design, furnish, operate, maintain, and remove temporary dewatering systems to control groundwater and surface water to maintain stable, undisturbed subgrades, and permit work to be performed under dry and stable conditions. Work to be done as part of dewatering includes, but is not limited to:
 - 1. Lower the groundwater level.
 - 2. Lower hydrostatic pressure.
 - 3. Prevent surface water from entering the excavation during construction.
 - 4. Implement erosion control measures for disposing of discharge water.
 - 5. Provide groundwater recharging systems as specified and as indicated.
 - 6. Provide and monitor observation wells and geotechnical instrumentation as specified and indicated.
- B. Groundwater within the excavation area shall be lowered to at least 2 feet [60 cm.] below the lowest excavation levels as specified and as indicated.
- C. Common dewatering methods include, but are not limited to, sump pumping, deep wells, well points, vacuum well points or any combinations thereof.
- D. Common groundwater recharge methods include, but are not limited to, deep wells, large sumps or any combination thereof.
- E. The Contractor shall obtain the required permits for discharge from the Contractor's dewatering systems in accordance with 61 FR 19284. The discharge location shall be in accordance with permit requirements.

1.02 RELATED WORK:

- A. Section 01568: Erosion Control Sedimentation and Containment of Construction Materials.
- B. Section 02160: Temporary Excavation Support Systems
- C. Section 02210: Earth Excavation, Backfill, Fill, and Grading
- D. Section 02223: Screened Gravel
- E. Section 02435: Crushed Stone
- F. Section 02273: Geotextile Fabric

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 - 1. Qualification of the Contractor's dewatering specialist's or firm's qualifications a minimum of four (4) weeks prior to execution of any dewatering. The submittal shall include, but not be limited to:
 - a. Qualifications of specialist's or firm's Registered Professional Engineer as specified in Paragraph 1.04 B.
 - b. Qualifications of specialist's or firm's field representative, as specified in paragraph 1.04 B, who shall oversee the installation, operation and maintenance of the dewatering system.
 - 2. Submit a dewatering plan, and, if applicable, a groundwater recharge plan at least two weeks prior to start of any dewatering operation. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
 - a. Dewatering plan and details stamped and signed by a Registered Professional Engineer.
 - b. Certificate of Design: Refer to Section 01300.

- c. A list of equipment including, but not limited to, pumps, prime movers, and standby equipment.
 - d. Detailed description of dewatering, maintenance, and system removal procedures.
 - e. Monitoring plan and details, including, but not limited to, number and locations of observation wells, geotechnical instruments such as settlement markers (reference points on structures), piezometers, and frequency of reading the monitoring devices.
 - f. Erosion/sedimentation control measures, and methods of disposal of pumped water.
 - g. List of all applicable laws, regulations, rules, and codes to which dewatering design conforms.
 - h. List of assumptions made for design of dewatering and for groundwater recharge systems, including but not limited to groundwater levels, soil profile, permeabilities, and duration of pumping and or recharge.
3. Measurement records consisting of observation well groundwater records and the geotechnical instrumentation readings within one day of monitoring.
 4. A modified dewatering plan within 24 hours, if open pumping from sumps and ditches results in boils, loss of fines or softening of the ground.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Employ the services of a dewatering specialist or firm having the following qualifications:
 1. Have completed at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years.
 2. Retain the services of a Registered Professional Engineer (in the state where the project is located) having a minimum of five (5) years experience in the design of well points, deep wells, recharge systems, or equal systems.

3. Retain the services of a field representative having a minimum of 5 years experience in installation of well points, deep wells, recharge systems, or equal systems.
 - C. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.
 - D. Notify the Engineer immediately if any settlement or movement is detected on structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.
 - E. If oil and/or other hazardous materials are encountered after dewatering begins, immediately notify the Engineer.
- 1.05 DELIVERY, STORAGE AND HANDLING:
- A. Provide in accordance with Section 01610 and as specified.

1.06 PROJECT/SITE CONDITIONS:

- A. Subsurface Conditions: Refer to Section 00100.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.
- B. Provide sand and gravel filter around the well screen. Wrapping geotextile fabric directly around the well screen shall not be allowed.
- C. When deep wells, well points, or vacuum well points are used, provide pumping units capable of maintaining high vacuum and handling large volumes of air and water at the same time.
- D. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.

- E. Provide and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.
- F. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.
- G. Provide cement grout having a water cement ratio of 1 to 1 by volume.

PART 3 - EXECUTION

3.01 EXECUTION:

- A. Execution of any earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed and the geotechnical instrumentation has been installed.
- B. Furnish, install and maintain dewatering system in accordance with the dewatering plan.
- C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.
- D. Do not excavate until the dewatering system is operational.
- E. Unless otherwise specified, continue dewatering uninterrupted until all structures, pipes, and appurtenances below groundwater level have been completed such that they will not be floated or otherwise damaged by an increase in groundwater elevation.
- F. Discontinue open pumping from sumps and ditches, if such pumping is resulting in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit to the Engineer at no additional cost to the Owner.
- G. Where subgrade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials in accordance with Section 02210 at no additional cost to the Owner.
- H. Dewatering Discharge:
 - 1. Install and monitor recharge systems when specified and/or indicated and in accordance with the submitted dewatering plan.

2. Install sand and gravel filters in conjunction with well points and deep wells to prevent the migration of fines from the existing soil during the dewatering operation.
3. Transport pumped or drained water to discharge location without interference to other work, damage to pavement, other surfaces, or property.
4. Provide separately controllable pumping lines.
5. The Engineer reserves the right to sample discharge water at any time.
6. Immediately notify the Engineer if suspected contaminated groundwater is encountered. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.

I. Monitoring Devices and Records:

1. Install, maintain, monitor and take readings from the observation wells and geotechnical instruments in accordance with the dewatering plan.
2. Install settlement markers on structures within the zone of influence for dewatering a distance equal to twice the depth of the excavation, from the closest edge of the excavation. Conduct and report settlement surveys to 0.01 ft.
3. For linear excavations such as trenches, the zone of influence for dewatering shall be established by the Contractor's dewatering specialist based on the soil permeability and depth of dewatering.
4. For large rectangular, square or circular mass excavations the zone of influence shall be defined by the actual cone of watering influence corresponding to a 10% increase in effective vertical stress.

J. Install and maintain erosion/sedimentation control devices at the point of discharge as indicated or specified and in accordance with the dewatering plan.

K. Removal:

1. Do not remove dewatering system without written approval from the Engineer.

2. Backfill and compact sumps or ditches with screened gravel or crushed stone wrapped with geotextile fabric in accordance with Section 02210.
3. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with section 01700.

END OF SECTION

SECTION 02160

TEMPORARY EXCAVATION SUPPORT SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Design, furnish and install temporary excavation support systems as required to maintain lateral support, prevent loss of ground, limit soil movements to acceptable limits and protect from damage existing and proposed improvements including, but not limited to, pipelines, utilities, structures, roadways, railroads and other facilities.
- B. The requirement of sheeting left in place in areas indicated on the drawings does not relieve the Contractor from the responsibility of furnishing and installing proper temporary excavation support systems in other areas.
- C. Common types of excavation support system include, but are not limited to, singular or multiple stages comprised of cantilevered or internally braced soldier piles and lagging, steel sheetpile wall, timber sheetpile wall, trench box, or combinations thereof. Trench box temporary excavation support system is only acceptable for pipe or utility trench excavations. Temporary unsupported open cut excavation with stable sloping sides is allowed where applicable.
- D. Wherever the word "sheeting" is used in this section or on the contract drawings, it shall be in reference to any type of excavation support system specified except trench box.
- E. Construction of the temporary excavation support systems shall not disturb the existing structures or the completed proposed structures. Damage to such structures shall be repaired by the Contractor at no additional cost to the Owner.
- F. Adjacent structures are those that are bear upon soils above the proposed excavation depth and within a distance equal to twice the total depth of the excavation away from the closest edge of the excavation. Monitor and protect adjacent structures as specified and indicated.
- G. The Contractor shall bear the entire cost and responsibility of correcting any failure, damages, subsidence, upheaval or cave-ins as a result of improper installation, maintenance or design of the temporary excavation support systems. The Contractor shall pay for all claims, costs and damages that arise as a result of the work performed at no additional cost to the Owner.

1.02 RELATED WORK:

- A. Section 02140: Dewatering
- B. Section 02210: Earth Excavation, Backfill, Fill, and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):
 - 1. A36: Standard Specification for Structural Steel
 - 2. A328: Standard Specification for Steel Sheet Piling
 - 3. A416: Standard Specification for Strand Steel, Uncoated Seven-Wire for Prestressed Concrete
 - 4. A722: Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete
 - 5. A615: Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- B. American Wood-Preserves Association (AWPA) Standards.
- C. American Welding Society (AWS) Code: D1.1.
- D. Federal Standard, FS TT-W-571: Wood Preservation and Treating Practices.
- E. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.
- F. American Concrete Institute (ACI)
 - 1. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 - 1. Submit the following qualifications four (4) weeks prior to the construction:
 - a. Qualifications of Contractor's temporary excavation support system designer as specified in Paragraph 1.05 G.

- b. Qualifications of Contractor's temporary excavation support system installer as specified in Paragraph 1.05 H.
 - c. Qualifications of Contractor's independent tieback testing laboratory as specified in Paragraph 1.05 I, if a tieback system is utilized.
 - d. Qualifications of Contractor's temporary excavation support system installation supervisor as specified in Paragraph 1.05 J.
2. Submit a temporary excavation support plan stamped and signed by a Registered Professional Engineer at least two weeks prior to start of the construction. Do not submit design calculations. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
- a. Proposed temporary excavation support system(s), details, location, layout, depths, extent of different types of support relative to existing features and the permanent structures to be constructed, and methods and sequence of installation and removal.
 - b. Certificate of Design: Refer to Section 01300.
 - c. A list of all design assumptions, including safety factors used for the temporary excavation support system(s) and all lateral pressures used for each system.
 - d. If utilizing a tieback system, include tieback installation procedures and criteria for acceptance of tiebacks for performance and proof tests. Submit the tieback testing results to the Engineer for information only.
 - e. Requirements of dewatering during the construction.
 - f. Minimum lateral distance from the edge of the excavation support system for use for vehicles, construction equipment, and stockpiled construction and excavated materials.
 - g. List of equipment used for installing the excavation support systems.
3. Submit a Construction Contingency Plan specifying the methods and procedures to maintain temporary excavation support system stability if the allowable movement of the adjacent ground and adjacent structures is

exceeded.

4. For excavation support systems left in place, submit the following as-built information prior to backfilling and covering the excavation support systems:
 - a. Survey locations of the temporary excavation support systems, including coordinates of the ends and points of change in direction.
 - b. Type of the temporary excavation support system.
 - c. Elevations of top and bottom of the excavation support systems left in place.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Conform to the requirements of the OSHA Standards and Interpretations: "Part 1926 Subpart P - Excavation, Trenching, and Shoring", and all other applicable laws, regulations, rules, and codes.
- C. Prepare design, including calculations and drawings, under the direction of a Professional Engineer registered in the state where the project is located and having the following qualifications:
 1. Not less than ten (10) years experience in the design of specific temporary excavation support systems to be used.
 2. Completed not less than five (5) successful temporary excavation support system projects of equal type, size, and complexity within the last five (5) years.
- D. Temporary Excavation Support System Installer's Qualifications:
 1. Not less than three (3) year experience in the installation of similar types and equal complexity as the proposed system.
 2. Completed not less than three (3) successful excavation support systems of similar type and equal complexity as the proposed system.
- E. If utilizing a tieback system, employ an independent testing laboratory to test the tieback system with the following qualifications:

1. Be accredited by the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program.
 2. Employ personnel conducting testing who are trained in the methods and procedures to test and monitor tieback systems of similar type and equal complexity, as the proposed system.
 3. Have not less than five (5) years experience in testing of tieback systems of similar type and equal complexity as the proposed system.
 4. Have successfully tested at least three (3) tieback systems of similar type and equal complexity as the proposed system.
- F. Install all temporary excavation support systems under the supervision of a supervisor having the following qualifications:
1. Not less than five (5) years experience in installation of systems of similar type and equal complexity as the proposed system.
 2. Completed at least five (5) successful temporary excavation support systems of similar type and equal complexity as the proposed system.
- G. All welding shall be performed in accordance with AWS D1.1.

1.06 DESIGN CRITERIA:

- A. Design of temporary excavation support systems shall meet the following minimum requirements:
1. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, temporary stockpiles, construction loads, roadways, railroads, and other surcharge loads.
 2. Design a bracing system to provide sufficient reaction to maintain stability.
 3. Limit movement of ground adjacent to the excavation support system to be within the allowable ground deformation as specified.
 4. Design the embedment depth below bottom of excavation to minimize lateral and vertical earth movements and provide bottom stability. Toe of braced temporary excavation support systems shall not be less than 5 feet [1.5 m] below the bottom of the excavation.

5. Design temporary excavation support systems to withstand an additional 2 feet [60 cm] of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.
6. Maximum width of pipe trench excavation shall be as indicated on the drawings.
7. Do not cast permanent structure walls directly against excavation support walls.
8. The design location of the excavation support wall shall be determined such that the installed wall and bracing system components are all located outside the limits of the permanent structure. Construction tolerances (e.g. wall verticality) shall be considered in determining the plan location.

1.07 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Sections 01610 and as specified.
- B. Store sheeting and bracing materials to prevent sagging which would produce permanent deformation. Keep concentrated loads which occur during stacking or lifting below the level which would produce permanent deformation of the material.

1.08 PROJECT/SITE CONDITIONS:

- A. Subsurface Conditions: Refer to Section 00100.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Structural Steel: All soldier piles, wales, rakers, struts, wedges, plates, waterstop and accessory steel shapes shall conform to ASTM A36.
- B. Steel Sheet Piling: ASTM A328, continuous interlocking type.
- C. Timber Lagging Left in Place: Pressured treated per appropriate AWPA standards.
- D. Tieback Tendons: Tieback tendons shall be high strength steel wire strand cables conforming to ASTM A416, or bars conforming to ASTM A722. Splicing of individual cables shall not be permitted.
- E. Raker Ties: ASTM A615 Grade 60.

- F. Cement Grout Materials And Admixtures For Tieback Anchorages: Grout cube strength shall be a minimum 3500 psi at 7 days and 5000 psi at 28 days.
- G. Concrete: Section 03300.
- H. Tamping tools adapted for backfilling voids after removal of the excavation support system.
- I. Provide specific trench box sizes for each pipe and utility excavation with structural capacity of retaining soil types as described in OSHA's 29 CFR Part 1926 Subpart P.

2.02 EQUIPMENT:

- A. A vibratory hammer shall be utilized for driving the temporary sheet piling providing that such operations do not exceed vibration/noise requirements of the specifications. Impact hammer shall be utilized when vibratory hammer is unable to drive temporary sheet piling to required depth and/or unable to meet vibration requirements. Impact hammer shall also meet noise requirement.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Installation of the temporary excavation support systems shall not commence until the related earth excavation and dewatering submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed.
- B. Install excavation support systems in accordance with the temporary excavation support plan.
- C. If utilizing a tieback system, all performance and proof tests shall be conducted in the presence of the Engineer. Testing performed without the Engineer present will not be accepted. Repeat testing in the Engineer's presence at no additional cost to the Owner.
- D. Do not drive sheeting within 100 feet [30 m] of concrete less than seven (7) days old.
- E. Carry out program of temporary excavation support in such a manner as to prevent undermining or disturbing foundations of existing structures of work ongoing or previously completed.
- F. Bottom of the trench box excavation support system shall be above the pipe invert prior to installing the pipe.

- G. Install and read geotechnical instrumentation in accordance with the temporary excavation support plan. Notify the Engineer immediately if any geotechnical instrumentation is damaged. Repair or replace damaged geotechnical instrumentation at the sole option of the Engineer and at no additional cost to the Owner.
- H. Continuously monitor movements of the ground adjacent to excavation support systems and adjacent structures. In events of the measured movements approaching or exceeding the allowable movements, take immediate steps to arrest further movement by revising procedures such as providing supplementary bracing, filling voids behind the trench box, supporting utilities or other measures (Construction Contingency Plan) as required.
- I. Notify utility owners if existing utilities interfere with the temporary excavation support system. Modify the existing utility with the utility owners permission or have the utility owner make the modifications at no additional cost to Owner.

3.02 GROUND DEFORMATION ADJACENT TO EXCAVATION SUPPORT SYSTEMS:

- A. Allowable Vertical (heave/settlement) and Lateral Movements: 2 inches [5 cm] maximum for the trench box excavation support system, and 1 inch [2.5 cm] maximum for other types of excavation support systems at any location behind the excavation support system.
- B. Monitoring personnel shall use a procedure for reading and recording geotechnical instrumentation data which compares the current reading to the last reading during data collection to eliminate spurious readings.
- C. Plot the observed ground deformation readings versus time. Annotate the plots with construction loading and excavation events having an impact on the readings. Evaluate plots by means of secondary rate-of-change plots to provide early warning of accelerating ground movements.
- D. Notify the Engineer when the allowable ground deformation is exceeded.
- E. Implement Construction Contingency Plan under direction of the temporary excavation support system designer and the Engineer.

3.03 REMOVAL OF EARTH RETENTION SYSTEM:

- A. When indicated or approved by the Engineer, remove the temporary excavation support system without endangering the constructed or adjacent structures, utilities, or property. Immediately backfill all voids left or caused by withdrawal of

temporary excavation support systems with bank-run gravel, screened gravel or select borrow by tamping with tools specifically adapted for that purpose.

- B. When tiebacks are used, release tension in tiebacks as the excavation is backfilled. Do not leave tensioned tieback in place at the completion of the work.
- C. The excavation support system left-in-place shall be cut-off a minimum of 2 feet below the bottom of the next higher foundation level or a minimum of 5 feet below finished grade.
- D. Conduct survey of the locations and final cut-off elevations of the excavation support systems left in place.

3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02210

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Perform the following earth excavation, backfill, fill and grading as indicated or specified:
 - 1. Make excavations to accommodate piping, conduits, foundations and other structures.
 - 2. Provide materials for backfilling excavations and constructing embankments and fills as indicated and specified.
 - 3. Construct embankments of compacted materials.
 - 4. Grade surfaces to meet finished grades indicated.
 - 5. Immediately notify the Engineer if suspected hazardous materials are encountered and cease operations in that part of work.
 - 6. Remove boulders within the excavation limits.

1.02 RELATED WORK:

- A. Section 01568: Erosion Control Sedimentation and Containment of Construction Materials.
- B. Section 02100: Site Preparation.
- C. Section 02140: Dewatering
- D. Section 02160: Temporary Excavation Support Systems
- E. Section 02211: Rock Excavation and Disposal
- F. Section 02223: Screened Gravel
- G. Section 02224: Bank-run Gravel
- H. Section 02225: Select Borrow

- I. Section 02273: Geotextile Fabric
- J. Section 02435: Crushed Stone
- K. Section 03346: Cast-in-Place Concrete for Utility Work

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM) Publications:

1. C33: Specification for Concrete Aggregates.
2. C136: Sieve Analysis of Fine and Coarse Aggregates.
3. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
4. D422: Test Method for Particle-Size Analysis of Soils.
5. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 Fm) Sieve.
6. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
7. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (600 kN-m/m³)).
8. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
9. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
10. D4718: Practice for Correction of Unit Weight and Water Content for Soils Containing Oversized Particles.
11. D4944: Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Pressure Tester Method.
12. D4959: Test Method for Field Determination of Water (Moisture) Content of Soil by Direct Heating Method.
13. D5080: Test Method for Rapid Determination of Percent Compaction.

14. D6938: Standard Test method for In-Place Density and Water Content of Soil and Soil-Aggregate by nuclear Methods (Shallow Depth)

B. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.

1.04 DEFINITIONS:

A. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM D1556 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.

B. Proof Roll: Compaction with a minimum of 4 passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller can not be used.

C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inch [15 cm] in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.

D. Unacceptable Materials: Materials that do not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

1.05 SUBMITTALS:

A. Submit the following in accordance with Section 01300:

1. Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.06 I, four (4) weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.

2. Submit an excavation, backfilling, and filling plan at least two weeks prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:

a. Detailed sequence of work.

- b. General description of construction methods.
 - c. Numbers, types, and sizes of equipment proposed to perform excavation and compaction.
 - d. Details of dust control measures.
 - e. Proposed locations of stockpiled excavation and/or backfill materials.
 - f. Proposed surplus excavated material off-site disposal areas and required permits.
 - g. Details of erosion and sedimentation control measures which will prevent erosion and sedimentation during the earth moving activities.
3. The following material submittals shall be submitted to the Engineer prior to backfilling and filling:
- a. Screened Gravel: As specified in Section 02223.
 - b. Bank-run Gravel: As specified in Section 02224.
 - c. Select Borrow: As specified in Section 02225.
 - d. Crushed Stone: As specified in Section 02435.
 - e. Other Acceptable Materials: Laboratory testing results of gradation and moisture-density relationship. Submittal shall include specific location of the source and the date when sample was taken.
4. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and percentage of compaction to the Engineer before placing the next lift or constructing foundations.

1.06 QUALITY ASSURANCE AND CONTROL:

- A. Provide in accordance with Section 01400 and as specified.
- B. Dewatering and Groundwater Control: Provide and maintain as specified in Section 02140.
- C. Excavations shall be performed in the dry, and kept free from water, snow and ice during construction. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.

- D. Temporary Excavation Support Systems: Provide and maintain as specified in Section 02160.
- E. Permanent Earth Retention Systems: Provide and maintain as specified in Section 02161.
- F. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- G. Do not excavate, construct embankments, or fill until all the required submittals have been reviewed by the Engineer.
- H. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.
- I. Employ an independent testing laboratory to perform particle size and gradation analyses in accordance with ASTM D422, and to determine compactibility in accordance with ASTM D1557 for all the proposed backfill and fill materials, and monitoring field compaction operations. The Contractor's independent testing laboratory shall have the following qualifications:
 - 1. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program.
 - 2. Have three (3) years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.
 - 3. Able to provide three (3) references from previous work.
- J. Field Testing and Inspections:
 - 1. By Contractor's independent testing laboratory, acceptable to the Engineer, at Contractor's expense as specified in Paragraph 1.06 K.
 - 2. Location of tests mutually acceptable to testing laboratory and the Engineer or as directed by the Engineer.
 - 3. In the event compacted material does not meet specified in-place density, recompact material and retest this area until specified results are obtained at no

additional to the Owner.

4. Contractor's testing laboratory to perform inspection at least once daily to confirm lift thickness and compaction effort for entire fill area.
5. Owner may retain the services of an independent testing laboratory to conduct confirmatory testing and inspection.

K. Methods of Field Testing:

1. In-Place Density: ASTM D1556, ASTM D2167, or ASTM D6938.
2. In-Place Moisture Content: ASTM D6938, ASTM D4944, or ASTM D4959.

L. Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill, grading and embankment.

1. Field In-Place Density and Moisture Content - Screened gravel and crushed stone shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than one test per:
 - a. Trenches under structures foundation preparation or roadways subbase: Every 1000 lin. ft. [300 m.] per lift.
 - b. Trenches in areas without structures or roadways: Every 1000 lin. ft. [300 m.] per alternate lift.
 - c. Paved Roadways: Every 200 lin. ft. [60 m.] per lift.
 - d. Paved Areas: 3,500 sq. ft. [350 sq. m.] per lift.
 - e. Under Structure: 1,000 sq. ft. [100 sq. m.] per lift.
 - f. Around Structures: 1,500 sq. ft. [150 sq. m.] per lift.
 - g. Embankment Fills: 10,000 sq. ft. [1000 sq. m.] per lift.
2. Moisture Density - One per source, except for screened gravel and crushed stone. Repeat the moisture density test for every 5,000 cubic yard of material use, and whenever visual inspection indicates a change in material gradation as determined by the Engineer.

3. Gradation Analysis - A minimum of one per source and for each moisture density test and whenever visual inspection indicates a change in material gradation.
4. Liquid Limit, Plastic Limit and Plasticity Index - Minimum of one test per 5,000 cubic yard [3825 cubic meter] of soil for use as fill material and whenever classification of material is in doubt as determined by the Engineer.
5. Owner's testing laboratory may conduct confirmatory testing at a minimum frequency of 25% of the specified frequencies in paragraph 1.06.L, or as directed by Owner's Engineer.

M. Construction Tolerances:

1. Construct finished surfaces to plus or minus 1 inch [2.5 cm] of the elevations indicated.
 2. Grade cut and fill areas to plus or minus 0.20 foot [6.0 cm] of the grades indicated.
 3. Complete embankment edges to plus or minus 6 inches [15 cm] of the slope lines indicated.
 4. Provide the Engineer with adequate survey information to verify compliance with above tolerances.
- N. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.
- O. Pipes, drains, and other utilities may exist in certain locations not indicated on drawings. No attempt has been made to show all services. Completeness or accuracy of information given is not guaranteed.
- P. Dig test pits considered as incidental to the normal excavation as indicated and specified in this Section, at no additional compensation. When the Engineer orders test pits beyond limits of excavation, payment for such test pits shall be as specified in Section 01025.
- Q. Carefully support and protect from damage, existing pipes, poles, wires, fences, curbing, property line markers, and other structures, which the Engineer determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

- R. Whenever certain existing structures, as described below, are encountered, and the Engineer so directs, change the location, remove and later restore, or replace such structures, or assist the Owner in doing so. Such work to be paid for under applicable items of work, otherwise as Extra Work.
- S. In removing existing pipes or other structures, include for payment only those new materials which are necessary to replace those unavoidably damaged as determined by the Engineer.
- T. The preceding two paragraphs apply to pipes, wires, and other structures which meet the following: (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer, will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.
- U. Restore existing property or structures as promptly as practicable.
- V. If material unacceptable for foundation (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, remove such material to the required width and depth as directed by the Engineer and replace it with screened gravel, select borrow, or concrete.
- W. Do not remove excavation materials from the site of the work or dispose of except as directed or permitted by the Engineer.
- X. Haul away and dispose of surplus excavated materials at locations directed by the Engineer at no additional cost to the Owner.
- Y. During progress of work, conduct earth moving operations and maintain work site so as to minimize the creation and dispersion of dust. Furnish and spread calcium chloride if the Engineer decides that it is necessary for more effective dust control.
- Z. Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to private property during construction, and remove said structures thereafter.

1.07 SITE CONDITIONS:

- A. Subsurface Conditions: Refer to Section 00100.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Use only acceptable materials from excavations or borrows.
- B. Unsuitable material is not suitable for use as select borrow.
- C. Provide 1,500 psi [10 MPa] concrete, screened gravel, bank-run gravel, fine aggregate, select borrow, and crushed stone.
- D. Provide Fine Aggregate conforming to ASTM C33.
- E. Provide erosion/sedimentation control devices as indicated, including geotextile fabric in accordance with Section 02273.
- F. Provide geotextile fabric as indicated, meeting the requirements and conforming to Section 02273.

2.02 EQUIPMENT:

- A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:
 - 1. Manually operated vibratory plate compactors weighing no less than 200 pounds [90 kg] with vibration frequency no less than 1600 cycles per minute.
 - 2. Vibratory steel drum or rubber tire roller weighing at least 12,000 pounds [5450 kg].

PART 3 - EXECUTION

3.01 SITE MAINTENANCE:

- A. Roadway and Site Leveling: Grade roadway and site as to maintain them in a level unrutted condition and to eliminate puddling of surface and subsurface water.

3.02 EXCAVATION:

- A. Execution of any earth excavation shall not commence until the related dewatering, excavation support systems, and backfill and fill materials submittals are reviewed by the Engineer and all Engineer's comments satisfactorily addressed.
- B. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.
- C. Excavate to widths that give suitable room for building structures or laying and jointing piping.
- D. Do not plow, scrape or dig by machinery near to finished subgrade in a manner that would result in disturbance of subgrade.
- E. Excavate to lines and grades indicated in an orderly and continuous program.
- F. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.
- G. Excavate to elevations indicated, or deeper, as directed by the Engineer, to remove unacceptable bottom material.
- H. Exercise care to preserve material below and beyond the lines of excavations.
- I. Place excavated material at the approved stockpile locations and in no case closer than 3 feet [90 cm] from edge of excavations to prevent cave-ins of bank slides.
- J. Regard small, less than two cubic yards, boulders, rock fragments, and concrete encountered during excavation as a normal part of in-place soils and not included for payment as rock.
- K. Excavate for depressed foundations, where mat foundations are indicated as depressed. Sheet and shore existing ground so that adjacent sections of foundation mat will rest on undisturbed ground as indicated. Installation of sheeting shall be in accordance with Section 02160.

3.03 SEPARATION OF EXCAVATED MATERIALS FOR REUSE:

- A. Remove only existing pavement that is necessary for prosecution of work.
- B. Carefully remove loam and topsoil from excavated areas. Store separately for further use or furnish equivalent loam and topsoil as directed.

- C. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material.

3.04 TRENCH EXCAVATION:

- A. When pipe is to be laid in gravel bedding or concrete cradle, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.
- B. When pipe is to be laid directly on bottom of trench, do not excavate lower part of trenches by machinery to subgrade. Remove remainder of material to be excavated just before placing of pipe by use of hand tools. Form a flat or shaped bottom, true to grade, so pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

3.05 DEPTH OF TRENCH:

- A. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.

3.06 WIDTH OF TRENCH:

- A. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.
- B. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. [30 cm] above top of pipe.

3.07 TRENCH EXCAVATION IN FILL:

- A. Place and compact material to top of fill or to a minimum height of 1 ft. [30 cm] above top of pipe, whichever is less, when pipe is to be laid in embankment or other recently filled material. Take particular care to ensure maximum consolidation of material under pipe location. Excavate pipe trench as though in undisturbed material.

3.08 EXCAVATION NEAR EXISTING STRUCTURES:

- A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.

- B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

3.09 REMOVAL OF SUBSURFACE OBSTRUCTIONS:

- A. Remove indicated subsurface structures and related obstructions to extent shown.
- B. Promptly notify the Engineer when any unexpected subsurface facilities are encountered during excavation such as utility lines and appurtenances, walls and foundations.

3.10 UNAUTHORIZED EXCAVATION:

- A. When the bottom of any excavation for structures is taken out beyond limits indicated or specified, backfill, with screened gravel and crushed stone wrapped with non-woven geotextile fabric or with 1,500 psi (10 Mpa) concrete.

3.11 REUSE AND DISPOSAL OF SURPLUS EXCAVATED MATERIALS:

- A. Reuse surplus acceptable excavated materials for backfill; deposit neatly and grade so as to make or widen fills, flatten side slopes, or fill depressions; or legally dispose off-site; all as directed or permitted and without additional compensation.

3.12 SUBGRADE PREPARATION AND PROTECTION:

- A. Remove loam and topsoil, loose vegetable matter, stumps and large roots from areas upon which embankments will be built or material will be placed for grading. Shape subgrade as indicated on drawings, and prepare by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.
- B. As directed by the Engineer, overexcavate unacceptable materials below the foundation subgrade. Backfill the overexcavation with compacted screened gravel or crushed stone wrapped with nonwoven geotextile fabric. In no case shall the screened gravel be placed directly on the exposed subgrade prior to placing the geotextile fabric.
- C. Proof roll the foundation subgrade prior to backfilling and filling operation, or placing foundation concrete.
- D. Proof roll the pipe trench foundation subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.
- E. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench foundation subgrade to avoid disturbance of the bearing

surface. Tamp the exposed subgrade with the excavating bucket prior to backfilling and filling operation, or placing soil-supported pipeline.

3.13 CARE AND RESTORATION OF PROPERTY:

- A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Operate excavating machinery and cranes of suitable type with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
- B. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed.
- C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dig up and temporarily replant and maintain. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured to such a degree as to effect their growth or diminish in their beauty or usefulness, replace by items of equal kind and quality existing at the start of the work.
- D. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces.
- E. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

3.14 BACKFILLING - GENERAL:

- A. Do not place frozen materials in backfill or place backfill upon frozen material. Remove previously frozen material or treat before new backfill is placed.
- B. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.
- C. Do not use puddling, ponding or flooding as a means of compaction.

3.15 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS:

A. Select Borrow, and Fine Aggregate:

1. Dump and spread in layers not to exceed 8-in. [20 cm] uncompacted thickness.
2. Compact, fill and backfill under structure and bedding for pipes (from below pipe to spring line) as indicated but to not less than 95 percent. Compact to not less than 90 percent in other areas unless otherwise indicated.

B. Screened Gravel and Crushed Stone:

1. Dump and spread in layers not to exceed 8-in. [20 cm] uncompacted thickness.
2. Compact using self propelled vibratory steel drum or rubber tire rollers with a minimum of 4 passes in directions perpendicular to one another in open areas. In small areas, use manually operated vibratory plate compactors with a minimum of 4 passes.

C. Bank-run Gravel and Acceptable materials for use as non-structural fill:

1. Dump and spread in layers not to exceed 12-in. [30 cm] uncompacted thickness.
2. Compact to not less than 90 percent unless otherwise indicated.

D. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the testing laboratory has advised the Engineer that adequate densities are obtained.

3.16 STRUCTURAL FILL AND BACKFILL UNDER STRUCTURES:

- #### A. Compact fill and backfill under structures and pavements with screened gravel, crushed stone, select borrow, or fine aggregate as specified and indicated.

3.17 NON-STRUCTURAL BACKFILL AROUND STRUCTURES:

- #### A. Use acceptable materials for non-structural backfill around structures and compacted as specified and indicated.
- #### B. Conduct hydraulic testing as soon as practicable after structures are constructed and other necessary work has been done. Start backfilling promptly after completion of tests.
- #### C. Deposit material evenly around structure to avoid unequal soil pressure.

- D. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage.

3.18 BACKFILLING PIPE TRENCHES:

A. General:

1. Begin backfilling and proceed until completed after: the pipes and conduits have been laid, joints have acquired maximum degree of hardness, pipelines and conduits have successfully passed tests and inspections as required in the Specifications, and concrete or masonry structures within the trench have reached their design strength to support all loads.
2. Backfill and compact indicated material under, around, and above pipes, conduits, and other structures to the indicated or specified compaction density requirement. Utilize compaction devices which will not damage the pipe, conduit, or structure within the trench.
3. Do not drop backfill material into trench from a height of more than 5 ft. [150 cm], or in a manner which will damage the pipe, conduit, or other structure within trench.

B. Pipe Trenches:

1. Materials:
 - a. From below pipe to 1 ft. [30 cm] above top of pipe: Use screened gravel, or crushed stone, unless otherwise indicated.
 - b. One foot [30 cm] above top of pipe to finished grade or to pavement subbase: Use bank-run gravel or acceptable materials, unless otherwise indicated.
2. Compacting Around Pipes: Compact material around circumference of pipe and the area between the trench wall and the pipe by hand tamping in 6 inches [15 cm] layers.
3. Compacting Above Pipe: Compact material by hand tamping. If trench width is wide enough to accommodate power tools and the compacted material over the pipe will support the load of the power tools without damage to the pipe, use rollers or other powered compaction equipment able to more readily achieve compaction requirements.

3.19 MATERIAL FOR FILLING AND EMBANKMENTS:

- A. Use acceptable materials for filling and building embankments unless otherwise indicated.

3.20 PLACING AND COMPACTING EMBANKMENT MATERIAL:

- A. Compact fill material as specified and indicated.
- B. Perform fill operation in an orderly and systematic manner using equipment in proper sequence to meet the specified compaction requirements.
- C. Place fill on surfaces which are free of unacceptable materials.
- D. Begin filling in lowest section of work area. Grade surface of fill approximately horizontal but provide with sufficient longitudinal and transverse slope to allow for runoff of surface water from every point.
- E. Conduct filling so that no obstruction to drainage from other sections of fill area is created at any time.
- F. Install temporary dewatering sumps in low areas during filling operation where excessive amounts of rain runoff collect.
- G. Reduce moisture content of fill material, if necessary, in source area by working it over under warm and dry atmospheric conditions. A large disc harrow with two to three foot diameter disks may be required for working soil in a drying operation.
- H. Compact uniformly throughout. Keep surfaces of fill reasonably smooth and free from humps and hollows which would prevent proper and uniform compaction. Do not permit hauling equipment to follow a single track on the same layer but direct equipment to spread out to prevent overcompaction in localized areas. Take care in obtaining thorough compaction at edges of fill.
- I. Slightly slope surface of fill to ensure drainage during periods of wet weather. Do not place fill while rain is falling or after a rain-storm until the Engineer considers conditions satisfactory. During such periods and upon suspension of filling operations for any period in excess of 12 hours, roll smooth the surface of fill using a smooth wheel static roller to prevent excessive absorption of rainfall and surface moisture. Prior to resuming compaction operations, remove muddy material off surface to expose firm, compacted material, as determined by the Engineer.
- J. When fill is placed against an earlier fill or against in-situ material under and around structures, including around piping beneath structures or embankments, slope junction

between two sections of fill, 1 vertical to 1.5 horizontal. Bench edge of existing fill 24-in. [60 cm] to form a serrated edge of compact stable material against which to place the new fill. Ensure that rolling extends over junction between fills.

- K. When fill is placed directly upon another older fill, clean surface thoroughly of debris and remove any loose material. Then proof roll the entire old surface.
- L. After spreading each loose lift to the required thickness and adjusting its moisture content as necessary, roll with sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Do not make additional passes until previous pass has been completed.
- M. In case material of any fill sinks and weaves under roller or under hauling units and other equipment, required degree of compaction is not being obtained. Reduce the moisture content. If such sinking and weaving produces surface cracks, suspend operations on that part of the embankment until it becomes sufficiently stabilized. Ideal condition in fill is that attained when the entire fill below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as roller passes. Spread out rolling operations over the maximum practicable area to minimize condition of sinking and weaving.
- N. If because of defective workmanship, compaction obtained over any area is less than that required, remedy condition at no cost to Owner. If additional rolling or other means fail to produce satisfactory results, remove material in that area down to a level of satisfactory density. Perform removal, replacement, and rerolling without additional compensation.

3.21 COMPACTION CONTROL OF BACKFILL, FILL, AND EMBANKMENT:

- A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed as specified or if not specified, at a level slightly lower than optimum.
- B. The soil testing laboratory shall provide inspection during filling or backfilling operations to ensure compaction of screened gravel or crushed stone and record compaction equipment in use.
- C. Moisture control may be required either at the stockpile area, pits, or on embankment or backfill. Increase moisture content when material is too dry by sprinkling or other means of wetting uniformly. Reduce moisture content when material is too wet by using ditches, pumps, drainage wells, or other devices and by exposing the greatest possible area to sun and air in conjunction with harrowing, plowing, spreading of material or any other effective methods.

3.22 ALLOWANCE FOR SHRINKAGE:

- A. Build embankments or backfill to a height above finished grade which will, in the opinion of the Engineer, allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.
- B. Supply specified materials and build up low places as directed, without additional cost if embankment or backfilling settles so as to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

3.22 ROADWAY SUBBASE FINE GRADING

A. EXAMINATION

1. Verify site conditions.
2. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.
3. Verify existing conditions before starting work.
4. Entirety of Court Street from connection to existing storm on the downstream side of project to the connection to the existing sanitary on the upstream side of the project, shall have all bituminous concrete pavement removed from edge of road to edge of road.
5. Where the bituminous pavement has been removed, the contractor will be required to fine grade the entirety of Court Street.

B. PREPARATION

1. Temporary and permanent erosion control shall be installed and maintained in accordance with the current Maine DEP Best Management Practices Manual for Erosion and Sedimentation Control before construction shall begin.
2. Identify required lines, levels, contours, and datum.
3. Stake and flag locations of known utilities.
4. Locate, identify, and protect utilities indicated to remain, from damage.

5. Notify utility company before removing or relocating utilities.
6. Protect above and below grade utilities indicated to remain.
7. Protect plant life, lawns, and other features remaining as portion of final landscaping.
8. Protect benchmarks, survey control point, property pins, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

C. SUBSOIL EXCAVATION

1. Excavate subsoil from marked areas.
2. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
3. When excavating through roots, perform Work by hand and cut roots with sharp axe or saw.
4. Remove excess subsoil not intended for reuse, from site.
5. Stability: Replace damaged or displaced subsoil as specified for fill.

D. FILLING

1. Install work in accordance with current version of the State of Maine, Department of Transportation, Standard Specifications - Highways and Bridges.
2. Fill areas to contours and elevations with unfrozen materials.
3. Place fill material on continuous layers and compact in accordance with schedule in Backfilling
4. Maintain optimum moisture content of fill materials to attain required compaction density.
5. Slope grade away from building minimum ¼" inch per foot, unless noted otherwise.
6. Make grade changes gradual. Blend slope into level areas.

7. Remove surplus fill materials from site.
8. Verify site conditions.
9. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.
10. Verify existing conditions before starting work.

3.23 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02211

ROCK EXCAVATION AND
DISPOSAL
(BLASTING NOT ALLOWED)

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and excavate and dispose of rock and boulders as shown on the Drawings and as specified herein.
- B. Blasting will not be permitted on this project.

1.02 DEFINITION OF ROCK:

- A. SECTION 01080, Abbreviations and Definitions

1.03 RELATED SECTIONS

- B. SECTION 02210, Earth Excavation, Backfill and Grading

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 GENERAL

- A. Rock in pipe trenches shall be excavated so as to be not less than 6 inches below the pipe after it has been laid. The width shall be as shown on the Drawings. Before the pipe is laid, the pipe bedding shall be installed to the correct subgrade with thoroughly compacted suitable material that is the same material as that required for bedding the pipe, furnished and placed at the expense of the Contractor.

- B. Rock at structures shall be excavated so as to be no less than 6 inches below the bottom of the structure slab. The width shall be 2 feet beyond the outside wall of the structure. Before the structure is laid, the structure bedding shall be installed to the correct subgrade with thoroughly compacted suitable material that is the same material that is required for bedding the structure, furnished and placed at the expense of the Contractor.

3.02 EXCESS ROCK EXCAVATION

- A. If rock is excavated beyond the limits of payment indicated on the Drawings and Specifications, the excess excavation, whether resulting from over breakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below in this Section.
- B. In pipe trenches, excess excavation below the elevation of the top of the bedding, cradle, or envelope shall be filled with material of the same type, placed and compacted in the same manner, as specified for the bedding, cradle, or envelope. Excess excavation above said elevation shall be filled as specified in Section 02210.
- C. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with concrete. Other excess excavation shall be filled as specified in Section 02210.

3.03 PREPARATION OF ROCK SURFACES

- A. Whenever so directed during the progress of the work, the Contractor shall remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly, using steam to melt snow and ice, if necessary. Water in depressions shall then be removed as required so that the whole surface of the designated area can be inspected to determine whether seams or other defects exist.
- B. The surfaces of rock foundations shall be left sufficiently rough to bond well with the concrete to be built thereon, and if required, shall be cut to rough benches or steps.
- C. Before any masonry or embankment is built on or against the rock, the rock shall be scrupulously freed from all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, ice, snow, and other objectionable substances. Picking, barring, wedging, streams of water under sufficient pressure, stiff brushes, hammers, steam jets, and other effective means shall be used to accomplish this cleaning. All free water left on the surface of the rock shall be removed.

3.04 DISPOSAL OF EXCAVATED ROCK

- A. Excavated rock shall be disposed of in accordance with Section 02210.

3.05 BACKFILLING ROCK EXCAVATIONS

- A. Where rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified under Section 02210.

3.06 BLASTING

- A. Blasting as a means to excavate rock SHALL NOT be permitted in this Contract.
- B. The Contractor shall submit to the Engineer details of the equipment that is to be used for rock excavation.

END OF SECTION

SECTION 02223
SCREENED GRAVEL

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide and compact screened gravel as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:

- 1. C33: Specification for Concrete Aggregates
- 2. D422: Test Method for Particle-Size Analysis of Soils.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:

- 1. Gradation test result from the soil testing laboratory, at least two (2) weeks prior to hauling material, for the Engineer's acceptance.
- 2. Submit a 20-lb. [9 kg] sample of the material when requested by the Engineer.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Qualifications of the independent soil testing laboratory as specified in Section 02210.
- C. Maximum particle size and gradation analyses shall be performed in accordance with ASTM D422.
- D. Material testing frequency and requirements as specified in Section 02210.

PART 2 – PRODUCTS

2.01 MATERIAL:

- A. Screened gravel: Gradation and physical property requirements of screened gravel shall conform to ASTM C33, Coarse Aggregate number 67.
- B. Screened gravel shall be free from roots, leaves, and other organic materials, and free of ice, snow, frost and frozen soil particles.
- C. Crushed rock of equivalent size and grading may be used instead of screened gravel.

PART 3 – EXECUTION

3.01 PLACEMENT AND COMPACTION:

- A. Specified in Section 02210 and as indicated on the drawings.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02224

BANK-RUN GRAVEL

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide and compact bank-run gravel as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:

1. D422: Test Method for Particle-Size Analysis of Soils.
2. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 μ m) Sieve.
3. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (600 kN-m/m³)).

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:

1. Gradation and compaction test results from the soil testing laboratory, at least two (2) weeks prior to hauling material, for the Engineer's acceptance.
2. Submit a 20-lb. [9 kg] sample of the material when requested by the Engineer.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Qualifications of the independent soil testing laboratory as specified in Section 02210.
- C. Maximum particle size and gradation analyses shall be performed in accordance with ASTM D422. Soil compaction test shall be performed in accordance with ASTM D1557 Procedure C.

D. Material testing frequency and requirements as specified in Section 02210.

PART 2 – PRODUCTS

2.01 MATERIAL:

- A. Bank-run gravel shall be obtained from approved natural deposits and unprocessed except for the removal of deleterious materials and stones larger than the maximum size permitted.
- B. Bank-run gravel shall be unfrozen and substantially free from vegetation, roots, loam and other organic matter, clay, snow, frozen particles and other fine or harmful substances.
- C. Bank-run gravel: Inorganic granular material meeting the following gradation:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
6 in. [15.2 cm]	100
2 in. [5.1 cm]	80 - 100
No. 4	20 - 65
No. 200	0 - 12

PART 3 – EXECUTION

3.01 PLACEMENT AND COMPACTION:

- A. Specified in Section 02210 and where indicated on the drawings.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02225
SELECT BORROW

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide and compact select borrow as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
- B. C33: Specification for Concrete Aggregates
- C. D422: Test Method for Particle-Size Analysis of Soils.
- D. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 μ m) Sieve.
- E. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (600 kN-m/m³).
- F. D2487: Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
- B. Gradation and compaction test results from the soil testing laboratory, at least two (2) weeks prior to hauling material, for the Engineer's acceptance.
- C. Submit a 20-lb. [9 kg] sample of the material when requested by the Engineer.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.

- B. Qualifications of the independent soil testing laboratory as specified in Section 02210.
- C. Maximum particle size and gradation analyses shall be performed in accordance with ASTM D422. Soil compaction test shall be performed in accordance with ASTM D1557 Procedure C.
- D. Material testing frequency and requirements as specified in Section 02210.

PART 2 - PRODUCT

2.01 MATERIAL:

- A. Use only material free from roots, leaves, and organic matter, and free of ice, snow, frost and frozen soil particles.
- B. Select borrow shall be well-graded coarse-grained soil in accordance with ASTM D2487 and shall meet the following gradation:

<u>Sieve</u> <u>Designation</u>	<u>Percentage by Weight Passing</u> <u>Square Mesh Sieves</u>
3 in. [7.6 cm]	100
1-1/2 in. [3.8 cm]	70 - 100
3/4 in.[1.9 cm]	50 - 85
No. 4	30 - 60
No. 50	10 - 25
No. 200	0 - 5

- C. Soil particles shall conform to the physical property requirements of ASTM C33.

PART 3 – EXECUTION

3.01 PLACEMENT AND COMPACTION:

- A. Specified in Section 02210 and as indicated on the drawings.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02273

GEOTEXTILE FABRIC

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide nonwoven geotextile fabric in foundation preparation for separation of existing soil from screened gravel or crushed stone.
- B. Provide woven geotextile fabric for temporary road reinforcement, and riprap separation as indicated or specified.
- C. Provide woven geotextile fabric for silt fence as indicated or specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading
- B. Section 02223: Screened Gravel
- C. Section 02435: Crushed Stone

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
 - 1. D4355: Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon ARC Type Apparatus.
 - 2. D4491: Test Methods for Water Permeability of Geotextile by Permittivity.
 - 3. D4533: Test Method for Trapezoid Tearing Strength of Geotextiles.
 - 4. D4632: Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - 5. D4751: Test Method for Determining Apparent Opening Size of a Geotextile.
 - 6. D4833: Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:

1. At least two weeks prior to shipment, submit manufacturer's certificate of compliance and physical property data sheet indicating that requirements for materials and manufacture are in conformance as specified.
2. For informational purposes only, submit manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. General:
 1. Producer of geotextile fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures. Laboratory to maintain records of quality control results.
 2. Do not expose geotextile fabric, except the geotextile fabric for silt fence, to ultraviolet radiation (sunlight) for more than 14 days total in period of time following manufacture until geotextile fabric is installed and covered with fill or backfill material.
 3. Take all precautions to protect geotextile fabric from damage resulting from any cause. Either repair or replace geotextile fabric to Engineer's satisfaction at no additional cost to the Owner.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.
- B. Provide geotextile fabric in rolls wrapped with protective covering to protect geotextile fabric from mud, dirt, dust, and debris. Label each roll of geotextile fabric with number or symbol to identify production run.
- C. Protect geotextile fabric from sunlight during transportation and storage. Do not leave geotextile fabric exposed to sunlight for more than two weeks during installation operations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Provide the following nonwoven geotextile fabric:
 1. Geotex 501 as manufactured by Propex.

2. Mirafi 160N as manufactured by TenCate Geosynthetics.
 3. 150 EX as manufactured by Thrace - LINQ.
 4. Or acceptable equivalent product.
- B. Provide the following woven geotextile fabric except for silt fence:
1. 200 ST as manufactured by Propex.
 2. Mirafi 500X as manufactured by TenCate Geosynthetics.
 3. GTF 200 as manufactured by Thrace-LINQ.
 4. Or acceptable equivalent product.
- C. Provide the following woven geotextile fabric for silt fence:
1. Geotex 2130 as manufactured by Propex.
 2. W100 as manufactured by SKAPS Industries.
 3. Beltech 940 by Belton Industries Inc.
 4. Or acceptable equivalent product.

2.02 MATERIAL:

A. Geotextile fabric shall conform to test requirements for minimum average roll value (weakest principle direction) for strength properties of any individual roll tested from manufacturing lot or lots of particular shipment in excess of minimum average roll value (weakest principle direction) as specified hereafter:

B. Physical Properties of Minimum Average Roll of the nonwoven geotextile fabric shall be:

Property	ASTM Test Method	Units	Value
1. Grab Strength	D4632	lbs [N]	150 [670](min.)
2. Grab Elongation	D4632	%	50 (min.)
3. Trapezoidal Tear Strength	D4533	lbs [N]	60 [270](min.)
4. Puncture Strength	D4833	lbs [N]	75 [330](min.)
5. Permittivity	D4491	sec -1	1.3 (min.)
6. Apparent Opening Size	D4751	Sieve Number	70-100
7. Ultraviolet Stability	D4355	Percent	70 (min.)

C. Woven geotextile fabric, except for silt fence, shall be:

Property	ASTM Test Method	Units	Value
1. Grab Strength	D4632	lbs [N]	200 [900](min.)
2. Grab Elongation	D4632	%	15 (min.)
3. Trapezoidal Tear Strength	D4533	lbs [N]	75 [300](min.)
4. Puncture Strength	D4833	lbs [N]	80 [350](min.)
5. Permittivity	D4491	sec -1	0.02 (min.)
6. Apparent Opening	D4751	Sieve	

Size		Number	30-70
7. Ultraviolet Stability	D4355	Percent	70 (min.)

D. Physical Properties of Minimum Average Roll of the woven geotextile fabric for silt fence shall be:

Property	ASTM Test Method	Units	Value
1. Grab Strength	D4632	lbs [N]	100[450](min.)
2. Permittivity	D4491	sec -1	0.10 (min.)
3. Apparent Opening Size	D4751	Sieve Number	20-30
4. Ultraviolet Stability	D4355	Percent	70 (min.)

PART 3 - EXECUTION:

3.01 INSTALLATION:

- A. Install geotextile fabric in accordance with manufacturer's printed instructions.
- B. Place geotextile fabric on the foundation subgrade prior to placing the screened gravel or crushed stone.
- C. Overlap geotextile fabric 18 inches [45 cm] minimum for unsewn lap joint. Overlap fabric 6 inches [15 cm] at seam for sewn joint.
- D. Do not permit traffic or construction equipment to travel directly on geotextile fabric.
- E. Place geotextile fabric in relatively smooth condition to prevent tearing or puncturing. Lay geotextile fabric loosely but without wrinkles or creases so that placement of the backfill materials will not stretch or tear geotextile fabric. Leave sufficient slack in geotextile fabric around irregularities to allow for readjustments.
- F. Patch all tears in geotextile fabric by placing additional section of geotextile fabric over tear with a minimum of 3 feet [90 cm] overlay.
- G. Extend the geotextile fabric and wrap around the screened gravel or crushed stone along the perimeter of the foundation.

- H. Install silt fence in accordance with the manufacturer's printed instructions and as indicated.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02431

CATCH BASINS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Construct catch basins as indicated and specified.
 - 1. Bases: Cast-in-Place concrete, one piece, precast concrete sumps or precast segmental plates, as indicated.
 - 2. Walls: Precast Concrete Masonry Units.
 - 3. Top of Cone: Brickwork for adjusting frame to meet finished surface (minimum 2 rows).
 - 4. Frames and Grates: As indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading
- B. Section 03346: Cast-in-Place Concrete

1.03 REFERENCES:

- A. ASTM A48: Standard Specification for Gray Iron Castings
- B. ASTM C32: Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
- C. ASTM C33: Standard Specifications for Concrete Aggregates
- D. ASTM C139: Standard Specification for Concrete Masonry Units for Construction of Catch basins and Manholes
- E. ASTM C150: Standard Specification for Portland Cement
- F. ASTM C207: Standard Specification for Hydrated Lime for Masonry Purposes

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Portland Cement: ASTM C150, Type II
- B. Hydrated Lime: ASTM C207, Type S
- C. Sand: ASTM C33, Fine Aggregate, except all passes No. 8 sieve.
- D. Water: Potable
- E. Brick: ASTM C32, Grade SS, except that the mean of five tests for absorption shall not exceed eight percent by weight.
- F. Frames and Grates: Gray iron conforming to ASTM Specification A48-83, Class 308.
 - 1. Catch basins
 - a. Gray iron conforming to ASTM Specification A48-83, Class 308.
 - b. Product number 62067 600 with 62102 600 grate cascade style as distributed by E.J. Prescott or approved equal.
 - c. Rated for H-20 wheel loading.
 - 2. All materials shall be AIS compliant

2.02 PRECAST CONCRETE MASONRY UNITS:

- A. Precast machine-made solid segments: ASTM C139, and following requirements:
 - 1. Use Type II cement except as otherwise permitted.
 - 2. Width of units as indicated.
 - 3. Inside and outside surfaces of units curved to necessary radius; interior surfaces of structures cylindrical, except top batter courses to reduce inside section of structure uniformly to required size and shape at top.
 - 4. Only full-length units required to lay any one course.
 - 5. Accept units on basis of material tests and inspection of completed product.

2.03 PRECAST CONCRETE SUMPS:

- A. Precast concrete sumps: ASTM C478, and following requirements:
 - 1. Wall section not less than 6 in. thick.
 - 2. Use Type II cement except as otherwise permitted.

1. Cured by saturated steam at temperature between 100 and 130 deg. F. for period of not less than 12 hours or, when necessary, for such additional time as needed to enable sections to meet strength requirements.
2. Allow no more than two lift holes cast or drilled in each sump.
3. Accept sumps on basis of material tests and inspection of completed product.

2.04 MIXES:

- A. Concrete: Section 03300 or Section 03346.
- B. Mortar for Brickwork: For Brickwork: Mix portland cement, hydrated lime and sand in proportion by volume of twelve (12) part mortar sand, six (6) part Portland cement and two (2) part hydrated lime. Use sufficient water to form workable mixture to make mortar damp, just short of "balling".
- C. Mortar for Masonry Units: Mix one part portland cement and two parts of sand by volume with sufficient water to form a workable mixture.
- D. Mortar for Plugging Lift Holes: Mix portland cement and sand 1:1/2, with sufficient water to make mortar damp, just short of "balling".

PART 3 - EXECUTION

3.01 LAYING BRICKWORK AND MASONRY UNITS:

- A. Use clean units.
- B. Moisten bricks by suitable means, until neither dry as to absorb water from mortar nor wet as to be slippery when laid.
- C. Do not moisten concrete masonry units.
- D. Lay each brick in full bed and joint of mortar without requiring subsequent grouting, flushing or filling; bond thoroughly.
- E. Lay each masonry unit in full bed of mortar; bond thoroughly. Fill vertical keyways, completely, with mortar.

3.02 PLASTERING AND CURING BRICK MASONRY:

- A. Plaster outside faces with mortar 1/4-in. to 3/8-in thick.
- B. Moisten brick masonry before application of mortar, if required.

- C. Spread and trowel plaster carefully.
- D. Check for bond and soundness after hardening, by tapping.
- E. Remove and replace unbonded and unsound plaster.
- F. Protect from too rapid drying by use of moist burlap or other approved means.
- G. Protect from weather and frost.

3.03 SETTING CURB INLETS, GRATES AND FRAMES:

- A. Set inlets and frames with tops conforming accurately to finished ground or pavement surface as indicated and directed.
- B. Set circular frames concentric with top of masonry.
- C. Set frames in full bed of mortar to fill and make watertight completely the space between top of masonry and bottom flange of the frame.
- D. Place a thick ring of mortar extending to the outer edge of masonry, around bottom flange. Finish mortar smoothly and give a slight slope to shed water away from the frame.
- E. Place grates in the frames on completion of other work at the catch basin.

3.04 PLUGGING LIFT HOLES IN SUMPS:

- A. Plug lift holes in sumps, used for handling, with mortar. Hammer mortar into holes until dense and excess of paste appears, then smooth flush with adjoining surface.

3.05 ADJUSTMENT TO GRADE OF EXISTING CATCH BASIN:

- A. Adjust existing catch basin tops to line and grade as indicated on drawings or as directed by Engineer.
- B. Use only new brick for adjustment.
- C. Use a minimum of two courses of brick directly below frame. Concrete grading rings may be used below two brick courses.

3.06 REBUILDING OF EXISTING CATCH BASIN:

- A. Cut suitable openings into existing structures to make connections to drains. Confine cutting to smallest amount possible consistent with good workmanship.

B. After installing drains, carefully fit around, close up, and repair structures watertight.

3.07 ABANDONMENT OF EXISTING CATCH BASIN:

A. See detail sheet.

B. Salvage and clean cast-iron frames, covers, and traps removed from abandoned catch basins. Deliver salvaged castings to Owner. Castings remain property of Owner.

3.08 CONTRACT CLOSEOUT:

A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02435
CRUSHED STONE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and compact crushed stone as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
 - 1. C33: Specification for Concrete Aggregates
 - 2. D422: Test Method for Particle-Size Analysis of Soils.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 - 1. Gradation test result from the soil testing laboratory, at least two (2) weeks prior to hauling material, for the Engineer's acceptance.
 - 2. Submit a 20-lb. [9 kg] sample of the material when requested by the Engineer.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Qualifications of the independent soil testing laboratory as specified in Section 02210.
- C. Maximum particle size and gradation analyses shall be performed in accordance with ASTM D422.
- D. Material testing frequency and requirements as specified in Section 02210.

PART 2 - PRODUCTS

2.01 MATERIAL:

- A. Crushed Stone: Gradation and physical property requirements of crushed stone shall conform to ASTM C33, Coarse Aggregate number 67.
- B. Crushed stone shall be free from roots, leaves, and other organic materials, and free of ice, snow or frost and frozen soil particles.

PART 3 - EXECUTION

3.01 PLACEMENT AND COMPACTION:

- A. Specified in Section 02210 and as indicated on the drawings.

3.02 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02480

LANDSCAPING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide loaming, fertilizing, seeding, planting and related work as indicated and specified.

1.02 REFERENCE STANDARD:

- A. American Standard for Nursery Stock.

1.03 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 1. Certify, invoice or order plants for each shipment grown in latitude north of Washington D.C., free of disease and insect pests. Submit certificates to Engineer.
 2. Prior to placement of any mulch, deposit, at a location on site suitable to Engineer, 1/2 cu. yd. sample of mulch for examination. After mulch sample is reviewed by the Engineer, provide mulch conforming to accepted sample.
 3. Submit to Engineer a sample of proposed soil separator mat and manufacturer's specification for mat.
 4. Submit with seed, certificates concerning seed mixture, purity, germinating value, and crop year identification.
 5. Submit test samples of loam to a certified soils consultant to determine fertilizer and lime requirements and return two copies of results for implementation.
 6. Submit list of plant material to be used and source.
 7. Prior to end of maintenance period, furnish two copies of written maintenance, instructions for maintenance and care of installed plants and lawn areas.

1.04 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Ability to Deliver:

1. Investigate sources of supply and make assurances that plants will be supplied as indicated in Schedule of Plant Material in sizes, variety and quality noted and specified before submitting bid.
2. Failure to take this precaution will not relieve responsibility for furnishing and installing plant material in accordance with Contract requirements and without additional expense to OWNER.

C. Inspection:

1. Upon delivery and before planting, Engineer will inspect plants.
2. Inspection and approval by Engineer of plants is for quality, size and variety only and in no way impairs the right of rejection for failure to meet other requirements during progress of work.

D. General:

1. Provide only nursery grown plants having been transplanted at least once and growing in a nursery for at least two years.
2. Allow Engineer to determine fitness of any plant.
3. Provide container grown stock in containers long enough for root system to develop sufficiently to hold soil together firm and whole when removed from container. Use no plants loose in the container.
4. Check plant material prior to commencing of planting operations. Plant no material prior to inspection by Engineer. Notify Engineer at least 48 hours in advance of all planned planting operations and identify specific material and its location.
5. Furnish suitable quantities of water, hose and appurtenances.
6. Use loam, having prior vegetative growth that did not contain toxic amounts of either acid or alkaline elements.
7. Begin maintenance immediately after each portion of lawn is seeded and continue for minimum of 45 days.
8. Repair or replace seeded areas, plants, shrubs, and trees which, in judgment of Engineer, have not survived and grown in a satisfactory manner, for a period of one calendar year after date of installation, and acceptance.
9. Provide as specified seedings or plantings replacements of the same type and size as specified.

10. Dry loam test samples to constant weight at temperature of 230 deg. F, plus or minus 9 degrees.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Provide in accordance with Section 01610.

B. Delivery:

1. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to state law.
2. Notify Engineer of delivery schedule in advance so plant material may be inspected at jobsite.

C. Storage:

1. Store seed and fertilizer in accordance with the manufacturer's recommendations.

1.06 JOB CONDITIONS:

A. It is the intent of this specification that existing trees within grading and seeding limits, not disturbed by building operations, be saved and protected, except where specified to be removed. Clear trees required to be removed only after approval by Engineer. Engineer directs variations required in grading on the job.

B. Planting Seasons:

1. Recommended Spring Planting Season: From time soil can be satisfactorily worked until following dates at end of planting season:
 - a. Evergreens - May 1.
 - b. Trees and Shrubs - May 15.
 - c. Lawns - May 15.
2. Recommended Fall Planting Season: Commence and terminate at time listed below:
 - a. Evergreens - August 20 to September 30.
 - b. Trees and Shrubs - From dormancy to November 30.

c. Lawns - August 1 to October 1.

C. Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

D. Protection:

1. Protect seeded and planted areas against damage by trespass and other causes.
2. Protect work until accepted.
3. Replace, repair, restake, or replant as directed by Engineer, and at own expense, seeding or planting which is damaged.
4. If planting is done after lawn preparation, protect lawn areas, repair damage resulting from planting operations.

E. Wherever landscape work must be executed in conjunction with construction of other work, arrange a schedule of procedure that will permit execution of landscape work as specified.

1.07 WARRANTY:

A. Provide in accordance with Section 01740.

B. Guarantee new plant material through one full calendar year from the date of the plantings installation.

1. Guarantee plants replaced under this for one full calendar year from date of replacement.
2. Repair damage to plants or lawns during plant replacement.

C. Guarantee lawn areas for duration of one full calendar year after seeding is determined to be alive and in satisfactory growth.

1. For purpose of establishing an acceptable standard, scattered bare spots, none of which is larger than 1 sq. ft. will be allowed up to a maximum of 3% of lawn area.

PART 2 - PRODUCTS

2.01 PLANTS:

A. Provide plants in accordance with ANSI Standard for Nursery Stock, Designation Z60.1-1973.

- B. Plant Material: Vigorous, healthy, well-formed upper growth and dense, fibrous and large root system, and free of insect or mechanical damage. Grown under climatic conditions similar to those in project locality.
- C. Plants, except those specified as container grown, balled in burlap with root ball formed of firm earth from original and undisturbed soil.
 - 1. Ball width, depth and lacing as specified in SCHEDULE OF PLANT MATERIAL. Do not accept balled and burlapped plants with broken or loose balls, or of "manufactured" earth or peat humus.

2.02 BONE MEAL:

- A. Commercial raw bone meal, finely ground and containing a minimum of 1 percent nitrogen and 18 percent phosphoric acid.

2.03 STAKES:

- A. Wood stakes, minimum of 2-in. by 2-in. square and 8 feet in length, of uniform size, straight, reasonably free from knots, treated with wood preservative and painted green.

2.04 WIRE:

- A. Two strands No. 14-gage galvanized soft ferrous wire, twisted, for tree guying.

2.05 HOSE COLLAR:

- A. Good quality reinforced rubber hose of minimum 1/2-in. inside diameter and green in color, for protecting tree bark from supporting wires.

2.06 TREE WRAP:

- A. Quality, heavy, waterproof crepe paper manufactured for this purpose. Width of material not less than 6 inches, and wrapped from bottom with minimum 2 in. overlap.

2.07 ANTIDESICCANT:

- A. Acceptable antidesiccant emulsion which provides a film over plant surfaces permeable enough to permit transpiration.
- B. Applied to evergreen trees, shrubs and all deciduous plant material. Application made prior to transportation from nursery if deciduous trees are leafed out at time of digging. The rate and method of application shall be in accordance with the manufacturer's recommendations.

2.08 MULCH:

- A. Shredded pine bark free of wood chips, stones, branches or other deleterious material. Bark shredded in strips not larger than 3 inches in any dimension and aged for period of not less than six months after removal from original logs.

2.09 METAL EDGE STRIPS AND STEEL STAKES:

- A. 1/4-in. by 5-inch steel plate edge strips, painted green.
- B. 16-in. tapered steel stakes.

2.10 MAT:

- A. Landscape fabric consisting of 3 ounce non-woven permanent mat, polypropylene material. Bonded on one side to permit water, fertilizer and air to pass through and so as to allow soil and roots to breathe.

2.11 LOAM:

- A. Fertile, friable, natural topsoil typical of locality, without admixture of subsoil, refuse or other foreign materials, and obtained from well-drained arable site. Mixture of sand, silt and clay particles in equal proportions. Free of stumps, roots, heavy or stiff clay, stones larger than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other deleterious matter.
- B. Not less than 4 percent nor more than 20 percent organic matter as determined by loss on ignition of oven-dried samples.

2.12 LIME, FERTILIZER AND SEED:

- A. Ground agricultural limestone containing not less than 85 percent of total carbonates.
- B. Commercial type, uniform in composition, free flowing, conforming to state and federal laws, and at least 50 percent of nitrogen derived from natural organic sources of ureaform and containing following percentages by weight: Nitrogen 10 percent, Phosphorus 10 percent, Potash 10 percent.
- C. Turf grass seed for lawn areas, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum proportion by weight	Percent purity	Percent germination
Kentucky bluegrass	35.98%	87%	85%

Pennlawn Red Fescue	44.32%	87%	85%
Merlon Blue Grass	13.52%	98%	85%
Inert Matter	5.89%	98%	90%
Other	0.29%	-	-

- D. Conservation Mixture for other areas, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum proportion by weight	Percent purity	Percent germination
Creeping Red Fescue	35.00%	87%	85%
Red Top	6.00%	87%	85%
Kentucky Blue Grass	24.00%	98%	85%
Perennial Rye	10.00%	98%	90%
Annual Rye	20.00%	98%	90%
White Clover	5.00%	98%	90%

- E. Weeds shall not exceed 0.25 percent.

2.13 HYDROSEEDING

- A. Apply seeded slurry at a rate of 3 pounds per 1,000 square feet evenly and in two intersecting directions with a hydraulic seeder. Do not hydroseed area in excess of that which can be mulched on same day.
- B. Immediately following seeding and rolling, apply mulch to a thickness of 1/8". Maintain clear of shrubs and trees.
- C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

2.14 SOD:

- A. Established, nursery grown Kentucky or Merion Bluegrass sod, vigorous, well rooted, healthy turf, free from disease, insect pests, weeds, other grasses, stones, and any other harmful or deleterious matter.

- B. Sod harvested by machine at uniform soil thickness of approximately 1 inch but not less than 3/4 of an inch. Measurement for thickness excludes top growth and thatch. Prevent tearing, breaking, drying or any other damage.

2.15 CRUSHED STONE:

- A. Crushed stone made from light colored granite. Stone screened to insure uniformity of size. No flat, elongated stone used. Size of stone in mowing strips and other areas as indicated on drawings, conforming to following requirements:

Size of square screen	Percent passing
1-1/4 inch	95% minimum
3/4 inch	15% maximum

2.16 PEAT MOSS:

- A. Shredded, loose, substantially free of mineral and waste matters.
- B. Minimum organic matter by weight on a dry basis: 80 percent.

PART 3 – EXECUTION

3.01 LOAM:

- A. Spread loam on areas to be seeded, to required 6-in. depth, fine grade and compact.

3.02 LIME AND FERTILIZER:

- A. Apply lime by mechanical means at rate of 50 pounds per 1,000 sq. ft.
- B. Apply fertilizer at a rate of 25 pounds per 1,000 square feet.
- C. Apply after smooth raking of topsoil and prior to roller compaction.
- D. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- E. Mix thoroughly into upper two inches with an appropriate method.
- F. Lightly water to aid the dissipation of fertilizer.
- G. Water dry topsoil to a depth of 4 inches, 48 hours prior to seeding to obtain a loose, friable seed bed.

3.12 SEEDING

- A. Seed shall be planted between April 15 to June 15, or August 15 to October 1.
- B. Apply seed at a rate of 3 pounds per 1,000 square feet evenly and in two intersecting directions. Rake in lightly to a depth of 3/8 inch. Do not seed area in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry or during windy conditions.
- D. Roll seeded area with roller weighing a maximum of 150 lbs/foot of width.
- E. Apply mulch immediately following seeding.
- F. Apply water with a fine spray immediately after each area has been mulched. Saturate to a depth of 4 inches of soil.
- G. Cover seeded slopes where grade is 2:1 or greater with jute mat. Roll fabric onto slopes without stretching or pulling. Apply mulch in all other areas.
- H. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Provide 12-inch overlay of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- I. Secure outside edges and overlaps at 36-inch intervals with stakes.
- J. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- K. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges a minimum of 6-inches

3.03 SOD:

- A. Install sod not more than 48 hours after cutting. Provide lime, fertilizer, etc, preparation for sod same as stated above for seed.

3.04 CRUSHED STONE:

- A. Place crushed stone to depth of 6 inches, and thoroughly consolidate by means of suitable vibrator or mechanical tamper. Add stone, as necessary, after tamping or vibrating to finish depth of 6 inches.

3.05 CLEAN-UP:

- A. Remove soil or similar material which has been brought onto paved areas, keeping these areas clean.
- B. Upon completion of planting, remove excess soil, stones and debris which has not previously been cleaned up and legally dispose of off-site.
- C. Prepare lawns and planting areas for final inspection.

- D. Protect slopes and embankments against erosion until work is accepted. Repair eroded portions of seeded or sodded areas by refilling, resodding, remulching and reseeding as required by condition and to satisfaction of Engineer. Protection may be by installation of sod strips or other methods.

3.06 MAINTENANCE - SEEDED AREAS AND PLANTING:

- A. Maintain lawn areas and other seed areas at maximum height of 2-1/2 inches by mowing at least three times. Weed thoroughly once and maintained until time of final acceptance. Reseed and refertilize with original mixtures, watering or whatever is necessary to establish over entire area of lawn and other seeded areas a close stand of grasses specified, and reasonably free of weeds and undesirable coarse native grasses.
- B. Begin maintenance immediately after each planting and continue until final acceptance of work. Water, mulch, weed, prune, spray, fertilize, cultivate and otherwise maintain and protect all plants.
- C. Reset settled plants to proper grade and position, and restore planting saucers and remove dead material. Tighten and repair guys. Correct defective work as soon as possible within guarantee period.

3.16 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02520

TELEVISION INSPECTION OF SANITARY SEWERS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Section Includes:

1. Television inspection of new sanitary sewer.

1.02 RELATED WORK:

A. Section 02622: Sanitary Sewer and Storm Drain Piping

1.03 SUBMITTALS:

A. Submit the following information to the Owner for review in accordance with Section 01300 - Submittals.

1. The Contractor shall submit written descriptions of the procedures and equipment used in his operations for the television inspection work.
2. Records:
 - a. All CCTV inspection data shall be provided in IT pipes format to the City.
 - b. The Contractor shall supply two (2) digital video files on DVD of the inspected sewers with voice descriptions for the existing sewer. The voice description shall include the locations of each point of infiltration, lateral connections, structural deficiencies, and any other discernible features.
 - c. Measurement for location shall be at ground level by means of a meter or other approved device. Location of camera shall be recorded visually by numbers and identified by voice at ten-foot intervals on the videotape.
 - d. The Contractor shall supply two (2) digital video files on DVD of the inspected sewers with voice descriptions for post installation of the rehabilitated pipe. The descriptions shall include the location of each lateral, deficiencies of joints at the lateral connection, deficiencies of joints in the mainline, and any other discernible features.

- e. The Owner will continuously monitor the television inspection while it is being performed and no such inspection shall take place without the Owner presence unless other action is specifically authorized.
- f. Digital video files are due to the Owner 90 days after the Notice to Proceed in IT pipes format. Submission of the digital video files shall be considered as integral part of the work of this Contract.
- g. Standard NASSCO codes and ratings shall be used during inspection work.

1.04 EXISTING TELEVISION INSPECTION VIDEOS:

- A. The City of Bangor, as part of the design process within the project area, has accumulated television inspection videos of the sewers in the project area. The video inspection tapes may be viewed by appointment during regular office hours by contacting Ms. Amanda Soucier at (207) 992-4244. These videotapes are not guaranteed or warranted as to accuracy or completeness, nor are they part of the Contract Documents.

PART 2 - EQUIPMENT

2.01 EQUIPMENT:

- A. Television inspection shall be accomplished by the use of closed circuit, color television camera. The television camera used for the inspection shall be one especially designed and constructed for sewer line inspection and shall have its own lighting system providing light levels suitable to allow a clear picture of the entire periphery of the pipe without creating significant steam vapor which might affect picture clarity. The camera shall be constructed so as to be operable in 100% humidity and with minimum lens fogging. Picture quality shall be such as to produce a continuous 600 line resolution picture showing the entire periphery of the pipe. The camera shall be constructed so as to be capable of being moved through the sewer pipe in either direction at uniform slow rate by means of manual cable winches or motorized mechanical equipment of indirect drive type. The camera shall be constructed so as to have continuous color video and audio tape recording capability capable of variable playback tape speed ranging from normal to one-third normal speed and video tape to have capability of not less than 180 lines of resolution and suitable television video and audio tape playback equipment (or DVD format) made available at office of Engineer. The camera shall be constructed so as to be operable for taking digital photographs and capable of pan and tilt inspection within pipeline.
- B. The Contractor shall note that wide-angle lenses may be required for those pipes with larger diameters so as to produce a picture showing the entire periphery of the pipe. Picture quality and definition shall be such that the interior of the pipe can be clearly seen in detail without static interference of any kind, to the satisfaction of the Owner.

- C. Telephones, radios or other suitable means of communication shall be provided between the members of the inspection crew.

2.02 PHOTOGRAPHS:

- A. Photographs shall be taken of the monitor at the request of the Owner, at points of pipe failure, infiltration, service connections, or unusual conditions. A complete set of the photographs shall be provided to the Owner.

PART 3 - EXECUTION

3.01 CONTROL OF EXISTING FLOWS:

- A. The Contractor shall control existing flows in accordance with Section 02720 – MAINTENANCE AND TRANSFER OF FLOWS.

3.02 TELEVISION INSPECTION METHOD:

- A. As directed by the Engineer, the Contractor may conduct a television inspection for each pipe section during low flow periods, which is generally at night.
- B. Prior to the television inspection of each pipe section, the Contractor shall notify the Engineer of any apparent condition within the pipeline which may obscure visibility of the conduit or prohibit television inspection.
- C. When materials, not apparent prior to television inspection, are encountered during television inspection which obstruct the transit of the television camera, the Owner may order the recleaning of all or a portion of a pipeline. Television inspection of any pipeline may not commence prior to the approval of the Owner.
- D. The work shall be performed in one section at a time. The inspection shall be conducted so as to produce continuous video tape recordings of the various pipelines, pipe section by pipe section, corresponding to the order that they exist in the ground.
- E. The camera shall be moved through the line, at a uniform slow rate by means of cable winches at each manhole or carried through the pipe if a physical walk-through inspection is performed, or by other means acceptable to the Owner. The camera movement shall be halted only to observe and record service connections in the pipe or other pertinent features.

3.03 VIDEO TAPE DESCRIPTION:

- A. Continuous digital video files with voice descriptions shall be supplied as described above and shall become the property of the City of Bangor.

- B. The narrator of the videos shall be subject to the approval of the Owner. The Owner will have the authority to reject the tape should the narrator use objectional language. If, during the course of the project, the inspection is rejected due to the narration, the tape will be edited and an alternate narrator's voice shall be dubbed in.
- C. The Contractor shall maintain records of all information necessary for the preparation and submission of the final report so as to allow prompt delivery of the digital files to the Owner upon the completion of the inspection of each pipeline.

3.04 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02601

MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and construct manholes as indicated and specified.
- B. Base: Precast or Cast-in-Place concrete. Tops accurately shaped by ring forms to suit riser sections.
- C. Base: Precast concrete. Tops accurately shaped by ring forms to suit riser sections.
- D. Walls (Risers and Cones): Precast Concrete
- E. Top of Cone: Brickwork (minimum of 2 courses of brick) above reinforced concrete grading rings below required two courses of brick for adjusting frame to match finished surface (not to exceed 11 in.).
- F. Inverts: Form invert channels of brickwork or concrete. Conform to adjoining pipes size. Curve side inverts and lay out main inverts (where direction changes) in smooth curves of longest possible radius tangent to adjoining pipelines centerline.
- G. Frames and Covers: Cast-iron

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading
- B. Section 03200: Concrete Reinforcement
- C. Section 03300: Cast-in Place Concrete
- D. Section 03346: Cast-in Place Concrete

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
 - 1. A48: Specification for Gray Iron Casting.
 - 2. C32: Specification for Sewer and Manhole Brick (Made for Clay or Shale).

3. C150: Specification for Portland Cement.
4. C207: Specification for Hydrated Lime for Masonry Purposes.
5. C478: Specification for Precast Reinforced Concrete Manhole Sections.
6. C923: Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and pipes.
7. D4101: Specification for Propylene Plastic Injection and Extrusion Materials.

B. AASHTO M198: Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gasket.

1.04 SUBMITTALS:

A. Submit the following in accordance with Section 01300:

1. Submit manufacturer's specifications and product data for all items specified.
2. Submit manufacturer's written instruction for installing resilient connector.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Provide in accordance with Section 01610 and as specified.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Portland Cement: ASTM C150, Type II
- B. Hydrated Lime: ASTM C207, Type S
- C. Sand: Fine Aggregate, for mortar, Section 03346 but passes No. 8 Sieve.
- D. Brick: ASTM C32, Grade SS, but mean of five tests for absorption not to exceed 8 percent by weight.
- E. Frames and Covers:
 1. Gray iron conforming to ASTM Specification A48-83, Class 308.
 2. 26 inch diameter gray cast iron, 24 inch clear opening.
 3. Cover labeled "Sewer".

4. Rated for H-20 loading.
5. Model 62112 (frame) and 62112 2 (cover) as manufactured by EJ Prescott, or approved equal.
6. All materials shall be AIS compliant.

F. Protective Coating.

1. H.B. Tnemecol 46-465, by Tnemec Company.
2. Amercoat 78HB, by Ameron International.
3. Bitumastic Super Service Black, by Carboline.
4. Or acceptable equivalent product.

G. Plastic Coated Steel Steps.

1. Copolymer polypropylene plastic coated steel or forged aluminum conforming to applicable safety requirements.
 - a. Steel: 1/2 inch diameter grade 60, minimum.
 - b. Aluminum: ALCOA No. 126538 or equal.
2. All materials shall be AIS compliant.

H. Steps capable of resisting following loads without loosening or damaging:

1. Minimum horizontal pull out load 1600 pounds (800 pounds per leg).
2. Minimum vertical load 800 pounds.

I. Manhole inverts shall be precast or poured in place. Concrete to be 3,000 psi minimum compressive strength.

2.02 PRECAST CONCRETE SECTIONS:

A. ASTM C478 and following modifications:

1. Wall thickness: as indicated.
2. Cement: ASTM C150, Type II, otherwise as directed by Engineer.

3. Joints between sections: Butyl rubber-based sealants.
 4. Cure by subjecting to saturated steam at temperature between 100 and 130 degrees F. for 12 hours or more.
 5. Cast or drill only two lift holes in each section.
 6. Clearly mark date of manufacture and name or trademark of manufacturer on insides of walls on all sections.
 7. Accept on basis of material tests and product inspection.
- B. Cones and Conical Transitions similar in design and construction to riser sections. Use flat slab tops only where indicated.
- C. Cast and build into bases during manufacture:
1. Resilient connectors for pipe connections
 2. Holes for future pipe connections
- D. Set steps accurately as indicated.

2.03 JOINTS:

- A. Between precast sections: Butyl rubber-based sealants per Type B, AASHTO M198, but no bitumen content.
- B. Resilient connectors for pipes to precast sections: ASTM C923, and to manufacturer's standards. Do not use connectors using castings and bolts with non-resilient bearing.
- C. Rubber ring waterstops for use in pipe-to-manhole joints: Rings of resilient material that will fit snugly over pipes, held firmly against pipe surface by means of a mechanical take-up device which when tightened will compress resilient material or by a stretch fit. Waterstop designed and installed so that leakage between pipe and manhole is minimized.
1. Materials and manufacture of waterstops: ASTM C923.
- D. Non-shrink mortar for pipe connections to existing manholes:
1. Masterflow 713 Grout made by Master Builders, Cleveland, OH.
 2. Five Star Grout made by U.S. Grout Corp., Old Greenwich, CT.
 3. Upcon made by Upco Co., Cleveland, OH.

4. Or acceptable equivalent product.

2.04 MIXES:

A. Concrete: Cast-in-place, 5,000 psi, Section 03346

B. Mortar:

1. For Brickwork: Mix portland cement, hydrated lime and sand in proportion by volume of twelve (12) part mortar sand, six (6) part Portland cement and two (2) part hydrated lime. Use sufficient water to form workable mixture to make mortar damp, just short of "balling".
2. For Plugging lift holes: Mix portland cement and sand in proportion by volume of 1: 1-1/2, with sufficient water.

2.05 HYDROPHILIC SEALANT:

- C. Hydrophilic sealant shall be a non-sagging, solvent-free, moisture-insensitive flexible epoxy resin material to seal between manhole grade rings and between the cast-in-place manhole base and the top of the existing brick manhole walls.
- D. Minimum bond strength of 350 psi at 14 calendar days when tested in accordance with ASTM C882.
 - 1.

PART 3 - EXECUTION

3.01 SETTING PRECAST SECTIONS:

- A. Set verticals with sections and steps in alignment. Set bases true to line and elevation.
- B. Install Butyl rubber-based sealants in joints between sections.
- C. Plug holes for handling with mortar. Hammer mortar into hole until dense and excess of paste appears, then smooth flush with adjoining surface.

3.02 LAYING BRICKWORK AND GRADING RINGS:

- A. Moisten bricks, before laying. Moistening grading rings NOT PERMITTED.
- B. Lay bricks and grading rings in full bed and joint of mortar without subsequent grouting, flushing or filling; bond thoroughly.

3.03 PLASTERING AND CURING BRICK MASONRY:

- A. Plaster outside faces with mortar for brick: 1/4 in. to 3/8 in. thick.
- B. Moisten brick masonry before application of mortar.
- C. Spread and trowel plaster carefully.
- D. Check after hardening by tapping for bond and soundness.
- E. Remove and replace unbonded and unsound plaster.
- F. Protect from too rapid drying by moist burlap or as approved.
- G. Protect from weather and frost.

3.04 JOINTING AND CONNECTIONS:

- A. Use joints between precast sections, and between pipes and precast sections conforming to related standards and manufacturer's instruction.
- B. Hold rubber ring water stops for pipe-to-manhole firmly against pipe surface by mechanical take-up device to compress resilient material when tightened. Install to minimize leakage.
- C. Apply non-shrink mortar according to manufacturer's instruction.
- D. Close openings for future connection with brick masonry bulkhead.

3.05 PROTECTIVE COATING:

- A. Apply two coats of protective coating material (min. 10 mils dft per coat) to exterior surfaces, by brush or spray according to manufacturer's printed instructions.

3.06 SETTING FRAMES AND COVERS:

- A. Set frames with top conforming to finished ground or pavement surface as indicated.
- B. Set circular frames concentric with top of masonry.
- C. Set frames in full bed of mortar to fill and make watertight the space between masonry top and bottom flange of frame.
- D. Place thick ring of mortar extending to outer edge of masonry, around bottom flange. Finish mortar smoothly and give a slight slope to shed water away from frame.
- E. Place concrete collar around frame when placing permanent pavement.

F. Place covers in frames on completion of work.

3.07 INSTALLING STEPS:

A. Embed or attach steps in wall during or after casting.

1. Embedded Steps: Use cleaning agents to remove dirt, oil, and grease. Rinse, dry and coat with heavy-bodied bituminous material, parts to be embedded. Dry and secure in forms for embedment during casting.
2. Attached Steps: Drive into plastic inserts. Embed inserts during casting or drive inserts into holes formed during casting.
3. Embed plastic coated steel steps during casting or attach after casting: Drive into holes formed during casting, or into embedded plastic inserts.

3.08 LEAKAGE TESTS:

A. General

1. Leakage tests shall be made and paid for by the CONTRACTOR and observed by the ENGINEER on each manhole. Prior to backfilling, all manholes shall be vacuum tested. After backfilling, the manholes shall be retested using either the vacuum test or exfiltration test. The exfiltration test and vacuum tests shall be made as described below.

B. Preparation for Test

1. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6 feet of the ground surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing exterior horizontal joints below the 6-foot depth line or any interior horizontal joints. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

C. Vacuum Test Procedure

1. All manholes shall be vacuum tested prior to backfilling. After backfilling manholes shall be retested by vacuum test or exfiltration test. Vacuum test shall require the sealed manhole to hold a vacuum drop of 1" Hg over a period of time as described below.

- a. Initial test pressure = 10" Hg (i.e. ± 20 " Hg absolute)
- b. Test time for 1" Hg drop to 9" Hg"
 - 2 minutes minimum allowable, for 0-10' deep manholes;
 - 2 ½ minutes minimum allowable for 10'-15' deep manholes;
 - 3 minutes minimum allowable for 15'-25' deep manholes.
- c. If the pressure drop exceeds 1" Hg in 2 minutes the manhole shall be repaired and retested.
- d. If a manhole fails to meet 1" Hg drop in 1 minute after repair, the unit shall be removed and repaired or replaced as necessary.

D. Exfiltration/Test Procedure

- 1. The manhole shall be filled with water to the top of the cone section. A period of time may be permitted, if the CONTRACTOR so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone; measuring the volume of water added. This amount shall be extrapolated to a 24 hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the ENGINEER to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallons per vertical foot per day, shall be cause for the rejection of the manhole. It shall be the CONTRACTOR'S responsibility to uncover the manhole as necessary and to disassemble, reconstruct, or replace it as directed by the ENGINEER. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

E. Infiltration Test

- 1. If after vacuum testing and backfilling the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the ENGINEER, such a test can be used to evaluate the water-tightness of the manhole. However, if the ENGINEER is not satisfied, the CONTRACTOR shall lower the water table and carry out the test as described hereinbefore.

3.09 DISCONNECTING LATERALS – PLUGGING:

- F. Existing sewers or drains shall be plugged with solid concrete masonry bricks or solid concrete masonry blocks with full mortar joints. Pipes entering a manhole or catch basin that are abandoned shall have plug flush with interior wall structure.

3.10 REMOVAL OF MANHOLES:

- G. An existing structure to be removed shall be completely removed. If the manhole is not to be replaced with a new manhole, the cavity shall be completely filled with selected materials in 6-inch layers and thoroughly compacted.

3.11 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02609

REINFORCED-CONCRETE DRAIN PIPE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and test reinforced concrete pipe as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth Excavation, Backfill, Fill and Grading
- B. Section 02211: Rock Excavation and Disposal
- C. Section 02223: Screened Gravel
- D. Section 02431: Catchbasins
- E. Section 02601: Manholes
- F. Section 03346: Cast in Place Concrete for Utility Work

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
 - 1. C76: Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - 2. C361: Specification for Reinforced Concrete Low-Head Pressure Pipe.
 - 3. C425: Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
 - 4. C443: Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets.
 - 5. C700: Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 - 1. Shop drawings showing pipe dimensions, reinforcement, joint and other details for each type and class pipe.

2. If less than 100 units of given size and class, submit three certified copies of pipe tests on identical pipe units made by same manufacturer within past year.
3. If more than 100 units of given size and class, submit:
 - a. Reinforcing steel mill or sample test reports for each shipment of steel.
 - b. Cement mill test reports for each shipment of cement.
 - c. Aggregate test reports before manufacturer of pipe and monthly thereafter during production.
 - d. Records of average daily temperature and number of days pipe units cured, when average daily temperature below 60 deg. F.
 - e. Concrete cylinder compression test results within three days after test.
 - f. Absorption test results.
 - g. Pipe load-bearing test results.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Provide pipe made by manufacturer of established good reputation in the industry and manufactured in a plant adapted to meet the design requirements of the pipe.
- C. Accept on basis of tests of materials, absorption tests, plant load-bearing tests, pressure tests, and inspection of completed product.
- D. Testing Agencies:
 1. Engage an acceptable independent testing laboratory to perform or witness tests, other than mill tests on reinforcing steel and cement, and certify the results.
- E. Allow Owner to engage independent testing laboratory at Owner's expense to perform additional inspection or tests of any or all pipe units at manufacturer's plant or elsewhere. Accept such additional inspections or tests as test results of record.
- F. Conduct all tests in accordance with applicable ASTM Specifications.
 1. Materials:

- a. Reinforcing Steel: Mill test reports or reports on samples taken from each shipment to pipe manufacturer.
 - a. Cement: Mill test reports for each shipment to pipe manufacturer. Cement for this project kept segregated from other cement.
 - b. Aggregates: Tests to demonstrate compliance with specified requirements. Initial tests prior to commencement of pipe manufacturer and additional tests at least monthly during production of pipe.
2. Concrete: Compression tests on standard cylinders for first pipe unit, then for every 100 cu. yd. of concrete used in pipe fabrication, or for each additional 200 units of pipe, whichever is lesser amount of concrete. Make 4 cylinders for each test and break them at 7, 14 and 28 days. Set aside one cylinder in case of unsatisfactory break.
 3. Conduct pipe tests on units selected at random by Engineer.
 - a. Absorption: Before load test, take 3 cores from each unit. Test by boiling. Average absorption: Maximum 8 percent of dry weight, no single test more than 9 percent.
 - b. Load-Bearing: Before delivery, conduct one test on one pipe unit of each size and class, and one additional test for each 200 units of each size and class, after taking cores for absorption test. Carry test to specified load to produce 0.01-in. crack; if no crack produced, pipe may be used. Plug cored holes with mortar as specified for repairs.
 - c. Pressure: Before delivery, test six units of each size and class. Join units in normal manner using joint to be furnished and bulkhead end units independently. Average internal hydrostatic pressure of 10 psi for 10 minutes minimum without visible leakage from joints or barrels. Perform test in presence of Engineer.

G. Inspection by Engineer:

1. At place of manufacture.
2. At site of work after delivery.
3. Reject pipe at any time if it fails to meet specified requirements, even if sample pipe accepted at plant.
4. Immediately remove rejected pipe from site.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.

PART 2 - PRODUCTS

2.01 PIPE FABRICATION:

- A. Interior: Smooth; no projections, indentations, offsets or irregularities.
- B. Classes: As indicated.
- C. Conform to ASTM C76, modified as follows:
 - 1. Provide with proper concrete ends true to size; form on machined rings to ensure accurate joint.
 - 2. Use Type II cement, no admixtures unless permitted by Engineer.
 - 3. Cement content in concrete: At least 564 lbs. per cu. yd.
 - 4. Aggregates: Fine and Coarse Aggregate per Sections 03300, 03346.
 - 5. Reinforcement: Section 03200. Longitudinal reinforcement continuous. Minimum cover 3/4 in. Elliptical reinforcement not allowed.
 - 6. Minimum laying length: 8-ft. except where otherwise indicated or permitted.
 - 7. Curing: Saturated steam at temperature between 100 and 130 deg. F. for minimum 12 hours.
 - 8. Shipping: Aged at least 450 day-degrees including steam curing period before shipping. Day-degrees defined as total number of days times the average daily air temperature at pipe surface. (Example: Five days at daily average temperature of 60 deg. F. equals 300 day-degrees.)
 - 9. No lift holes.
 - 10. Repairs:
 - a. Mortar: Minimum compressive strength 4,000 psi at 7 days, and 5,000 psi at 28 days, when tested in 3-in by 6-in. cylinders stored in standard manner.
 - b. Only those allowed by ASTM C76.
 - 11. Mark permanently on inside and outside of pipe:

- a. Date of manufacture
- b. Class
- c. Size
- d. Consecutive number
- e. Manufacturer's trade mark

2.02 FITTINGS AND SPECIALS:

- A. Reinforcement: As required for class of pipe to be used.
- B. Details: As indicated and conforming to approved shop drawings.
- C. Pipebells for chimneys or building connections:
 - 1. Formed or built into pipe unit at plant.
 - 2. Vitrified-clay bells with premolded gaskets: ASTM C700, extra strength, and ASTM C425.

2.03 JOINTS:

- A. Rubber Gasket Type: Gaskets in compression permitting longitudinal and angular movement.
- B. Pipe 36 in. or less in diameter: O-ring: ASTM C361 and as specified.
- C. Pipe larger than 36 in. in diameter: O-ring or ribbed-gasket: ASTM C443 and as specified.
- D. Design:
 - 1. No visible leakage, when tested under average internal hydrostatic pressure of 10 psi.
 - 2. Diameter of joint surfaces compressing the gasket: Not off more than 1/16 in. from true diameter, or as permitted by above ASTM Standard, whichever is less.
- E. Composition and Texture of Gaskets:
 - 1. Resistant to common ingredients of sewage, industrial wastes, and groundwater. Permanent under anticipated service conditions.

2. Fabricated by manufacturer regularly making rubber gaskets for pipe.

PART 3 - EXECUTION

3.01 HANDLING:

- A. Handle into position in acceptable manner.
- B. Furnish suitable devices for support when lifted.

3.02 INSTALLATION:

- A. Inspect before installation. Remove and replace defective units. Clear of debris and dirt.
- B. Bedding:

1. Support on compacted screened gravel per Section 02223, or as indicated. Do not permanently support on saddles, blocking, or stones.
2. Provide bell holes for imparting bearing pressure to pipe barrel.

- C. Alignment:

1. Install to line and grade indicated.
2. Maintain close joints with next adjoining unit. Match inverts. Do not drive down to grade by striking.

- D. Jointing:

1. Clean and lubricate bell or groove before jointing per manufacturer's recommendation. Push into place. Force pipe units together by proper devices leaving minimum open recess inside and outside and achieving tightly sealed joints. Avoid force that could wedge apart or split bell or groove ends. Do not pull or cramp joints, except where permitted by Engineer.
2. Inspect proper position of joint gasket with feeler gage furnished by Contractor.
3. Remove and replace unfittable pipe units with suitable units and new gaskets.
4. Install gaskets and assemble joints in accordance with recommendations of manufacturers of joint material and pipe, subject to acceptance by Engineer. Provide watertight pipeline with flexible joints.

- E. Backfill:

1. Compact gravel between pipe and sides of trenches to hold pipe in correct alignment. Fill bell holes with screened gravel and compact as indicated.
2. Prevent floatation in trench.

F. Cleaning:

1. Use watertight plugs in open ends of pipe and branches when installation not in progress.
2. Do not use pipeline as conductor for trench drainage.
3. Prevent earth, water, and other material from entering pipeline.
4. Clean pipeline and manholes upon completion. Prevent soil, water, and debris from entering existing sewers.

3.03 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02622

SANITARY SEWER AND STORM DRAIN PIPING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and test polyvinylchloride (PVC) sewer pipe as indicated and specified.
- B. Provide and test high density polyethylene (HDPE) storm drain pipe as indicated and specified.

1.02 RELATED WORK:

- A. Section 02210: Earth excavation, Backfill, Fill and Grading
- B. Section 02601: Manholes
- C. Section 02223: Screened Gravel

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
 - 1. ASTM D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - 2. D3034: Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 3. D3212: Specification for Joints for Drain and Sewer Plastic Pipes using Flexible Elastic Seals.
 - 4. D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Material
 - 5. F 477: Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - 6. F679: Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
 - 7. ASTM F2306: Standard Specification for 12-inch to 60-inch Annular Corrugated Profile-Wall Polyethylene (PE) and Fittings for Gravity Flow Storm Sewer and Subsurface Drainage Applications

1.04 SUBMITTALS:

- A. Submit the following in accordance with Section 01300:
 - 1. Submit shop drawings and descriptive literature showing pipe dimensions, joints, joint gaskets, pipe stiffness, and details for each size of pipe indicated.
 - 2. Submit gasket and pipe manufacturers' joint assembly directions.
 - 3. Submit certification with each delivery, that pipe complies to this specification.
 - 4. Submit certified copies of test reports, with each delivery, stating compliance with ASTM D3212, ASTM F477, ASTM D2412, ASTM D2444, and ASTM D3034 or ASTM F679.

1.05 QUALITY ASSURANCE:

- A. Provide in accordance with Section 01400 and as specified.
- B. Provide labor to assist the Engineer in inspecting pipe upon delivery. Remove rejected pipe immediately.
- C. Reject pipe of any manufacturer if more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even if they conform to ASTM Specifications. Remove all unsatisfactory pipe of that manufacturer of same shipment from work and furnish from another manufacturer conforming to these specifications.
- D. Perform tests in accordance with methods prescribed by ASTM specifications. Accept or reject based on the test results.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide in accordance with Section 01610 and as specified.

PART 2 - PRODUCTS

2.01 PIPE, FITTINGS, AND SPECIALS:

- A. Sanitary Sewer Pipe and fittings including those required for stubs: ASTM D3034 or ASTM F679. Pipe stiffness (PS): 46 psi minimum.
- B. Storm drain pipe and fittings: Provide smoothbore High Density Polyethylene (HDPE) non-pressure drainage pipe, conforming to ASTM Specification D3350

- C. Provide straight pipe in lengths of 13 ft. maximum for sewer pipe and 20 ft maximum for drain pipe, Y-branches in lengths of 3 ft. maximum. Saddle Y-branches NOT ACCEPTABLE.
- D. Provide specials as specified and to meet the specifications for straight pipe insofar as applicable and to the details indicated.

2.02 JOINTS:

- A. PVC Joints: Conform to ASTM 3212.
- B. HDPE Joints: Conform to AASHTO M252, Type S or AASHTO M294 Type S. Joints shall be silt tight.
- C. Provide push-on bell and spigot joints with elastomeric ring gaskets.
- D. Provide gaskets conforming to ASTM F477; resistant to common ingredients of sewage and industrial wastes, including oils and groundwater; and capable of enduring permanently under conditions of proposed use. Fix gaskets into place in bells to avoid dislodging during joint assembly.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Examine excavation before pipe placement to ensure:
 - 1. Excavation complete to elevations and slopes indicated.
 - 2. No obstruction exists to interfere with installation.
 - 3. Bottom firm and dry.
- B. Inspect each pipe and fitting before installation. Remove defective pipe. Replace with sound pipe.

3.02 HANDLING:

- A. Store until installation, acceptable to Engineer; keep pipe at ambient outdoor temperature.
 - 1. Provide temporary shading.
 - 2. Do not use covering causing temperature build-up.
- B. Handle into position to avoid damage and acceptable to Engineer.

3.03 INSTALLATION:

- A. Do not install non-straight pipe.
 - 1. Do not allow pipe centerline to deviate from straight line drawn between ends, by more than 1/16 in. per ft. of length.
 - 2. Remove pipe failing to meet above requirement.
- B. Support pipe on compacted screened gravel, Section 02223. Do not permanently support on saddles, blocking or stones.
- C. Excavate bell holes so that only pipe barrel receives bearing pressure.
- D. Clear pipe units of debris, dirt, etc. before installation and keep clean until acceptance.
- E. Install to lines and grades indicated.
- F. Maintain close joint with previously installed pipe. Match with adjoining pipe.
- G. Do not drive pipe down to required grade by striking.
- H. Clean joint surfaces. Lubricate bell according to manufacturer's recommendation. Push pipe unit into place without damage to pipe or gasket. Use devices to force pipes together with minimum open recess inside and outside and tightly sealed joints. Avoid force that could wedge apart and split bell ends.
- I. Do not pull or cramp joints without permission of Engineer.
- J. Remove unfittable pipes and replace with sound units.
- K. Follow directions of joint material and pipe manufacturers when installing gaskets and joints to render them watertight and flexible.
- L. Close open ends of pipe and branches with PVC stoppers secured in place.
- M. After bedding pipe, place and compact screened gravel between pipe and sides of trench. Use extra care to compact screened gravel under lower half of pipe. Fill bell holes with screened gravel and compact. Place and compact screened gravel as indicated.
- N. Prevent pipe flotation in trench.
- O. Make open ends of pipe and branches watertight with temporary plugs when pipe installation not in progress.

- P. If water in trench, do not remove plug until provisions made to prevent water, earth, or other substances from entering pipe; then resume work.
- Q. Do not use pipeline as conductor for trench drainage.
- R. Cleaning:
 - 1. Prevent earth, water, and other material entering pipeline.
 - 2. Clean pipeline and manholes upon completion.

3.04 ALLOWABLE PIPE DEFLECTION:

- A. Allow a maximum deflection of installed pipe of 5.0 percent of base diameter.
- B. Measure deflection after completion of a section including placement and compaction of backfill. Pull a specially designed gage through completed section. Use a gage as recommended by pipe manufacturer and accepted by Engineer.
- C. Provide base diameter and gage diameter (diameter of circumscribing circle):

Nominal Size (in.)	Base Diameter (in.)	Gage Diameter (in.)
6	5.742	5.45
8	7.665	7.28
10	9.563	9.08
12	11.361	10.79
15	13.898	13.20
18	16.969	16.12
21	19.990	18.99
24	22.453	21.33
27	25.280	24.02

- D. Should the installed pipe fail to meet above requirement, do all work to correct problem without additional compensation.

3.05 LEAKAGE TESTS FOR SEWER PIPE:

- A. Perform leakage tests and measurements:
 - 1. After completion of backfill.

2. After return of groundwater to normal level.
 - a. Plug underdrains.
 - b. Stop other groundwater drainage.
- B. Furnish test plugs, water pumps, appurtenances, and labor. Install bulkheads for testing and weirs for measurements as necessary. Determine groundwater elevation from observation wells or excavations subject to acceptance by Engineer.
 1. If groundwater is more than 1 ft. above top of pipe at upper end, conduct infiltration or low-pressure air tests. If maximum pressure exerted by groundwater is greater than 4 psig, conduct infiltration test.
 2. If groundwater is less than 1 ft above top of pipe at upper end, conduct exfiltration or low-pressure air tests.
- C. Perform exfiltration or infiltration test on sections of approved length and before connection to buildings. Perform low pressure air tests on manhole-to-manhole sections of pipeline.
- D. A Low-pressure air test:
 1. Equipment:
 - a. Designed for testing sewers using low-pressure air.
 - b. Provide air regulator or safety valve so air pressure does not exceed 8 psig.
 - c. Air through single control panel.
 2. Procedure:
 - a. Perform tests from manhole-to-manhole after backfill.
 - b. Place pneumatic plugs: (1) Sealing length: Equal or greater than pipe diameter
(2) Capable of resisting internal test pressure without external bracing or blocking.
 - c. Introduce low-pressure air into sealed line and achieve internal air pressure 4 psig greater than maximum pressure exerted by groundwater above pipe invert.
 - d. Limit internal pressure in sealed line below 8 psig.

- e. Allow 2 minutes minimum for air pressure to stabilize. Disconnect low-pressure air hose from control panel.
3. Acceptable Test Result:
- a. Allow a time for pressure to drop from 3.5 to 2.5 psig. greater than maximum pressure exerted by ground water above pipe invert of no less than:

Pipe diameter, in.	Time, min.
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5
27	13.0

- b. Allow a time for sewers with more than one size of pipe based on largest diameter reduced by 0.5 min.
4. Locate and repair leaks, and retest as required, without additional compensation.

E. Infiltration Test:

- 1. Dewater, and conduct test for at least 24 hours.
- 2. Locate and repair leaks, and retest as required, without additional compensation.
- 3. Allow a maximum infiltration including manholes, fittings and connections of 100 gallons per inch per mile per 24 hours.

F. Exfiltration Test:

- 1. Subject sewers to internal pressure by: (1) Plugging the pipe at lower end. (2) Filling pipelines and manholes with clean water to height of 2 ft. above top of sewer at upper end.

2. Use suitable ties, braces, and wedges to secure stoppers against leakage from test pressure, where conditions between manholes may result in test pressure causing leakage.
3. Determine the rate of leakage from sewer by amount of water required to maintain level 2 ft. above pipe top.
4. Allow exfiltration same as allowable infiltration.
5. Modify this test, only as permitted by Engineer.
6. Locate and repair leaks, and retest as required, without additional compensation.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 02720

MAINTENANCE AND TRANSFER OF FLOWS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. The Work of this Section includes, but is not limited to, furnishing all labor, materials, and equipment and performing all operations to maintain flow in existing sewers, drains, and the temporary transfer of flow from proposed systems into existing facilities, where required. At a minimum, the Work shall include the following:
 - 1. Constructing and maintaining all temporary connections, piping, pumps, plugs and bypasses.
 - 2. Upon completion of the Work, removing the temporary connections, piping, pumps, plugs and bypasses and transferring the flows to the new pipes.
 - 3. Meet the Maine DEP maintenance of flow guidance documents.

1.02 RELATED SECTIONS:

- A. Section 02601: Manholes
- B. Section 02609: Reinforced Concrete Pipe
- C. Section 02622: Sanitary Sewer and Storm Drain Piping

1.03 SUBMITTALS:

- A. Submit in accordance with Section 01300.
 - 1. Plan of maintenance and transfer of flow during construction.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. All materials used in construction of temporary connections, piping, pumps, plugs, and bypasses, plugging and filing of pipes to be abandoned, and all other Work described herein shall be in accordance with other Sections, as applicable.

PART 3 - EXECUTION

3.01 MAINTAINING EXISTING FLOWS:

The Contractor shall construct temporary bypasses or provide temporary pumping of all dry weather and wet weather flows. The temporary facilities shall provide adequate hydraulic capacity to prevent local surcharge of the sewers and drains upstream and downstream of the Work site. All bypasses shall be covered at all times to minimize odors.

- A. At locations where the proposed pipe system is required and it is not possible to construct the downstream or discharge point for the proposed pipe system due to such issues as construction staging or work by others, the Contractor shall provide temporary connections from the proposed system to the existing system. Prior to performing the temporary connection, the Contractor shall verify that the existing system will accept the proposed flows without creating unsafe conditions on the roadway or surrounding areas.
- B. The Contractor shall not overflow, bypass, pump or by any other means convey dry weather sanitary sewage to any watercourse.
- C. All bypass pumping operations shall not induce a discharge of combined sewage (CSO) from any outfall in the collection system at a frequency greater than what is considered normal operation of the system for all weather conditions.
- D. Should a combined sewage discharge occur any time during the construction of this project, the Contractor is required to notify the Engineer immediately. Within 48 hours of the notification, the Contractor is to prepare a report containing the details of the discharge, including, but not limited to: duration of activation, estimated volume of combined sewage discharged and the associated rainfall volume and intensity or other cause that induced the activation.
- E. Should damage of any kind occur to the existing pipes, the Contractor shall make repairs to the satisfaction of the Engineer.
- F. Plugs for existing pipes, 12 inches in diameter and greater, to be abandoned shall be constructed of a mortared brick wall two layers of brick deep. Plugs for existing pipes to be abandoned less than 12 inches in diameter shall be concrete extending one foot into the pipe and one foot beyond the end of the pipe.
- G. An indication of local flows are as follows: Peak, average, and minimum dry-weather flows, peak 3-Month 24-hour storm flow, and peak 1-Year 24-hour storm flow are derived from hydraulic modeling. Flows presented represent a range of conditions each structure can experience given a variety of flow factors. Actual flow conditions may vary from those presented.

Description	Dry Weather Flow MGD)			Wet Weather Flow MGD	
	Peak	Average	Min.	3 Month 24-hour Storm	1 year 24-hour Storm
Court Street Existing SMH-3	0.28	0.23	0.12	10.0 (peak) 3.2 (avg)	20.8 (peak) 4.9 (avg)

- H. Bypass pumping operations shall normally be conducted at existing manhole locations. The Contractor may, however, construct at his option and at his expense, temporary works, such as manholes into the sewer at the location of the upstream manhole to facilitate bypassing wastewater flows with the approval of the Engineer. Obtain local permits if required and restore the site to its original condition at the completion of the work. The Contractor shall submit final design documents showing the change and restoration for review by the Engineer. Contractor may install upstream manhole out of sequence to facilitate bypass pumping.
- I. For bypass pumping operations, the Contractor shall provide temporary dams to prevent overflow into the work area.
- J. The Contractor may pump simultaneously from more than one manhole location. Bypass pumping operations may be required continuously during the work.
- K. System to consist of pumping equipment, conduits and other equipment and appurtenances necessary to bypass the sewer flow around the work area.
- L. Have adequate standby equipment available and ready for immediate installation and use in the event of emergency or breakdown.
- M. All engines and powered equipment for operation outside of normal work hours to be equipped in a manner to keep noise at a minimum. Noise control to include the use of appropriate baffles or other means of noise control.

3.02 PROTECTION OF NEW FACILITIES:

- A. The Contractor shall protect all Work against flooding.
- B. At locations where Work is to connect to new facilities constructed by others, the Contractor shall provide a temporary plug adequate to prevent flow from entering the Work.

3.03 ADDITIONAL DEMOBILIZATION AND MOBILIZATIONS:

- A. When directed by the Engineer because of anticipated hydraulic issues with the remainder of the sewerage system and/or the operation of the Bangor Wastewater Treatment Plant or any of its associated pump stations, the Contractor shall demobilize operations by removing from all corresponding and connecting sewers, all materials, tools, and equipment which could substantially impeded flow or be carried away by the flow, and shall exit all workers. Items included, but not limited to, are collapsible dams, sandbags, shovels, ladders, buckets mortar boxes, boards, ropes, and concrete placement equipment. Temporary flow control and flow conveyance facilities, such as flumes and adjustable dams which can be held in place and minimally impede the flow may be

retained in the sewer, if allowed by the Engineer.

- B. After notice from the Engineer to resume work, the Contractor shall re-mobilize by re-entering the sewer, re-cleaning the sewer as deemed necessary by the Engineer, re-establishing working conditions, and proceeding with the work.

3.04 HYDRAULIC UPLIFT OF STRUCTURES:

- A. The Contractor shall be responsible of the protection of all structures against hydraulic uplift until such structures have been accepted by the Engineer.

3.05 SEQUENCE OF CONSTRUCTION:

- A. The Contractor shall submit to the Engineer for review and approval a complete schedule of his sequence of work on the Court Street Sewer Separation Project including proposed locations for his surface operations.

3.06 CONTRACT CLOSEOUT:

- A. Provide in accordance with Section 01700.

END OF SECTION

SECTION 03346

CAST-IN-PLACE CONCRETE FOR UTILITY WORK

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide, finish, cure and protect cast-in-place concrete for electrical duct banks, manhole base slabs, manhole top slabs, equipment pads, pipe encasements and thrust blocks as indicated and specified.
- B. Provide and remove all formwork to produce cast-in-place concrete as indicated and specified.
- C. Provide reinforcement and accessories as indicated and specified.

1.02 RELATED WORK:

- A. Division 1: General Requirements

1.03 SUBMITTALS:

- A. Shop Drawings: Submit the following in accordance with Section 01300:
 - 1. Mix design and results of strength tests from trial mixes by the Contractor's testing laboratory firm.
 - 2. Submit manufacturer's Stable-Air Generator Admixture product data, installation instructions and recommendations for material use.
 - 3. Test and Performance - Submit the following data:
 - a. Concrete mix design for each strength of concrete.

1.04 QUALITY ASSURANCE:

- A. Perform concrete work in conformance with ACI-301 unless otherwise indicated or specified.
- B. Measure all materials for ready mixed concrete, including water, with equipment and facilities suitable for accurate measurement and capable of being adjusted in conformance with ASTM C 94. Use scales certified by local Sealer of Weights and Measures within one year of use and accurate when static load tested to plus or minus 0.4 percent of total capacity of scale. Batch all materials by weight except admixtures which may be batched by volume.

- C. Measure all materials for site mixed concrete, including water, with equipment and facilities suitable for accurate measurement. Batch all materials by weight.
- D. Hot weather concrete: Conform to ACI 305R and as specified herein.
- E. Cold weather concrete: Conform to ACI 306R and as specified herein.
- F. Reject concrete delivered to job site which exceeds the concrete temperature limitations specified.
- G. Do not place concrete in water or on frozen or disturbed ground.
- H. Remove all formwork from concrete.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Order concrete from batching plant so that trucks arrive at discharge locations when concrete is required. Avoid excessive mixing of concrete or delays in placing successive layers of concrete in forms.
- B. Deliver concrete to discharge locations in watertight agitator or mixer trucks without altering the specified properties of water-cement ratio, slump, air entrainment, temperature and homogeneity.
- C. Reject concrete not conforming to specification, unsuitable for placement, exceeding the time or temperature limitations or not having a complete delivery batch ticket.

1.06 JOBSITE CONDITIONS:

- A. Do not place concrete until conditions and facilities for making and curing control test specimens are in compliance with ASTM C 31 and as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Furnish Portland cement conforming to ASTM C 150. Use one approved brand from one mill throughout the contract term unless otherwise approved by the Engineer. Use cement of uniform color.
 - 1. Use Type II for all work.
 - 2. Reject the entire shipment when cement is lumpy, wetted, partially or wholly set.

B. Water:

1. Use water for concrete which is potable and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances, and conforms to the requirements for water in ASTM C 94, and as specified herein.
2. Heat or cool water to obtain concrete temperatures indicated or specified, and in conformance with ACI 305R and ACI 306R.

C. Aggregates:

1. Use fine aggregates for normal weight concrete consisting of well graded natural sand conforming to ASTM C 33 and to the following requirements:
 - a. Fineness modulus: 2.50 to 3.10
 - b. Soundness: Maximum of 10 percent weighted average loss after 5 cycles of magnesium sulfate soundness test as determined by ASTM C 33.
2. Use coarse aggregates for normal weight concrete consisting of well graded gravel or crushed stone conforming to ASTM C 33 and to the following requirements:
 - a. Soundness: Maximum of 14 percent weighted average loss after 5 cycles of magnesium sulfate soundness test as determined by ASTM C 88.
3. Test aggregates for chert in conformance with ASTM C 33 as determined by ASTM C 123.

D. Waterproof Curing Sheet: Waterproof paper or white opaque polyethylene film conforming to ASTM C 171.

E. Cloth, Burlap, Jute or Kenaf: Curing materials conforming to CCC-C-467C.

2.02 MIXES:

- A. Ready Mixed Concrete: Use ready-mixed concrete secured from a batching or mixing plant conforming to ASTM C 94, capable of developing specified characteristics, and being placed without segregation.
- B. Site Mixed Concrete: Mix in a batch mixer of adequate capacity. Volume of mixed batch shall not exceed the rated capacity of the mixer.
- C. Use 5,000 psi concrete for all concrete, unless otherwise indicated or specified.

- D. Secure, for every part of work, concrete of homogeneous structure having required strength, watertightness, and durability. Give careful attention to selection of materials, mixtures, transporting to discharge locations, placing, spading, vibrating, and curing.
- E. Use the 3/4 inch coarse aggregate size for all concrete, unless otherwise indicated or specified.
- F. Provide concrete meeting the requirements in Table 03346-1.

TABLE 03346-1		
Minimum compressive strength at 28 days (psi)	Minimum compressive strength at 28 days (MPa)	Maximum water cement ratio*
CLSM (100 psi MAX)	N/A	N/A
1,500	10	0.76
3,000	20	0.53
5,000	35	0.40

*Total water in mix at time of mixing, including free water in the aggregates.

- G. Consistency: Mix concrete to produce homogeneous consistency, capable of being worked into constricted areas of forms, corners and around embedded items, without segregation or bleeding of free water.
- H. CLSM:
 1. CLSM mix design shall produce a consistency that will result in a flowable product at the time of placement which does not require manual means to move it into place.
 2. Provide mix with compressive strength of maximum 100 psi [0.07 MPa] when measured 56 days after placement.
 3. CLSM shall have minimal subsidence and bleed water which is measured as a Final Bleeding of less than 1.0% (retains 99.0 percent of original height after placement, approximately 1/4" per foot of depth) as measured in Section 10 of ASTM C 940 "Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory".
 4. The fresh unit weight shall be 90 - 110 lbs./ft³ (1440 - 1760 kg/m³), except where specified, and in the absence of strength data the cementitious content shall be a maximum of 150 lbs./cy (90 kg/m³).
 5. Control Density Fill shall have an in-place yield of 98% of design yield.

6. Provide Stable-Air Generator and comply with manufacturer's recommendations. Add Stable-Air Generator at the production plant or placement site.

2.03 FORMS:

- A. Forms shall be constructed of sound lumber, plywood or metal and shall conform accurately to dimensions shapes and elevations indicated on the drawings.
- B. Forms shall be mortar tight, rigid and unyielding during placing and compacting of concrete.

2.04 STEEL REINFORCING BARS:

- A. Provide newly rolled deformed billet-steel reinforcement bars conforming to ASTM A 615, Grade 60.
- B. All materials used shall be AIS compliant.

2.05 TIE WIRE:

- A. Provide minimum 16 gage mild steel or annealed iron tie wire.
- B. All materials used shall be AIS compliant.

2.06 REINFORCING BAR SUPPORTS:

- A. Provide 3-in. by 3-in. plain precast concrete blocks and precast concrete doweled blocks for reinforcing bar supports. Provide block thickness to produce concrete cover of reinforcement as indicated.
- B. All materials used shall be AIS compliant.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Batch, mix and deliver portland cement concrete in conformance with ASTM C 94. Batch all constituents at central batching or mixing plant. Produce concrete in conformance with ACI 301 and as specified herein.
- B. Seasonal Conditions:

1. Conform to ACI 305R and as specified herein for hot weather concreting. Do not add retarder admixture to any concrete.
2. Conform to ACI 306R and as specified herein for cold weather concreting. Do not add accelerator admixture to any concrete.

3.02 FORMS:

- A. Set forms true to the indicated line and grade and to obtain specified tolerances for formed surfaces. Correct deviations in line before concrete placement.
- B. Apply oil to form surfaces in contact with concrete. Clean, repair and re-oil all reused form surfaces.
- C. Inspect forms, embedded items and foundation preparation before placing concrete. Remove snow, ice, water, dirt, debris and foreign matter from excavation and within formwork before placing concrete.
- D. Do not remove forms until concrete has cured 72 hours minimum.
- E. Set reinforcing bars and welded wire fabric to tolerances specified in ACI 117 & ACI 318. Hold reinforcing in position using tie wire with ends pointed away from forms.
- F. Tack welding reinforcement is prohibited.

3.03 EMBEDDED ITEMS:

- A. Clean embedded items of oil and foreign matter.
- B. Install inserts, anchors, sleeves and other items indicated or specified under other sections of these specifications in formwork. Close ends of conduits, piping and sleeves embedded in concrete with caps or plugs.
- C. Complete required tests on embedded piping before starting concrete placement.
- D. Check location and support of piping, conduits and other embedded items before depositing concrete. Correct locations as required and secure supports.

3.04 TRANSPORTING AND MIXING:

- A. General: Conform to concreting procedures set forth in ACI 304R and as specified herein.
 1. Transport concrete to discharge locations without altering the specified properties of water-cement ratio, slump, temperature and homogeneity.

2. Discharge concrete into forms within 1-1/2 hours after cement has entered mixing drum or before the drum has revolved 300 revolutions after the addition of water, whichever occurs first. Do not add retempering water at jobsite, nor exceed the maximum water content in the approved concrete design mix.
 3. Site Mixed Concrete: Mix in a batch mixer of adequate capacity. Volume of mixed batch shall not exceed the rated capacity of the mixer.
 - a. Provide adequate facilities for accurate measurement and control of materials entering drum.
 - b. Revolve mixer at uniform peripheral speed of approximately 200 feet per minute.
 - c. Mixing Time: Mixing time is measured from the time when all solid materials and water are first introduced into the drum.
 - (1) Mixing time shall be a minimum of 1 1/2 minutes for each batch for mixers of 1 cubic yard capacity or less.
 - (2) Mixing time shall be increased 30 seconds for each additional half cubic yard capacity or fraction thereof.
 - d. The entire batch shall be discharged before the mixer is recharged.
 4. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time is necessary, in conformance with the following:
 - a. Reduce mixing and placement time from 90 to 45 minutes maximum when concrete temperature at time of placement is between 85 and 90 degrees Fahrenheit.
 - b. Reject concrete with a temperature in excess of 90 degrees Fahrenheit.
- B. Conveying: Convey concrete from agitator or mixer truck to place of final deposit in forms by one of the following methods:
1. Buckets or hoppers with discharge gates having a clear opening equal to not less than one-third the maximum interior horizontal area or five times the maximum aggregate size being used, whichever is greater, and side slopes of not less than 60 degrees to horizontal.
 2. Buggies or wheelbarrows equipped with pneumatic tires.
 3. Round bottom, metal or metal-lined chutes with inclined slope of between two to three feet horizontally to one foot vertically and sufficient capacity to avoid

overflow.

4. Circular drop pipes with a top diameter of at least eight times the maximum aggregate size, but not less than 4 in., or tapered to not less than six times maximum aggregate size. Do not drop concrete more than 5 feet without drop pipes.

3.05 CONCRETE ACCEPTANCE:

- A. Accept or reject each batch of concrete delivered to the point of agitator or mixer truck discharge. Concrete acceptance shall be indicated by the signature of a Contractor's authorized representative on the delivery batch ticket.
- B. Reject concrete delivered without a complete concrete delivery batch ticket as specified herein. Copies of the signed batch ticket will be furnished by the concrete supplier to the Contractor and Engineer.
- C. Field tests shall be performed by the Contractor's testing laboratory firm at the point of agitator or mixer truck discharge. Accept or reject concrete on the basis of conformity with slump, air content and temperature specified.
- D. Inspect concrete transit truck's barrel revolution counter and gauge for measuring water added to the concrete. Reject concrete which exceeds the maximum barrel revolution of 300 or which has water content exceeding the specified water-cement ratio.
- E. Reject concrete exceeding time or temperature limitations specified.
- F. Concrete not conforming to specification shall be rejected by the Contractor or by the Engineer before discharging into the forms.

3.06 PLACING:

- A. Deposit concrete into its final position in conformance with ACI 304R and as specified herein. Place concrete in horizontal layers 1-1/2 to 2 feet thick maximum completely across forms. Avoid inclined layers and cold joints. Place concrete at lower portion of slope first on sloping surfaces.
 1. Do not deposit partially hardened concrete in forms. Retempering of partially hardened concrete is not permitted. Remove all partially hardened concrete from site at no additional compensation.
 2. Do not allow concrete to fall freely in forms to cause segregation (separation of coarse aggregate from mortar). Do not move concrete horizontally more than four feet from point of discharge.

3. Pump Concrete: Use equipment procedures with backup to maintain steady flow of concrete at discharge end of pipe. Maintain concrete properties of unit weight, slump, air content and temperature. Make adjustments in concrete proportions to provide concrete properties in accordance with the approved concrete design mix and as specified herein. Do not pump concrete through aluminum piping. Use pipe having at least three times the maximum coarse aggregate size. Take samples at the point of agitator or mixer truck discharge. Adjust slump and air content to maintain the specified requirements at the discharge end of the pipe. Furnish labor and assistance as required by the testing laboratory in obtaining and handling test specimens.

B. Consolidation:

1. Consolidate concrete using mechanical vibrators operated within the mass of concrete and/or on the forms conforming to procedures set forth in ACI 309R and as specified herein.
2. Conduct vibration in a systematic manner with regularly maintained vibrators. Furnish sufficient backup units at job site. Use vibrators having minimum frequency of 8,000 vibrations per minute and of amplitude to consolidate concrete. Use not less than one vibrator with crew for each 35 to 40 cubic yards of concrete placed per hour.
3. Insert and withdraw vibrator vertically at a uniform spacing over the entire area of placement. Space distance between insertions such that spheres of influence of each insertion overlap.

3.07 CURING AND PROTECTION:

A. General:

1. Protect concrete from premature drying, hot or cold temperatures and mechanical injury, beginning immediately after placement and maintain concrete with minimal moisture loss at relatively constant temperature. Continuously cure concrete for a period of not less than seven days after placement.
2. Comply with curing procedures set forth in ACI 301, applicable portions of ACI 308 and as specified herein.
3. Perform hot weather concreting in conformance with ACI 305R and as specified herein.
4. Perform cold weather concreting in conformance with ACI 306R and as specified herein.

B. Methods of Curing:

1. Unformed Surfaces: Cover and cure entire surface of newly placed concrete immediately after completing finishing operations and water film has evaporated from surface. Use warm water curing for unformed surfaces. Continuously water cure all exposed concrete by ponding, immersion, spraying, sprinkling or saturated materials such as burlap or cotton mats in contact with concrete surface at all times kept wet with a soil soaking hose and maintained.
2. Formed Surfaces: Minimize moisture loss for formed surfaces exposed to heating by the sun by keeping forms wet until safely removed. Keep surface continuously wet by warm water spray or warm water saturated fabric immediately following form removal. Liquid membrane curing compound may be substituted for water curing when curing materials and locations are approved by the Engineer.
3. Membrane Curing:
 - a. Use liquid membrane curing compounds where water curing is not feasible as a temporary method of curing when finishing operations necessitate delay in start of warm water curing.
 - b. Apply membrane curing compound uniformly over concrete surface by means of roller or mechanical spray machine at a rate recommended by the curing compound manufacturer, but not less than 1 gallon per 150 sq. ft. of surface area.
4. Sealing Materials:
 - a. Use common sealing materials such as plastic film or waterproofing (kraft) paper when approved by the Engineer.
 - b. Lap adjacent sheets a minimum of 12 inches. Use sheets of sufficient length to cover sides of concrete member.
 - c. Place sheet materials only on moist concrete surfaces. Wet concrete surface with fine warm water spray if the surface appears dry.
 - d. The presence of moisture on concrete surfaces at all times during prescribed curing period is proof of acceptable curing using sheet material.

C. Duration of Curing and Protection: Continuously cure concrete for period of not less than seven days after placing.

1. Protect concrete so that temperature at concrete surface will not fall below 50 deg. F. for at least seven days after placement. Use methods of protecting concrete as

specified herein and in conformance with Section 01500.

2. Do not use salt or heat producing chemicals for cold weather protection.

D. Protection from physical injury: Protect concrete from physical disturbances such as heavy shock and vibration during curing period.

E. Protection from Deicing Agents: Do not apply deicing chemicals to concrete.

3.08 REPAIR:

A. General: Repair surface defects immediately after form removal. Surface defects include tie holes, air voids and bug holes with a nominal diameter or depth greater than 1/4 inch, honeycombed areas, visible construction joints, fins, burrs and other defects as determined by the Engineer. Make concrete repairs in concrete surfaces to produce a uniform color and texture and free of irregularities.

B. Repair of Defective Areas:

1. Remove honeycombed and other defective concrete down to sound concrete. Chisel edges a minimum of 1 inch deep perpendicular to surface or slightly undercut. No feather-edges permitted.

2. Dampen the area to be patched and area at least 6 inches wide surrounding it for at least 24 hours to prevent absorption of water from patching mortar.

3. Make patching mixture of same materials and of approximately same proportions as used for the parent concrete, except omit coarse aggregate. Use not more than 1 part cement to 2-1/2 parts sand by damp loose volume and substitute white portland cement for a portion of regular grey portland cement to produce patching mix to match the surrounding concrete in color when dry.

4. Use no more mixing water than necessary for handling and placing. Mix patching mortar and allow to stand with frequent manipulation with a trowel, without addition of water, until it has reached stiffest consistency that will permit placing.

5. Brush bond coat of neat cement well into surface after surface water has evaporated from area to be patched. Consolidate mortar into place and strike off so as to leave patch slightly higher than surrounding surface to permit initial shrinkage. Leave patch undisturbed for at least 1 hour before final finish. Keep patched area damp for a minimum of 7 days.

C. Tie Holes: Fill tie holes solid with patching mortar after cleaning and dampening. Fill tie holes in liquid containing structures with specified non-shrink, non-metallic grout.

- D. Final determination as to acceptability of concrete and repair of defects shall be made by Engineer.

3.09 FINISHES:

- A. Hard steel-trowel finish surfaces shaped with or without forms and over which liquids will flow.
- B. Use forms for all concrete.
- C. Finish other concrete surfaces as indicated or specified.
- D. Descriptions:
 - 1. Steel-Trowel Finish: Remove excess laitance from surfaces by tamping, screeding and magnesium or bull-floating. Dusting with dry cement or other mixtures or sprinkling with water is not permitted in finishing. Leave surfaces with smooth hard finish free of blemishes.
 - 2. Form Finish: Remove fins, finish flush with parent concrete and make repairs.

3.10 METALWORK IN CONCRETE:

- A. Secure castings, inserts, conduits and other metalwork encased in concrete to prevent metalwork from being displaced or deformed during concrete work.
- B. Set anchor bolts by means of templates.

3.11 CONCRETE TOLERANCES:

- A. Comply with the requirements of ACI 117 for tolerances for formed surfaces.
- B. Maximum deviation in concrete work not to exceed 1/4 inch in 10 feet as determined by a 10 foot straight edge placed anywhere on the surface in any direction.

END OF SECTION