2.07 TYPE 7 CRUSHED STONE

A. The crushed stone shall consist of clean, hard, inert, durable particles or fragments. It shall be free from clay, loam, vegetable or other objectionable matter.

B. At least 50% of the material passing a one (1) inch sieve shall have a fractured face. The percent of wear of the crushed stone for pavement base coarse shall not exceed 50.

The stone sizes for the crushed stone shall be as follows:

SIEVE SIZE	PERCENT BY WEIGHT PASSING
1 1/2 inch	100
1 1/4 inch	85-100
3/4 inch	10-40
1/2 inch	0-8

C. The equipment for producing crushed stone shall be of adequate size and with sufficient adjustments to produce the required materials without unnecessary waste. The plant shall be capable or removing excess sand. The Engineer may order final screening of crushed stone if flat or elongated pieces are present in objectionable amounts.

PART 3 EXECUTION OF WORK

3.01 PLACING AND COMPACTING

A. The material shall be placed and compacted as specified in related specification sections.

END OF SECTION

SECTION 02250

COMPACTION CONTROL AND TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials and equipment necessary to place and compact fill or backfill. The Contractor shall furnish all equipment necessary to collect soil samples.

B. Actual testing of soil samples with the exception of insitu-density determinations shall be done by an independent testing laboratory approved by the Owner. Insitu-density determinations shall be made by the Engineer or his representative. Copies of test results shall be furnished by the test laboratory directly to the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK
B. SECTION 02224 - FILL & BACKFILL MATERIAL

1.03 SUBMITTALS

A. Prior to commencement of filling and backfilling operation, the Contractor shall submit for approval a detailed list (six (6) copies unless otherwise specified) of the types of compacting equipment to be utilized in the work, and the number of each.

PART 2 MATERIALS

2.01 TEST METHODS

A. Contractor shall provide heavy duty sample bags for fill or back fill material to be tested. Soils shall be classified as in the related sections of the Specifications which include AASHTO specification M145 Recommended Practice for Classification of Soils as Soil-Aggregate Mixtures for Highway Construction Purposes.

B. Soil samples shall be prepared for testing according to ASTM D42 Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.

C. Gradation testing shall be done according to ASTM D2216 Particle Size Analysis of Soils and ASTM D1140 test for Amount of Materials in Soils Finer than the No. 200 sieve.

D. Moisture content of soil shall be determined by ASTM D2216 Laboratory Determination of Moisture Content of Soil.

E. Liquid Limits and Plasticity Index shall be determined by ASTM D423 Liquid Limit of Soils and ASTM D424 Plastic Limit and Plasticity Index of Soils.

F. Maximum dry density for each type of fill shall be determined by ASTM D1557 Method D Moisture - Density Relations of Soils using 10-lb. Hammer and 18-in. Drop.

G. In-place field unit weight shall be determined by ASTM D-1556 Density of Soil in Place by the Sand-Cone Method.

H. Maximum dry density may, at the discretion of the Engineer, be determined in accordance with ASTM D-2049 test for Relative Density of Cohesionless Soils.

PART 3 EXECUTION OF WORK

3.01 COMPACTION EQUIPMENT

A. No backfilling shall be done until the compacting equipment list has been submitted and approved as conforming to the Contract requirements. Sufficient compacting equipment shall be available at all times, thereafter while backfilling is being conducted.

B. Each layer of fill shall be inspected prior to compaction. All visible roots, vegetation, or debris shall be removed. Stones larger than 6 in. in diameter shall be removed. The water content of each layer shall be determined to be suitable for compaction or shall be brought to a suitable condition. Material incorporated in the fill which is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense. Placement of fill on frozen ground or placement of fill material which is frozen will not be permitted.

C. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.

D. Filling shall begin in the lowest section of the area. Fill shall be spread in layers as specified. The surface of each layer shall be approximately horizontal but will be provided with sufficient longitudinal and transverse slope to provide for runoff of surface water from every point. Filling shall be conducted so that no obstruction to drainage from other sections of the fill area is created at any time. Sumps, if any, shall be continuously maintained in effective operating condition.

E. Each layer of material shall be compacted by the use of only approved rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, or where such equipment is not permitted, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.

F. The compaction equipment shall be operated so as to make a minimum of three passes over each section of each layer of fill. Each successive pass shall overlap the adjacent pass by not less than 10%. Additional passes shall be made to obtain the required compaction, if necessary.

G. Compaction by water-jetting will be allowed only if the Engineer deems the conditions suitable for this method. Wherever the material contains excessive amounts of clay or loam to prevent satisfactory drying, water-jetting shall not be used.

H. If the material is allowed to be compacted by water-jetting, it shall be placed in uniform layers not exceeding 4 ft. deep. Each layer shall be thoroughly saturated throughout its full depth and at frequent intervals until all slumping ceases. For water-jetting, the Contractor shall provide one or more jet pipes, each of sufficient length to reach the specified depth and not less than 1-1/4 in. in diameter. The jet pipe shall be equipped with a quick-acting valve and sufficient fire hose to connect to a hydrant or pump having adequate pressure and capacity. A hydrant shall be utilized only upon approval of the local Water and/or Fire Departments.

3.02 COMPACTION REQUIREMENTS

A. Pipe Bedding: Bedding as specified in Section 02700 - GRAVITY SEWER AND DRAIN PIPING - GENERAL shall be Type 6 fill placed uniformly in 6 inch layers and compacted unless otherwise specified. Compaction shall be accomplished by 20 lb. hand tampers.

B. Pipe Sand Blanket: Material shall be Type 2 fill placed uniformly in 6 inch layers and compacted to 90% of maximum dry density of the sand. Compaction shall be accomplished by 20 lb. hand tampers.

C. Trench Cover: Material shall be Type 1, 2, 3 or 4 fill placed uniformly in 12 inch layers and compacted to 95% of maximum dry density for the type of material used. Compaction shall be accomplished by mechanical tampers. Compaction by water-jetting shall be in accordance with the related sections of the specifications.

D. Catch Basin and Manhole Base Bedding: Material shall be Type 6 fill placed uniformly in 6 inch layers and compacted. Compaction shall be accomplished by 20 lb. hand tampers or pneumatic tampers.

E. Structural Fill (Foundation Subgrades, Foundation Underdrainage Pavement Subgrades, Pavement Subbase): Material for foundation subgrade or pavement subgrade shall be Type 3 fill. Structural fills shall be placed in 6 inch layers compacted to 95% maximum dry density for a given type of material. Compaction shall be by mechanical power driven vibratory compactors. Pavement subgrade in cut areas shall be rolled and compacted to 95% density of the insitu material.

F. Fill around structures shall be Type 1, 2, 3 or 4 material placed in 6 inch layers and compacted to 95% maximum dry density. Compaction shall be accomplished by mechanical power driven vibratory compactors. Compaction of backfill against concrete structures shall not be carried out by motorized equipment closer to the structure than the depth of the structure below grade.

G. Non Structural Fill (Landscaping and other uses as designated by the Engineer): Material shall be Type 1, 2, 3 or 4 placed in 12" layers and compacted to 45% maximum dry density for the given type of material used. Compaction shall be accomplished by mechanical power-driven vibratory compactors.

3.03 APPROVAL OF FILL OR BACKFILL MATERIAL

A. Before placing or compacting any on-site or borrow material, the Contractor shall submit a sample of the material for testing. No on-site material shall be placed until approved by the Engineer.

B. The Engineer may at any time require additional laboratory testing should he observe any changes in gradation of the material being placed. No additional fill shall be placed or compacted until the material has been approved. If the material does not meet the required gradation and Otterburg limits for a given type of fill, the Contractor shall remove it as his expense. The Contractor may use the material for other types of fill providing it meets the required gradation and properties of that type.

3.04 FREQUENCY OF COMPACTION TESTING

A. The Engineer may perform tests of the degree of compaction obtained, in any area he may select. Payment for performing tests will be made by the Owner. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted material including retesting, shall be borne by the Contractor. If improper compaction methods are used, the Owner shall have the right to discontinue payments from the Contractor for said payment item until the situation is corrected.

3.05 FAILED TESTS

A. If the percentage compaction at any point is found to be unacceptable, additional compaction with or without modification of the field moisture content as directed by the Engineer, shall be performed and a second moisture-density determination made. This procedure shall be repeated until satisfactory compaction is obtained. If after five (5) tests any fill or backfill material cannot be compacted to the required density it shall be removed and disposed of at the Contractor's expense.

END OF SECTION 02250

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This work shall consist of temporary and permanent control measures as shown on the Contract Drawings, as required, or as ordered by the Engineer throughout the construction and post-construction period to control erosion and sedimentation by the use of silt fences, sedimentation pools, check dams, filter fabric and other control devices. The erosion and sediment control features installed by the Contractor shall be satisfactorily maintained by the Contractor.

B. In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness or failure to install permanent controls as a part of the work scheduled, and such additional measures are ordered by the Engineer, the work shall be performed by the Contractor at his expense.

C. Repeated failures by the Contractor to control erosion (pollution/siltation) shall be cause for the Engineer to employ outside assistance or to use his own forces to provide the necessary corrective measures. The cost of such assistance plus Engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

D. The Contractor shall remove sediment from behind silt fences, check dams and from sedimentation pools as necessary or as directed by the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 01300 - SUBMITTALS

B. DIVISION 2 - SITE WORK

PART 2 MATERIALS

2.01 SLOPE PROTECTION AND EROSION CONTROL

A. This work shall consist of the design, installation, maintenance and removal of temporary erosion control measures such as mulching slope drains and grasses to control and/or prevent erosion around the construction site during construction. Mulches may be hay, straw, fiber mats, netting or other suitable material acceptable to the Engineer.

B. Slope drains may be constructed of pipe, fiber mats, or other material acceptable to the Engineer that adequately controls erosion.

C. Grass shall be a quick growing species (such as rye grass Italian rye grass, or cereal grasses) suitable to the area providing a temporary cover which will not later compete with the grasses used later for permanent cover.

D. Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Engineer.

E. Hay bales shall be 36" x 18" x 24", or larger, with two 1" x 1" X 48" stakes, per bale, to secure the bale in place.

2.02 SEDIMENTATION POOLS

A. Sedimentation pools if used shall be constructed to a size and configuration and at locations as approved by the Engineer. The sedimentation pools shall be constructed and operational before excavation, embankment or drainage system construction in the area served by the pool is started. After clearing and grubbing has been completed, the pool areas shall be graded to a uniform surface and the dikes and slopes constructed. The crushed stone and dumped riprap shall be placed as shown on the Contract Drawings or as directed by the Engineer. Pools shall be maintained and kept in operation by the Contractor for the duration of the project. Any dikes, slopes, spillways, temporary ditches, and all other appurtenances shall be regularly maintained and repaired to ensure structural and operational integrity. Sediment and other deposits shall be removed when the depth of material reaches 12 inches, or as directed by the Engineer, to ensure satisfactory pool performance. The Contractor shall provide and maintain access to the pools for their maintenance. The pools shall be removed at the completion of the Contract or when directed by the Engineer. All disturbed areas shall be covered with 4 inches of plantable soil borrow and seeded in accordance with the provisions of these Specifications.

2.03 SILT FENCES

A. This work shall consist of the construction, maintenance and removal of temporary silt fences. The silt fences shall be placed at the locations shown on the Contract Drawings or as directed by the Engineer. The silt fences shall be in place before construction in the area begins.

B. The snow fence should be set in place with a 6" trench on the front side. The filter fabric will be laid loosely on the fence so as not to stretch the material. The panels shall be overlapped a minimum of 12 inches. Suitable tie wire shall be used to secure the cloth to the top of the fence. The bottom of the cloth should be buried in the trench to prevent water from flowing beneath the fence. Fence posts shall be wooden or metal posts set 1 1/2 feet into the ground at 6' centers.

C. The filter fabric shall conform to the following requirements. The yarn shall consist by weight of at least 85 percent vinylidene chloride and shall contain stabilizers added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and/or heat exposure. After weaving, the cloth shall be calendered so that the filaments retain their relative positions with respect to each other. The cloth shall be free of defects or flaws which significantly affect its physical and/or filtering properties. It shall be woven in widths of at least 6 feet and in rolls of not less than 50 linear feet. The sheets of filter cloth shall be sewn together with polypropylene or polyvinylidene chloride at the point of manufacture to form sections not less than 24 feet wide. All edges of the cloth shall be salvaged. During shipment and storage, cloth shall be wrapped with a suitable material for protection against damage.

D. Should the Contractor desire to use an equal filter fabric sample of the proposed filter fabric shall be furnished 30 days prior to installation of the fabric. Samples, shipping, and cost of testing shall be at the Contractor's expense. A minimum of 5 square yards of cloth a minimum of 36 linear inches of seam, with at least one foot of cloth each side of the seam, shall be furnished for testing. Mill certificates, or affidavits from the manufacturer, shall accompany these samples, citing the trade name and producer of the cloth and certifying that the samples are representative of the material which will be installed on the project and that the cloth meets the requirements stated in this Specification. In addition, a certified copy of permeability and filtration tests from a qualified laboratory showing the performance of filter with various grain size soils and water, giving both particle retentions and permeability, shall be submitted at the request of the Engineer.

E. Filter fabric shall be handled and placed in accordance with the manufacturer's recommendations. When the fabric is joined by stitching it shall be stitched with a yarn of contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The stitches shall number 5 to 7 per inch of seam.

F. Should the fabric be damaged during placing, the torn or punctured section shall be repaired by placing a piece of fabric that is large enough to cover the damaged area and to meet the overlap requirement.

G. Damaged sections of the silt fences shall be repaired or replaced by the Contractor for the duration of their use. Sediment shall be removed as directed by the Engineer.

H. The silt fences shall be removed when adequate vegetative growth insures no further erosion of the slopes or when directed by the Engineer. The filter fabric may be cut at ground level.

I. All material, including the filter fabric and fence, become the property of the Contractor and shall be disposed of away from the site.

2.04 STONE LINED WATERWAYS

A. The Contractor shall provide all material, labor, and crushed stone for waterways, consisting of a protective covering of angular shaped stones laid on the waterway to insure protection of the waterway.

B. The waterway shall be placed to line and grade as shown on the plans or as directed by the Engineer on a prepared bed of crushed stone. Each stone for the waterway shall be carefully placed by hand, normal to the slope and firmly bedded thereon. Each stone shall weigh not less than 50 pounds nor more than 125 pounds and at least 75% of the volume shall consist of stones weighing not less than 75 pounds each. The remainder of the stones shall be so graded that when placed with the larger stones, the entire mass will be compacted with a minimum percentage of voids and a minimum thickness of 6 inches.

PART 3 EXECUTION OF WORK

3.01 PRECONSTRUCTION CONFERENCE

A. At the preconstruction conference or prior to the start of the applicable construction, the Contractor shall submit to the Engineer for acceptance, his plans and schedules for accomplishment of temporary and permanent slope protection and erosion control and restoration work, as are

applicable for clearing and grubbing and general construction and disposal of unsuitable material and restoration of disturbed land to its original (prior to construction) condition. No work shall be started until schedules and methods of operations have been approved by the Engineer.

3.02 PROCEDURAL DETAILS

A. The Engineer shall have the authority to limit the area of erodible earth exposed by construction and to direct the Contractor to provide immediate permanent or temporary erosion control and slope protection measures to prevent sediment runoff to adjacent streams, ponds, or other areas of water impoundment. Such work may involve the construction of temporary mulches, mats, seeding or other control devices or methods as required by the conduct of the work or as directed by the Engineer.

B. The Contractor shall be required to incorporate all permanent erosion control measures into the project at the earliest practical time as outlined in the approved schedule. Temporary erosion control and slope protection measures will be used to correct conditions that develop during construction that were not foreseen during the design stage.

C. The Contractor shall undertake and comply with the following measures with respect to adverse environmental impacts, resulting from the operations listed below.

(1) Clearing and Grubbing - Disturbed areas shall be regrassed at the direction of the Engineer.

(2) Access Road Construction - Riprap or sodding shall be used to prevent erosion.

(3) Material Storage - Materials shall be stored only at approved locations. Petroleum products shall be stored away from wetland areas.

(4) Excavation - The Contractor shall use care to contain wet fill where it is dumped. When material is stockpiled next to a trench, the side away from neighboring brooks, swamps, canals, etc., shall be utilized where space is available. Side slopes of stockpiled material shall conform to the natural angle of repose of the soil. The Contractor shall promptly remove all sediment from brooks and swamp

areas, if deposition cannot be avoided during construction. The Contractor shall promptly remove excess fill and regrass the work area. Excess fill shall not be disposed of in wetlands, other than in areas defined on the drawings, or areas approved by commissions or authorities having jurisdiction.

(5) Water handling - The Contractor shall be required to use crushed stone or plastic sluiceways leading to brooks to filter pumped discharges.

(6) Backfilling - The Contractor shall replace unsuitable material with properly suitable material. He shall also be responsible for surface repairs as required.

(7) General - Trash receptacles shall be required on the job site. The Contractor shall perform preliminary clean-up operations as he completes segments of his work.

(8) Spillings - Ground spilling of oil or other petroleum products drained from equipment shall be prohibited. The Contractor shall provide leakproof containers for receiving drained oil and shall properly dispose of such oil away from the site of the job.

3.03 ACCEPTANCE

A. Final inspection and acceptance in regard to clean-up, site restoration, erosion control and sloped protection measures shall be made in the presence of the Owner and/or commissions or authorities having jurisdiction. The Contractor shall notify the Owner in writing of the readiness of the work for final inspection.

END OF SECTION

SECTION 02380

SHEETING AND BRACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall do all permanent and temporary work involved in the bracing of excavation through the use of steel sheet pilings, timber sheeting or shoring boxes as shown on the Contract Drawings or as directed by the Engineer.

B. The Contractor shall take responsibility and shall furnish all parts, labor and materials for the placement and maintaining of sheeting, bracing or shoring of the sides of the excavation so as to prevent earth movements which would in any way diminish the width of excavation so as to interfere with proper construction, which would cause injury to persons in or about the work site, which would endanger adjacent structures, or which would delay the progress of work.

C. The Contractor shall engage a Professional Engineer, registered in the State of New Hampshire and possessing prior experience in this field to design all necessary sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and written certification of this shall be provided promptly by the Professional Engineer.

D. No sheeting, bracing or shoring operations shall commence until the Engineer has reviewed all descriptions, plans, sketches and time sequences and until the Engineer has given his approval of such items. The furnishing of such materials are only for review purposes and does not serve to relieve the Contractor of any part of his responsibility for the safety of the work or the successful completion of the work.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - SITE WORK

1.03 SUBMITTALS

A. The Contractor shall submit to the Engineer in triplicate a detailed written description of the equipment and methods he proposes to use in the sheeting, bracing and shoring operations along with the computations and sketches of his Professional Engineer. This material shall be submitted to the Engineer at least fifteen (15) working days prior to the proposed start of work. In addition, the Contractor shall also supply the Engineer with an overall time schedule of the sheeting, bracing and shoring work.

PART 2 MATERIALS

2.01 STEEL SHEET PILING

A. Steel sheeting and associated bracing shall be of adequate weight for the use intended. The materials used for steel sheet piling shall conform to the requirements of ASTM-A328. Gauged sheeting shall not be acceptable for use where sheeting must be left in place.

2.02 TIMBER SHEET PILING

A. Timber Sheeting shall be composed of a 3 layer laminated timber with tongue and groove connecting edges. The toe of the sheeting shall be cut on a diagonal so that, in driving, the pile will be continuously wedged back against the previously driven pile. Timber sheet piling shall conform to the requirements of AASHTO M.09.01-1.

B. Timber Sheeting shall be sound, straight grained, free from shakes, loose knots, and other defects liable to impair its strength or durability.

2.03 STEEL SHORING BOXES

A. In areas where temporary sheeting is specified, steel shoring boxes may be utilized to protect the excavation from collapsing when approved by the Engineer.

B. The boxes shall be composed of sections, the number of which shall be dictated by the depth of excavation. The forward end of the box shall be equipped with cutting edges to facilitate the movement of the box along the trench bottom and shall be equipped with eyelets or hooks by which the excavator may pull the boxes along.

PART 3 EXECUTION OF WORK

3.01 GENERAL

A. Whenever possible, sheeting shall be driven ahead of the excavation to avoid loss of materials from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be filled immediately and compacted.

B. The Engineer may direct that sheeting and bracing be cut off at any specified elevation, at least 3 feet below final grade, but not lower than 1 ft. above the top of pipe.

C. In streets, the Contractor will generally be required to install the braced excavation from the existing ground surface.

3.02 INSTALLATION OF SHEETING

A. Sheet piles shall be driven in such a manner as to preserve interlocking between piles and so as to be vertical without any tendency to leaning.

B. If handling holes on sheets should extend below normal static groundwater elevation, they shall be welded or plugged so as to facilitate trench dewatering operations.

C. Splicing of steel piles shall not occur without the prior approval of the Engineer and spliced sections shall not be driven until inspection of the welded splice has been conducted by the Engineer.

D. Bracing of the sheeting shall follow the designs of the Contractor's Professional Engineer and be subject to additional bracing if directed by the Engineer.

3.03 EXCAVATION UTILIZING SHORING BOXES

A. The use of shoring boxes is an acceptable measure of excavation protection; however, special attention should be made to ensure that the boxes are set stable in the excavation, that when it is pulled along the trench the box remains on line and that the proper grade and depth is maintained.

B. When other utilities or cross-connections are encountered within the excavation, the use of the shoring box may be somewhat limited and may necessitate the use of other sheeting or bracing measures as needed or as directed by the Engineer.

3.04 SHEETING LEFT-IN-PLACE

A. When indicated in the Contract Documents, or as directed by the Engineer, sheeting and/or bracing shall be left-in-place and properly backfilled.

B. The Engineer may direct the Contractor at any time in writing, to have sheeting, bracing, left in place to be embedded in backfill or concrete for the purpose of preventing subsequent injury to structures or property.

3.05 EXTRACTION OF SHEETING

A. All sheeting and bracing not to be left in place shall be carefully removed in such a manner as to not endanger the construction, other structures, utilities or property. All voids left or caused by withdrawal of sheeting shall be refilled immediately with sand by ramming with tools especially adapted to that purpose, by watering, or by other means as may be approved.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, appurtenant material and equipment, and incidentals required to design, install, operate and remove a temporary dewatering system to prevent surface and groundwater from entering any excavations required as per this Contract. The dewatering system installed shall lower the groundwater and prevent surface water intrusion to provide a firm, dry excavation with a stable bottom and sidewalls capable of supporting structures, pipes and backfill.

B. The Contractor shall retain the services of a Professional Geotechnical Engineer, registered in the State of New Hampshire and experienced in dewatering systems, to design the dewatering system to be used during construction. A copy of the

proposed dewatering system including plans and calculations shall be submitted to the Engineer for review at least two weeks prior to commencing any work. All drawings and calculations shall bear the stamp and signature of the Registered Professional Geotechnical Engineer. The Registered Professional Geotechnical Engineer shall monitor the installation of the dewatering system and visit the site periodically during the construction period.

C. The dewatering system shall include the installation of one or a combination of the following dewatering methods as necessary: sumps and ditches, horizontal drainage systems, cofferdam dewatering, well method, well point method, cutoff methods and other methods as designated by the Contractor's Geotechnical Engineer and approved by the Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - SITE WORK

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

A. The bottom of all excavations shall be dry and firm. All excavation, construction, backfilling and compaction shall be conducted "in-the-dry" unless hydraulic compaction measures are dictated by the Engineer.

B. The following measures shall be met in all areas where predrainage of the existing watertable is required prior to construction operations.

1. No excavation below the elevation of the groundwater level existing at the time of construction will be allowed until this groundwater level has been lowered to, and maintained at, an elevation at least 2 feet below the bottom of excavation.

2. The dewatering system shall maintain the groundwater level at least 2 feet below the bottom of excavation until sufficient backfill has been placed to prevent flotation of any structures or pipelines.

3. The Contractor and his Professional Geotechnical Engineer shall be responsible for insuring that dewatering measures and

wellpoints are so installed and situated as to provide sufficient dewatering of the work area and abutting soil stratum.

4. The design of well points of other dewatering units shall be such that removal of fines during pumping is minimized.

5. A single stage well point system with the header at ground surface will not be adequate to lower the water level to the required depths.

C. Safe working conditions shall be ensured by whatever dewatering measures deemed necessary, including the use of chemical and soil stabilization.

D. During the course of construction if alterations or re-design of the dewatering system is necessitated, the Contractor's Professional Geotechnical Engineer shall submit plans and calculations, stamped and signed, indicating such alterations and changes. The Contractor shall bear all costs of the Geotechnical Engineer and any modifications.

E. Dewatering measures shall be so designed as to prevent the removal of any lines during pumping or excessive subsidence about the construction site. Discharged groundwater shall be properly detained, settled, filtered, or otherwise treated so as to prevent contamination, and to prevent contamination of nearby waterways.

1.04 SUBSURFACE CONDITIONS

A. Test borings and groundwater observation wells installed along the excavation route by the Owner or Engineer shall be made available to the Contractor for his use.

B. The Contractor shall also consider groundwater level fluctuations due to the season, precipitation, or other factors.

C. The Contractor shall be responsible for obtaining all additional and supplementary information he deems necessary for the design of the dewatering system.

PART 2 MATERIALS

2.01 SUBMITTALS

A. The Contractor shall submit to the Engineer for approval a plan showing a typical dewatering method to be used during the construction. The plans shall be submitted to the Engineer four weeks prior to beginning the work. Plans shall show location of a given method and the materials to the used for a given installation. Submittal shall include a description of each piece of equipment to be used for the dewatering operation.

PART 3 EXECUTION OF WORK

3.01 GENERAL

A. The Contractor shall conduct all dewatering operations in a manner which will protect existing structures, pipelines and utilities from undermining of their bearing soils or disturbance to soil supporting, overlying or adjacent to structures. The Contractor shall be solely responsible for damage to properties, buildings, structures, utilities, pavements, sidewalks or pipelines resulting from his dewatering and surface water control operation.

B. The Contractor shall control all surface and groundwater so that dry, firm, undisturbed bearing soils exist in the trench or pit during all stages of excavation, construction and backfilling. Softening and instability due to the presence of seepage of water shall not be allowed to occur.

C. The Contractor shall maintain surface and groundwater control until backfilling is completed so as not to cause shifting of pipe due to flotation and bouyant forces.

3.02 CONCRETE STRUCTURES

A. The Contractor shall construct concrete cutoff dams to prevent the unnatural flow of groundwater through the backfilled trenches as detailed on the Contract Drawings. Intervals between the dams shall not exceed 300 feet. At least one dam shall be constructed between manholes.

B. The Contractor shall not permit water to rise above concrete or brick masonry within 24 hours after being placed, nor shall moving water be allowed to rise over any masonry for 96 hours. In no event shall water be permitted to rise so as to set up unequal pressures in structures until the concrete or mortar has set at least 24 hours.

3.03 SURFACE WATER CONTROL

A. The Contractor shall control surface water inflow through the construction of dikes, ditches, pumps or any other control method required to prevent the flow of any surface water into any excavation.

3.04 INSTALLATION OF DEWATERING SYSTEM

A. The Contractor shall install the dewatering system, and shall show to operate to the Engineer's satisfaction, prior to the excavation of any trench or pit. The system shall be shown to maintain the groundwater level as specified or modified to provide the required level as directed by the Engineer. Provisions shall be made to have standby pumps and generators available at all times.

3.05 OBSERVATION WELLS

A. The Contractor shall install observation wells along the trench centerline in all areas requiring predrainage. There shall be an operating observation well located within 50 ft. of the working edge of the excavation. The Contractor shall install all observation wells to a minimum bottom of the excavation. Observation wells shall consist of a screened or slotted well point and a riser pipe extending to ground level. The riser pipe shall be fitted with a threaded watertight cap. Additional observation wells may be required as instructed by the Engineer in areas where a sand stratum underlies a clay layer located at or below the bottom of the excavation.

B. The Contractor shall make water level readings in the observation wells twice daily, and submit a copy to the Engineer on a daily basis. The Engineer shall be permitted to make independent readings as he requires.

3.06 SITE RESTORATION

A. Upon completion of the excavation work and approval of the Engineer, the Contractor shall restore the area to its pre-construction condition. All equipment, materials and accessories shall be removed and shall become the property of the Contractor. Observation wells shall be filled with sand upon completion of the Contract or as directed by the Engineer.

B. Any areas requiring repaving shall be repaved in accordance with related sections of the specifications.

END OF SECTION

SECTION 02575

PAVING REPAIR AND RESURFACING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to remove and replace all paved surfaces and curbs, damaged by work under this Contract, as herein specified and as directed by the Engineer.

B. The Contractor shall furnish all labor, material, equipment and incidentals required to reset all existing water boxes, catch basin frames, manhole frames and all other castings prior to paving.

C. Construction methods shall conform to all current requirements as contained in the State of New Hampshire Department of Public Works and Highways Standard Specification for Road and Bridge Construction, approved and adopted 1983, hereinafter referred to as the "Standard Specifications".

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. DIVISION 2 - SITE WORK

B. DIVISION 3 - CONCRETE

1.03 SCHEDULE OF PAVING REQUIREMENTS

A. The following is a listing of the required paving under this project.

1. Salmon Falls Road, Sta. 3+84 tc 14+93
   - Temporary Trench Pavement (Item 4A)
   - 1" Overlay - 25' Width Average (Item 4C)

2. Salmon Falls Road, Sta. 14+93 to 31+86
   - Grind Existing Pavement (Item 4E)
   - 2" Base Course - 25' Width (Item 4C)
   - 1" Leveling Course (Item 4C)

3. Autumn St., Sta. 0+00 to 16+00
   - Temporary Trench Pavement (Item 4A)
   - 1" Overlay - 25' Width Average (Item 4C)

PART 2 MATERIALS

2.01 GRAVEL BASE

A. Gravel bases for the various types of paving shall conform to the following sections of the "Standard Specifications":

(1) Base for all street paving: Section 304 - 2.1.3
(2) Base for all sidewalk paving: Section 209 - 2.1.1.2

2.02 PAVEMENT

A. Mixes for the various paving courses shall conform to the following sections of the "Standard Specifications":

(1) Temporary trench paving, all courses: Section 401 - Type C
(2) Permanent paving, base course: Section 401 - Type B
(3) Leveling Course: Section 401 - Type C or D, as directed
(4) Bituminous sidewalk paving, base course: Section 608 - Binder
surface course: Section 608 - Wearing
(5) Concrete sidewalks: Section 520 - Class A

2.03 CEMENT MORTAR

A. Mortar for jointing granite edging and setting curb inlets shall conform to Section 569 of the "Standard Specification".

2.04 CONTROL OF MATERIALS

A. The Contractor attention is directed to the requirements of SECTION 00700 - GENERAL CONDITIONS regarding Certificates of Compliance and Inspection and Testing of Materials.

B. In addition to certificates of compliance, the acceptability of bituminous mix compositions may be verified by testing random samples as directed by the Engineer for conformance with the applicable mix designation tolerance. When plant inspection is not maintained, samples shall be taken upon delivery of material to the job site.

C. For determination of bituminous pavement density, samples shall be taken from the mixture incorporated in the work after finishing operations have been completed and the pavement has cooled. The Contractor shall have suitable coring equipment available in order that the required number of samples may be taken. Samples will be removed by the Contractor in the presence of the Engineer on the day following the placement of the course, weather permitting. The necessity and frequency of density sampling shall be as directed by the Engineer.

D. Concrete for paving shall be sampled and tested in accordance with Section 520 of the "Standard Specification".

2.05 DUST CONTROL

A. Calcium chloride, used to reduce dust conditions, shall conform to AASHTO M-144, except that the pellet or flake form shall be equally acceptable.

PART 3 EXECUTION OF WORK

3.01 BITUMINOUS PAVING - GENERAL

A. All mixes delivered to the job site shall be accompanied by a Certificate of Compliance. Deliveries not accompanied by a certificate will not be used in the work.

B. Construction methods shall conform to the requirements of the "Standard Specification", including the following:

1) Mixtures delivered to the job site shall not possess signs of segregation of ingredients or surface crust.

2) The temperature of the mixture when delivered to the spreader shall be a minimum of 250 F.

3) Mixtures shall be placed only upon approved surfaces that are clean from foreign material and are dry; and when weather conditions are suitable. No mixtures shall be placed when the weather is foggy or rainy, provided, however, that the Engineer may permit, in the case of a sudden rain, the placing of mixture then in transit from the plant, if laid at the proper temperature and if the roadbed is free from pools of water. Such permission shall in no way relax the requirements for the quality of the pavement and smoothness of the surface. No material shall be placed upon a frozen base, or when wind conditions are such that rapid cooling will prevent satisfactory compaction.

4) Wherever possible material shall be compacted using steel wheeled rollers.

5) In areas not accessible to a roller, compaction shall be accomplished by using mechanical compactors or hand tampers, approved by the Engineer.

6) All material placed shall receive final compaction before nightfall of the day placed, unless artificial light, satisfactory to the Engineer, is provided.

7) The density of completed paving shall be not less than 95% of the density obtained from laboratory compaction of a mixture composed of the same materials in like proportions.

8) The Engineer may require the Contractor to remove and replace at his own expense, any work deemed defective on the basis of sampling and testing for composition and density, or faulty procedures.

9) All pavement thickness referred to herein are compacted thickness. The Contractor shall place sufficient material to ensure that the specified thickness of pavement results.

3.02 TEMPORARY TRENCH AND TEST PIT PAVING

A. Temporary trench paving shall be placed in depths as specified herein, or as directed by the Engineer.

B. Prior to placing trench paving, trenches shall have been backfilled in accordance with Section 02200 - EARTHWORK. The top of the trench shall be backfilled with the specified gravel base course material, spread and compacted in layers not exceeding 6 inches, such that a 9 inch minimum depth shall underlie the trench paving. The gravel base course shall be compacted to a uniform density of not less than 95% of the maximum dry density.

C. Within twenty-four hours following the completion of trench backfilling and compaction, unless otherwise directed or allowed by the Engineer, the backfilled trenches shall be excavated to the proper depth and shall receive temporary paving. The edges of the existing pavement, previously cut for the trenching operations, shall be retrimmed along clean, straight, undamaged lines, as directed by the Engineer, and the gravel base course shall be recompacted to form a satisfactory, stable foundation. The cut edges of existing pavement shall be swept clean and painted with a prime or tack coat of a compatible asphalt material.

D. The temporary trench pavement shall be furnished, placed and compacted, as herein specified, to such widths necessary to meet undisturbed existing pavement. The completed pavement shall match the grade and shape of the adjoining existing surfaces.

E. The Contractor shall continuously maintain trench pavement in good repair, flush with existing pavement, at his own expense. Should soft, damaged or broken areas develop, such areas shall be removed immediately and be replaced with new, properly compacted materials. The Contractor's attention is directed to the fact that should curb to curb paving be intended, the temporary trench pavement will serve as a base for curb to curb pavement.

F. Local Road: temporary trench paving shall be 3 inches in minimum compacted depth, placed and compacted in two 1 1/2 inch courses. Temporary trench paving off public ways shall conform to this same requirement.

G. State Road: temporary trench paving shall be 6 inches in compacted depth, placed and compacted in two inch courses.

H. Temporary test pit paving shall conform to all requirements stated for temporary trench paving.

3.03 PERMANENT TRENCH AND TEST PIT PAVING

A. Permanent trench paving is to be placed after at least 8 months has elapsed since the placing of temporary paving or sufficient time has elapsed for required compaction to have occurred as determined by the Engineer.

B. Prior to placing permanent trench paving the temporary pavement and all loose and damaged material in the existing pavement edges shall be removed. The existing pavement shall be retrimmed along clean straight, undamaged lines at a minimum distance of 12 inches from the line of temporary pavement, and the gravel base course shall be adjusted and recompacted to accept permanent pavement. The edges of existing pavement shall be swept clean and painted with a tack coat.

C. Permanent trench paving shall be furnished and compacted, as herein specified, to such widths necessary to meet undisturbed existing pavement. The completed pavement shall match the grade and shape of the adjoining existing surfaces.

D. Local Road: permanent trench paving shall be 3 inches in minimum compacted depth, placed and compacted in two courses, consisting of a 2" base course and a 1" surface course. Permanent trench paving off public ways shall conform to this same requirement.

E. State Road: permanent trench paving shall be 6 inches in minimum compacted depth, placed and compacted in three courses consisting of 2 - 2 1/2" base courses and a 1" surface course.

F. Permanent test pit paving shall conform to all requirements stated for permanent trench paving.

3.04 CURB TO CURB PAVING

A. Temporary pavement shall remain in place as a base for the overlay.

B. Curb to curb paving is to be placed after one winter season has elapsed since the placing of temporary paving or sufficient time has elapsed for required compaction to have occurred as determined by the Engineer.

C. Prior to curb to curb paving, the Contractor shall make all final repairs to the previously installed trench paving, and raise or cause to be raised, all existing, manhole, catch basin, valve box, curb box, and utility covers, etc. to conform to the final pavement grade. All loose or damaged material in the existing pavement outside of trench pavement, shall be removed and a leveling course, as herein before specified, shall be installed. Leveling course shall also be installed at depths and locations, as directed by the Engineer, to fill existing holes and depressions, or to improve roadway crowns. Leveling course quantities used to repair trench paving shall not be included for compensation.

D. All surfaces to receive curb to curb paving shall be dry and thoroughly cleaned of foreign or loose material; a compatible prime or tack coat, shall be applied at the rate of 0.05 to 0.15 gallons per square yard of pavement, depending upon the condition of the existing surface. All castings and edgestones will be protected from the tack coat.

E. Where curbing is present, notches shall be cut in the existing pavement such that curb reveal shall be substantially the same prior to and following the application of curb to curb paving.

F. Curb to curb paving shall be placed and compacted as herein specified. Longitudinal and transverse joints shall be offset a minimum of 12 inches from trench paving or definable existing joints. Longitudinal joints shall be made hot in accordance with Section 401-3.7 of the "Standard Specifications".

G. Local Road curb to curb paving shall be 1" in minimum compacted depth.

H. State Road curb to curb paving shall be 5/8" in minimum compacted depth.

3.05 SIDEWALK PAVING

A. Bituminous and concrete sidewalks if required shall be installed in accordance with Section 608 of the "Standard Specifications", over a carefully graded and compacted lift of the specified gravel base. The depth of the compacted gravel base shall be 8 inches.

B. Trench elevations under sidewalks shall have been backfilled in accordance with SECTION 02200 - EARTHWORK with the exception that water-jetting will not be allowed.

C. Bituminous sidewalks shall be 2 1/2" in minimum compacted depth depth, placed and compacted in two courses, consisting of a 1 1/2" base course and a 1" surface course.

D. Concrete sidewalks shall be 4" in depth.

3.06 REMOVING AND RESETTING EXISTING GRANITE EDGING

A. Granite edging (curbing) to be displaced during sewer construction shall be removed and reset to proper grade and alignment in accordance with the construction methods of Section 602 - 3.1 of the "Standard Specifications".

B. Edging to be reset shall be carefully removed and stored. The Contractor shall replace any edging damaged or lost due to his negligence.

C. The base upon which the edging is to be set shall be compacted to a firm even surface.

D. Joints shall be pointed with mortar and the exposed portion finished with a jointer.

E. Granite curb inlets shall be set in full mortar beds.

3.07 REPAIR OF DAMAGE

A. All streets, gutters, sidewalks, driveways and curbs which are not designated by the Engineer to be replaced or reset, but which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to sustaining damage.

3.08 MAINTENANCE OF PAVING

A. The Contractor shall maintain paving and curbing placed under this Contract until the expiration of the guarantee period. All soft, damaged or broken areas or depressions shall be promptly removed and replaces with new, properly compacted materials, so as to keep the pavement in a safe and satisfactory condition for traffic.

END OF SECTION

SECTION 02615

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish, install and test ductile iron pipe and fittings and appurtenant materials as shown on the Contract Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK

1.03 SUBMITTALS

A. Submit to the Engineer six (6) sets of shop drawings detailing the type and class of materials to be furnished. The Contractor shall not purchase the pipe prior to the Engineer's approval of the shop drawings.

PART 2 MATERIALS

2.01 DUCTILE IRON PIPE & FITTINGS

A. The ductile iron pipe shall be Class 52 unless otherwise specified and shall conform to the ANSI A21.50, A21.51 Specifications for Ductile Iron Pipe.

B. Pipe fittings shall conform in all respects to ANSI 21.10 and 21.11.

C. Pipe joints shall be either of the push-on type, mechanical joint or flanged as indicated on the Contract Drawings.

D. All pipe and fittings shall be supplied with silicon bronze serrated wedges.

E. All pipe and fittings shall be furnished with a cement lining on the inside of the pipe. The lining shall be as specified in AWWA C104. Cement lining shall be double thickness. The cement lining shall be given a seal coat of bituminous material.

F. All ductile iron pipe for buried service shall be furnished with a minimum of 1 mil thick bituminous coating.

2.02 PUSH-ON JOINTS

A. Push-on joints shall meet all the requirements of ANSI A21.11 and shall consist of a single continuous, molded, rubber ring gasket; a bell socket cast integrally with the pipe or fitting; and a plain end. The configuration shall be such that when the plain end is inserted into the pipe fitting socket, the gasket shall be compressed radially to form a positive seal. The gasket and annular space shall be so designed and shaped that the gasket is locked in place after the plain end is inserted into the fitting socket.

B. Push-on joints shall have the same pressure rating as the pipe or fitting of which they are a part.

C. Gaskets for push-on joints shall be vulcanized natural or synthetic rubber. All gaskets shall be free of porous areas, foreign material and visible defects.

2.03 MECHANICAL JOINTS

A. Mechanical joints shall meet all the requirements of ANSI A21.11 and consist of : a bell socket cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes and a socket with annular recess; a plain end; a continuous molded, rubber ring gasket and; a follower with bolt holes, tee head bolts and hexagonal nuts.

B. Mechanical joints shall have the same pressure rating as the pipe or fitting of which they are a part.

C. Glands for mechanical joints shall be cast or ductile iron and be stamped with the manufacturer's identification, nominal size and material type. Glands shall receive a bituminous coating at the shop.

D. Rubber gaskets for mechanical joints shall be natural or synthetic vulcanized rubber, free of porous areas, foreign materials and visible defects.

2.04 FLANGED JOINTS

A. Flanged joints shall meet all the requirements of ANSI A21.15 and ANSI A21.10 and shall consist of two threaded flanges; flange gasket and; bolts with square or hexagonal shaped heads and hexagonal nuts.

B. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer. Threaded flanges shall not be installed in the field. Flange faces shall be machined.

C. Pipe furnished with flanges at each end shall have the bolt holes aligned.

D. Flange gaskets shall be ring or full face rubber and be 1/8 inch thick.

2.05 PIPE MARKING

A. The weight, class or nominal thickness and casting period shall be shown on each piece of pipe. The manufacturer's mark, year of fabrication and the letters "DI" or the word "Ductile" shall be cast or stamped on in letters and numerals not less than 1/2 inch in height.

PART 3 EXECUTION OF WORK

3.01 HANDLING AND CUTTING PIPE

A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces and abrasion of the pipe coating or lining.

B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

3.02 INSTALLING PUSH-ON JOINT PIPE AND FITTINGS

A. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket.

3.03 DEFLECTION OF PIPE

A. When laying ductile iron pipe, the deflection at the joints shall not exceed 5 degrees or 12 inches for a 16 foot length of pipe.

3.04 INSTALLING MECHANICAL JOINT PIPE AND FITTINGS

A. Prior to assembling mechanical joints the bell and plain end shall be cleaned of all foreign matter and then brushed with non-toxic gasket lubricant supplied by the pipe manufacturer. With the follower gland and gasket on the plain end, seat the plain end into the bell and press the gasket evenly and firmly into the bell. Move the follower gland into position for bolting and insert all nuts and bolts and make finger tight. The follower gland shall be tightened evenly using a torque wrench on opposite bolts until all are made up.

END OF SECTION

SECTION 02622

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, tools, equipment, materials, and services necessary to lay, join and test all PVC pipe and fittings, and appurtenant materials as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02200 - EARTHWORK

B. SECTION 02224 - FILL & BACKFILL MATERIALS

C. SECTION 02722 - GRAVITY SEWER AND FORCE MAIN - GENERAL

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Exercise care in transporting and handling to avoid damage to the pipe and fittings.

B. Bundle and package all pipe in such a manner as to provide adequate protection for the ends, threaded or plain, during transportation from the manufacturer to the Contractor.

C. Store materials in enclosures or under protective coverings. Do not store materials directly on the ground, keep inside of pipes and fittings free of dirt and debris.

1.04 SHOP INSPECTION

A. It shall be the Contractors responsibility to ensure that inspection of the pipe manufacturing facility by the Owner's or Engineer's representative or inspector is allowed in order to certify compliance with applicable requirements, standards and specifications. Subsequent approval of facilities by the inspector shall not relinquish any responsibility by the Contractor or manufacturer from furnishing adequate materials.

B. The inspector shall have free access to those parts of manufacturer's plant that are necessary to assure that products comply with all requirements.

C. The manufacturer shall make available for the inspector's use, without charge, such tools and assistance as are necessary for inspection and handling of materials.

D. All pipe delivered to the job site shall be accompanied by independent testing laboratory reports certifying that the pipe and fittings conform to ASTM Specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such of the tests specified as he may from time to time deem necessary. All tests shall be made in accordance with the methods prescribed by the ASTM Specifications.

PART 2 MATERIALS

2.01 PVC - PRESSURE PIPE

A. The PVC pressure pipe shall be Class 150 or DR18 unless otherwise specified and conform to ANSI/AWWA C-900 standard for PVC Pressure Pipe. PVC pipe shall meet the criteria of ASTM D-2241 "Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)". PVC Class 150 Pipe shall be manufactured to dimensions of standard Cast Iron Pipe outside diameters instead of dimensioning according to Iron Pipe Standards (I.P.S.). PVC pipe (SDR-18) shall meet all requirement of Uni-Bell Standard Uni-B-2-72. Class 150 pipe & couplings shall meet the following requirements:

PHYSICAL PROPERTY	REQUIREMENT	TEST METHOD
90 second Minimum Burst Pressure	755 PSI	ASTM D-1599
Sustained Pressure	500 PSI	ASTM D-1598 ASTM D-2241
Impact	100 Ft. - lbs.	ASTM D-2444
Hydrostatic Integrity	Non-Failure	ANSI/AWWA C 900-81 Section 3.1.1
Flattening	Non-Failure	ASTM D-2412
Extrusion Quality	Non-Failure	ASTM D-2152
Coupling Pressure Seal	Non-Failure of Seal	ASTM D-3139

2.02 PVC PIPE - GRAVITY SEWER

A. The PVC gravity sewer shall be SDR 35 unless otherwise specified and shall conform to ASTM D3034 Standard for PVC pipe. The PVC pipe shall be supplied in lengths not exceeding 13 feet.

B. Except as indicated differently on the Contract Drawings or in the specifications or where specifically directed by the Engineer, gravity sewer pipe shall be furnished with standard integral bell and spigot ends and elastomeric gasket joint.

C. PVC gravity sewer tees, wyes and tee wyes to be used for service connections shall be PVC SDR 35 fittings with ring tite joints. All fittings shall be capped.

2.03 PUSH-ON JOINTS

A. Push-on joints shall consist of 1) a single continuous, molded, rubber, ring gasket, 2) a bell socket cast integrally with the pipe or fitting and 3) a pipe or fitting plain end. The configuration shall be such that when the plain end is inserted into the pipe fitting socket the gasket shall be compressed radially to form a positive seal. The gasket and annular space shall be so designed and shaped that the gasket is locked in place after the plain end is inserted into the fitting socket.

B. Push-on joints shall have the same pressure rating as the pipe or fitting of which they are a part.

C. Gaskets for push-on joints shall be vulcanized natural or synthetic rubber. All gaskets shall be free of porous areas, foreign material and visible defects.

2.04 PVC BELL (INTEGRALLY CAST)

A. The bell shall consist of an integral wall section with locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C-900.

2.05 SOLVENT WELD JOINTS

A. Where solvent weld joints are required they shall be made with solvent supplied by the pipe manufacturer's specifications or with ASTM Recommended Practice D2855. The dry fit of joints shall be snug; pipe and fittings which afford loose fits will be rejected by the Engineer. The use of multiple layers of filler solvent to overcome a loose fit will not be permitted. Solvent cements shall conform to ASTM D-2564.

2.06 PIPE MARKINGS

A. Pipe and couplings shall bear identification markings that will remain legible during normal handling, storage, installation and during the life of the pipe. Markings shall have been applied to the pipe and couplings in a manner which will not reduce strength or durability or otherwise damage the pipe.

B. Markings for pressure pipe shall be applied at intervals of not more than 5 Feet and shall include the following: nominal size and OD base, "PVC", dimension-ratio number, AWWA pressure class, AWWA designation number for AWWA C-900, manufacturer's name or trademark and production record code, and mark or seal of pipe testing agency.

C. Coupling markings shall include the following: nominal size and OD base, "PVC", dimension-ratio number, AWWA designation number for AWWA C-900, manufacturer's name or trademark and mark or seal of pipe testing agency.

PART 3 EXECUTION OF WORK

3.01 HANDLING AND CUTTING PIPE

A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring its surfaces and ends.

B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that my have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

D. All cutting of PVC pipe is to be square. The pipe to be cut shall be marked around its entire circumference prior to cutting.

E. Using a factory finished beveled end as a guide to determine the angle and length of taper, the end of a freshly cut pipe shall be beveled similarly.

3.02 PIPE BEDDING

A. Pipe bedding and foundation design shall be as specified in related sections.

3.03 INSTALLATION OF PIPE

A. Standard laying lengths shall be 20 feet for pressure pipe with 85% of the total footage of pipe being full lengths and the remaining 15% being furnished as random lengths. Random lengths shall not be less than 10 feet long. Standard laying lengths for gravity sewer shall be 13 feet.

B. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket.

C. Pipe shall be installed in such a manner that will ensure that external loads will not subsequently cause a deflection of greater than 5% in the vertical cross-section dimension.

D. For PVC pressure pipe horizontal deflection from joint to joint shall be limited to 12 inches for PVC pipe sizes 6 inches to 12 inches based on 16 foot length.

E. The bedding of the pipe shall conform to the trench detail as shown on the Contract Drawings. Installation precautions are also given in ASTM D 2774.

F. Cleanouts shall be installed where shown on the Contract Drawings and at convenient points in long runs of pipe.

G. Installed pipe shall rest flat and straight on the bedding at all locations without bridging or binding. Backfill shall be carefully placed to avoid damage to the pipe. The pipe shall be placed to the grades shown on Contract Drawings.

H. Only laborers competent in laying plastic pipe and suitable equipment shall be employed. Pipe and fittings shall be handled with care so as to prevent scratching or other damage to the materials. All joints shall be properly cleaned and free of foreign matter. The installation instructions of the manufacturer shall be strictly followed with the exception that the pipe bedding shall be as shown on the Contract Drawings.

I. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, hammer, or other unyeilding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.

J. Before a joint is made, the pipe shall be checked to insure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and form to the required grade.

K. The Contractor shall take all necessary precautions to prevent flotation of the pipe from trench flooding. At all ties when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

L. Any defective pipe or fitting found in the line shall be removed and replaced without cost to the Owner. All pipes and fittings shall be kept clean of all dirt and debris before being laid, and shall be kept clean until acceptance.

3.04 PIPE ENCASEMENT

A. Concrete encasement of the PVC Pipe shall be conducted as specified herein or as shown on Contract Drawings. Concrete requirements for such encasement shall be specified in related sections.

3.05 FIELD TESTING

A. Pressure testing of PVC Pipe lines shall conform to all requirements as specified in related sections.

END OF SECTION

SECTION 02641

PIPING SPECIALTIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Included:

Furnish all labor, materials, equipment and incidentals required to install all gate valves, tapping sleeves pressure reducing dressers, valves, check valve, couplings, hydrants, compound water meters and appurtenances, complete as shown on the Drawings and/or as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02615 - DUCTILE IRON PIPE AND FITTINGS
B. SECTION 02622 - PVC PIPE & FITTINGS
C. SECTION 11303 - PREFABRICATED SEWAGE PUMPING STATION

1.03 APPROVAL OF MATERIAL

A. Submit to the Engineer within ten days after execution of the Contract a list of materials to be furnished, the name of the suppliers and the date of delivery of materials to the job site.

B. Contractor shall provide to Engineer a signed affidavit upon receipt of valves that they comply with all applicable provisions of the reference standards and the other provisions of these specifications including the coating requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete for Thrust Blocks:

1. Concrete for thrust block shall be as specified in Section 03300.

B. Gate Valves:

1. All gate valves shall be manufactured in full compliance with the content and intent of this specification. Gate valves shall be iron body, resilient wedge type with 8 mil epoxy coating inside and out, with two inch operating nut. Valves shall have mechanical joint hubs. Gate valves shall conform in every respect to AWWA C509. Valves shall be designed for 200 psi working and 300 psi test pressure and shall open right.

2. Valves shall also conform to the specifications of the AWWA as to size of stem, pitch of thread, etc. The gasket seating area shall be fully machined to fixed dimensions and tolerances as per AWWA specifications. All valves shall be provided with "O" rings. The design of the valve shall be such that the seal plate can be fitted with new "O" rings while the valve is under pressure in a fully open position. Cartridge O-ring type gate valves, if accepted, shall be furnished with a spare cartridge for each valve furnished.

3. Exterior surfaces of all valves shall be coated with a minimum of three applications of an approved bituminous solution, on a rust-free casting, prior to shipment. Body ring shall be free of any bitumastic solution.

C. Valve boxes:

1. Valve boxes shall be provided for each buried valve. They shall be cast iron, of heavy pattern, sliding adjustable type and provided with cast cover. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve. Boxes shall have barrel of not less than 5 1/4-inch diameter and be of the sliding adjustable type with a lap of at least 6 inches when in the most extended position. Covers shall have the word "SEWER" cast into them.

2. Valve boxes shall be provided for each valve installed for buried service.

D. Plug Valves:

Each discharge line shall be equipped with a 2-way plug valve to permit isolation of the pumps from the Forcemain. Plug valves shall be of the non-lubricated, tapered type. Valve body shall be semi-steel with flanged end connections drilled to ANSI 125 pound standard. Valves shall be furnished with a drip-tight shutoff plug mounted in stainless steel bearings, and shall have a resilient facing bonded to the sealing surface.

E. "Dresser" Couplings:

1. "Dressers" shall be mechanical joint with ductile iron glands.

2. Ductile iron "Dressers" shall conform to AWWA Specification C-110. solid sleeves, plugs and caps shall also be ductile iron and conform to AWWA Specification C-110.

3. Coupling and bolts shall receive two coats of bituminous paint - Inertol No. 66 Special Heavy - after installation.

F. Check Valves:

Full flow type swing check valves shall have cast iron body with flanged ends rated at 125 pounds. The valves shall be fitted with an external lever and spring. Bronze body ring shall be threaded into the valve port. The valve clapper shall be cast iron, bronze face, and shall swing completely clear of waterway when valve is full open. Hinge pin shall be 18-8 stainless steel construction and shall be utilized with bronze bushings and O-ring seals. The valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. The valve rating shall be 175 psi water working pressure, 350 psi hydrostatic test pressure.

G. Tapping Sleeves and Valves:

1. Tapping sleeves and valves shall conform to the AWWA specifications for tapping sleeves and valves. Tapping sleeves shall be mechanical joint, two part castings, flanged on the vertical centerline, and come complete with all joint accessories. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with lead gaskets. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket. Bolts shall be properly spaced to insure uniform gasket pressure and compression.

2. Sleeve outlets shall have counterbored flanges to insure proper centering of the tapping valve. All tapping valves shall be flanged by mechanical joint as specified by the Owner. Tapping valves shall conform with the aforementioned specifications for gate valves.

H. Water Services:

1. Service Pipe. Service pipe shall be copper tubing, Type K for buried service as required and shall be American made and of a manufacturer approved by the Owner.

2. Services Boxes. Service boxes shall be tar coated sliding type, with brass plug type covers. Service box shall consist of cast iron foot piece, reinforced at the arch and the pipe ring areas, and a galvanized pipe upper piece. The operating rod shall be 1/2 inch diameter, offset for centering in the pipe, with heavy ductile iron end yoke, and brass cotter pin. Box shall be adjustable to accommodate bury depths from five feet to six feet.

3. Required Brass Goods shall include Corporation Cocks, Curb Stops, Misc. Couplings and Fittings. Castings shall be sufficiently heavy to meet all service conditions without springing or leaking and be clean and free from roughness both inside and out. Waterways shall be smooth, full size and free from obstruction. All threads shall be cut sharp, clean and true.

4. Nuts shall be of commercial bronze containing not less than 89 percent copper and finished on both sides to true faces. Adjusting nuts shall also come to a true facing against bottom of the bronze washer and proper adjustment shall be made to assure easy turning and freedom from leakage. Adjusting nuts shall be properly locked to the stop plug to avoid change in position in operation of stop.

5. All plugs of corporations and curb cocks shall be solid (except for waterway). Bronze in all plugs shall be of composition harder than that of the body such as ingot No. 245 Navy M metal containing not less than 87 percent copper. All plugs shall be properly lubricated and upon assembly bronze washers are to come to a true facing completely around bottom of curb cock body.

6. All curb cocks shall be subjected to a sustained hydraulic pressure of 200 pounds and tested in both the open and closed position. Curb cocks shall be Hays No. 5046CF, with drain, or equal.

7. All brass goods shall be individually wrapped to protect threads during shipment. Corporation cocks and curb cocks shall open left, and shall be of the compression type. Compression fittings for joining copper tubing shall be Hays No. 5615CF, or equal.

I. AIR AND VACUUM VALVES

1. Where indicated on the Contract Drawings, the Contractor shall install an air and vacuum valve to permit the escape of air from piping that is being filled and to permit the inflow of air into piping that is being emptied.

2. All valves shall be heavy duty, float actuated, with a heavy cast iron body, stainless steel float, and bronze and stainless steel working parts. Air and vacuum valves shall be Valve & Primer Corp. Model 403, or equal. The components of a combination valve shall be provided by a single manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Buried valves and boxes shall be set with the stem vertical and box vertically centered over operating nut. Valves shall be set on a firm foundation and supported and anchored as shown on the Drawings. Selected excavated material shall be placed and tamped under and at the sides of the valve. Valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.

B. All bolts and nuts shall be heavily coated with two coats of bituminous paint comparable to Inertol No. 66 Special Heavy.

C. Pipe upon which a tapping sleeve is to be installed shall be thoroughly cleaned of all foreign matter with scraping tools and wire brushed, a minimum of scraping tools and wire brushed, a minimum of six (6) inches each side of the sleeve. Sleeve bolts shall be alternately tightened from the extreme end on one side to the extreme of the opposite side with approved torque wrenches until all are securely tightened. Take care to ensure that the tapping machine is kept in leveled horizontal position and securely supported so as not to transmit any additional weight to the tapping valve.