DIVISION 2

SITE WORK

Scope of Work

Provide, install and test all site work and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of work.

Contents of Division

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Clearing includes, but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of nonsalvageable structures and materials, and necessary preliminary grading.

B. Limits of Work:

1. Perform clearing and grubbing work within the areas required for construction to a depth of 12 inches below the existing grade.
2. Perform additional clearing and grubbing work within areas and to depths which, in the opinion of the District, interfere with excavation and/or construction, or are otherwise objectionable.
3. No clearing and grubbing shall occur beyond the Limits of Work without prior written approval from the District.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Dispose of combustible material by burning only when permitted by and in accordance with all applicable local and state laws, ordinances and code requirements.

B. Remove and dispose of nonsalvageable structures and material in accordance with all applicable local and state laws, ordinances and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all materials required to complete the work.

B. All timber and wood shall become the property of the Contractor unless other agreements are made between the District and the Contractor.

C. Repair any damage to structures to the complete satisfaction of the District.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully preserve and protect from injury all trees and/or shrubs not to be removed.

B. Right-of-way:
1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the District's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.
2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the District, essential for construction operations.
3. All other removals or damage shall be replaced or restored at the Contractor's expense.

3.2 PERFORMANCE

A. Clearing:
1. Remove and dispose of all trees, brush, slash, stubs, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except any areas that may be designated as "Selective Clearing", and except as otherwise shown on the Drawings or as directed by the District.
2. Remove all stumps unless otherwise directed by the District.
3. Dispose of material to be removed daily as it accumulates.
4. Take special care to completely dispose of all elm trees and branches immediately after cutting either by burial in approved locations or, when permitted, by burning in areas well removed from standing elm growth.

B. Protection of Wooded Growth:
1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing and paint all cut surfaces with an approved bituminous paint.

C. Selective Clearing:
1. When shown on the Drawings and when directed by the District, perform selective clearing work to preserve natural tree cover.
2. Perform selective clearing work only under the direction and supervision of the District.
3. Remove all dead and uprooted trees, brush, roots and other material which are objectionable.
4. Cut flush with the ground and remove only those trees indicated by the District.
5. Employ skilled workmen or tree surgeons to carefully trim all branches requiring cutting on trees to be left standing and to paint all cut surfaces with an approved bituminous paint.
6. Paint tree roots which are cut and are to be left exposed to the weather with an approved bituminous paint.

D. Grubbing:
1. Perform grubbing work beneath new roads, driveways, walks, seeded areas and other areas as required.
2. Grub out all sod, vegetation and other objectionable material to a minimum depth of 12 inches below the existing grade.
3. Completely remove all stumps, including major root systems.

E. Disposal:
   1. Remove from the site and dispose of material not being burned.
   2. Provide an approved disposal area.

F. Burning:
   1. Dispose of combustible materials by burning only if approved by local and state officials.
   2. Employ competent workmen to perform burning work in such a manner and at such locations that adjacent properties, trees and growth to remain, overhead cables, wires and utilities will not be jeopardized.
   3. Do not leave fires unguarded.
   4. Do not burn poison oak, poison ivy or other plants of similar nature.
   5. Do not use tires or other combustible waste material to augment burning.
   6. Burn combustible materials daily as the work progresses.
   7. The Contractor shall be responsible for all damage caused by burning and shall be responsible for obtaining all necessary permits for burning.

3.3 REPLACEMENT OF MATERIALS

A. Paving, Curbing and Miscellaneous Material:
   1. Remove all paving, subpaving, curbing, gutters, brick, paving block, granite curbing, flagging and minor structures that are over the area to be filled or excavated.
   2. Remove and replace bituminous asphaltic and portland cement concrete in accordance with the appropriate sections of these Specifications.
   3. Properly store and preserve all material to be replaced in a suitable location.

B. Shrubs and Bushes:
   1. Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.

C. Topsoil:
   1. When applicable, carefully remove, store, and protect topsoil in accordance with the appropriate section of this division.

D. Responsibility:
   1. Replace, at no cost to the District, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02220

STRUCTURE EXCAVATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Structure excavation work includes the removal of sand, gravel, ashes, loam, clay, swamp muck, rock, ledge and combinations of such materials for the installation of structures.

B. Related Work Specified Elsewhere (When Applicable):
   1. The use of explosives is specified in Division 1.
   2. Traffic regulation is specified in Division 1.
   3. Clearing, removal and replacement of paving, trench excavation in earth and ledge, backfilling, borrow and bedding material, and dewatering, are specified in the appropriate sections in this division.

1.2 JOB CONDITIONS

A. Utilities:
   1. The approximate locations of known buried water lines, sewer lines, telephone cables, storm drains, culverts, gas mains, electric conduits, and other utilities are shown on the Drawings. No guarantee is made as to the accuracy or completeness of the information given.
   2. Use manual excavation methods to locate existing utilities.

B. Existing Structures:
   1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures, utilities and any work previously completed under this Contract.
   2. Where existing buildings and other structures are in proximity to the proposed construction, exercise extreme caution and utilize whatever precautionary measures are necessary.

C. Repairing Damage:
   1. Repair, or have repaired, to the complete satisfaction of the District, utility company and/or the property owner, at Contractor's expense, all damage which results from construction operation to existing utilities, structures, lawns, and other public and private property.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Right of Property:
   1. The Contractor shall not have any right of property in any materials taken from any excavation.
   2. Do not remove any such materials from the construction site without the approval of the District.
   3. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the District to be unsuitable for backfilling.

B. Unsuitable Material:
   1. If the material encountered at and/or below the indicated grade for excavation, as shown on the Drawings, is unsuitable for the foundation of the structure, remove the material.
   2. Replace the unsuitable material with thoroughly compacted suitable screened gravel or crushed stone.

C. Disposal of Material:
   1. All excavated materials designated unsuitable, and excavated ledge and rock, shall become the property of the Contractor.
   2. Dispose of this material at Contractor's expense.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Amount of excavation:
   1. Excavate areas large enough to provide suitable room for building the structures.
   2. The extent of open excavation shall be controlled by prevailing conditions.
   3. Open excavation shall, at all times, be confined to the limits designated.

B. Ledge Excavation:
   1. Excavate all ledge to the lines and grades shown on the Drawings.
   2. Remove ledge by suitable means.
   3. Remove all vegetation, dirt, sand, clay, loose fragments and other objectionable substances from the ledge prior to placing any concrete on or against the ledge.

C. Sheeting and Bracing:
   1. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, and property in accordance with all state and OSHA safety standards.

D. Fencing:
   1. Erect suitable fences around structure excavation and other dangerous locations created by the work.

END OF SECTION

SECTION 02222

AGGREGATE BASE AND SUBBASE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The aggregate base and subbase courses for use below pavement shall be composed of layers of aggregate of different gradations as required by the Town of Ogunquit or Maine Department of Transportation.

B. Related Work Specified Elsewhere: (When Applicable)
   1. Excavation and Embankment, Bituminous Concrete Paving.

1.2 SUBMITTALS

A. Contractor shall certify that materials comply with the specification requirements by submitting either laboratory test results or certificates of compliance.

1.3 QUALITY ASSURANCE

A. Compact aggregate base and subbase course materials to a density of at least 95 percent of the maximum density as determined in accordance with ASTM D-1557, Method D.

B. Work shall be halted when the District is not satisfied with the apparent results of the Contractor's compaction operation. A testing laboratory acceptable to the District shall then be obtained by the Contractor to determine, by conducting density tests, if the Contractor is complying with these compaction specifications.
   1. If the test results fail to meet the requirements of these Specifications, the Contractor shall undertake whatever action is necessary, at his expense, to obtain the required compaction. The cost of the testing service will be borne by the Contractor and no allowance will be considered for delays in the performance of the work.
   2. If the test results pass and meet the requirements of these Specifications, the direct invoice cost of the testing service to the Contractor will be borne by the District, but no allowance will be considered for delays in the performance of the work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate subbase course shall be gravel consisting of hard, durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the portion which will pass a three inch sieve shall meet the grading requirements of the following tables:

TABLE 1 GRADATION REQUIREMENTS - AGGREGATE SUBBASE COURSE:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve			
	Type D	Type E	Type F	Type G
1/4 inch	25-70	25-100	60-100	--
No. 40	0-50	0-30	0-50	0-70
No. 200	0-7	0-7	0-7	0-10

B. Aggregate for base shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the part that passes a 3-inch sieve shall meet the grading requirements of the following table:

TABEL 2 GRADATION REQUIREMENT - AGGREGATE BASE COURSE

Sieve Designation	Percent by Weight Passing Square Mesh Sieves		
	Type A (Crushed) Aggregate	Type B (Screened) Aggregate	Type C (Bank Run) Aggregate
1/2 inch	45-70	35-75	----
1/4 inch	30-55	25-60	25-70
No. 40	0-20	0-25	0-30
No. 200	0-5	0-5	0-5

C. Gradation tests shall conform to AASHTO Method T-27, except that the material may be separated on the 1/2 inch sieve. The subbase shall not contain particles of rock which will not pass the six inch square mesh sieve. Type A aggregate for base shall not contain particles of rock which will not pass the 2-inch square mesh. Type B aggregate for base shall not contain particles of rock which will not pass the 4-inch sieve. Type C aggregate for base shall not contain particles of rock which will not pass the 6-inch square mesh sieve.

PART 3 - EXECUTION

3.1 PLACING

A. The subbase course may be constructed full depth in one lift. Fine grading the lower layer will not be required.

B. Aggregate base course shall be placed full depth in one lift.

3.2 SHAPING AND COMPACTING

A. All layers of aggregate subbase course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.

B. The Contractor shall bear full responsibility for and make all necessary repairs to the base and subbase courses and the subgrade until the full depth of the base and subbase courses is placed and compacted.

C. If the top of any layer of the aggregate base or subbase course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

D. The top of any aggregate subbase course layer shall be scarified and loosened for a minimum depth of one inch immediately prior to the placing of the next layer of aggregate base course.

3.3 SURFACE TOLERANCE

A. The completed surface of the aggregate base and subbase courses shall be shaped and maintained to a tolerance, above or below the required cross sectional shape, of 3/8 inch for aggregate base course and 1/2 inch for aggregate subbase.

3.4 PAVING

A. Paving on Town roads shall be coordinated with and approved by the Town of Ogunquit.

B. Paving on state roads shall be coordinated with and approved by the Maine Department of Transportation.

END OF SECTION

SECTION 02223

TRENCH EXCAVATION - EARTH

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Trench excavation work in earth includes the removal of sand, gravel, existing sewers and manholes, ashes, loam, clay, swamp muck, trolley tracks, soft or disintegrated rock or hard pan or a combination of such materials for the installation of pipes and appurtenant structures.

B. Related Work - Specified Elsewhere:

1. Traffic regulation is specified in Division 1.
2. Clearing, removal and replacement of paving, trench excavation ledge, borrow and bedding material, manholes, and catch basins, trench backfilling, compaction, control and testing, when applicable, are specified in the appropriate sections in this division.
3. Pipe and pipe fittings, valves and gates, when applicable, are specified in Divisions 2 and/or 15.

1.2 JOB CONDITIONS

A. Utilities:

1. The locations of utilities shown on the plans are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. It shall be the responsibility of the Contractor to determine the actual locations of any utilities within the project area.
2. Rules and regulations governing the respective utilities shall be observed in executing all work. Active utilities shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped. Report in writing to the District, the locations of such abandoned utilites. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable. If, in the progress of excavation, any utility should become damaged and result in any damage to public or private property, the Contractor shall restore to the original condition, at his expense, anything which has been damaged or disturbed.

B. Existing Structures:

1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures and any work previously completed under this Contract.
2. Where existing buildings and other structures are in proximity to the proposed construction, exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures, that may be required.

C. Repairing Damage:
1. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations to the complete satisfaction of the District, the utility company, the property owners and the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The Contractor shall not have any right of property in any suitable materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the District. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined to be unsuitable for backfilling.

B. Unsuitable Material:
1. If, in the opinion of the District, the material encountered above the indicated grade shown on the Drawings for excavation is unsuitable material, remove and replace this material as specified in the "Trench Backfilling, Compaction, Control and Testing" section of this division.
2. If the material encountered at or below the indicated grade shown on the Drawings for excavation is unstable material, remove the material to the full width of the trench and to a minimum depth of twelve inches below the pipe. Replace this material with thoroughly compacted suitably screened gravel bedding material.
3. All excavated materials designated by the District as unsuitable shall become the property of the Contractor and disposed of at Contractor's expense.

C. Embankment Material:
1. Obtain prior approval and instructions from the District prior to undertaking the excavation for pipe placement in any fill material that has been in an embankment less than one year.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Unless otherwise specifically directed or permitted by the District, begin excavation at the low end of sewer and storm lines and proceed upgrade.
2. Perform excavation for force mains and water mains in a logical sequence.

B. Amount of Excavation:
1. Trench width: As shown on the Drawings.
2. Trench depth: As shown on the Drawings.
3. Open Excavation:
   a. The extent of open excavation shall be controlled by prevailing conditions.
   b. Open excavation shall, at all times, be confined to the limits prescribed.

4. Unauthorized Excavation:
   a. Backfill to the specified grade, any excavation beyond the limits stated above and as shown on the Drawings (unless specifically ordered) with thoroughly compacted gravel borrow or screened gravel.
   b. Backfilling unauthorized excavation shall be at Contractor's expense.

C. Shoring and Bracing:
   1. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards.

END OF SECTION

SECTION 02224

TRENCH EXCAVATION - LEDGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Trench excavation work in ledge includes the removal of ledge and rock required for the installation of pipes and/or structures.
2. "Ledge" and "rock" include any natural compound, natural mixture, and chemical element required to be excavated that, in the opinion of the District, can be removed from its existing position and state only by blasting, drilling and blasting, wedging, drilling and wedging, wedging and breaking with power hand tools, or by extending the use of an approved excavating machine beyond normal and design wear and tear. No boulder, ledge, slab, or other single piece of excavated material less than one cubic yard in total volume shall be considered to be rock unless it must be removed from its existing position by one of the methods mentioned above.
3. All trench excavation shall be classed as earth or ledge.

B. Related Work Specified Elsewhere:

1. The use of explosives is specified in Division 1.
2. Traffic regulation is specified in Division 1.
3. Clearing, removal and replacement of paving, trench excavation - earth, trench backfilling, compaction, control and testing, dewatering, borrow and bedding material, manholes and catch basins are specified in the appropriate sections in this division.
4. Pipe and pipe fittings, valves, gates and hydrants, when applicable, are specified in Divisions 2 and/or 15.

1.02 JOB CONDITIONS

A. Utilities:

1. The locations of known buried water lines, sewer lines, telephone cables, oil pipelines, storm drains, culverts, gas mains, electric conduits and other utilities are shown on the Drawings. No guarantee is made as to the correctness of the locations shown and to the completeness of the information given.
2. Use manual excavation methods to locate existing utilities.

B. Existing Structures:

1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures and any work previously completed under this Contract.
2. Where existing buildings and other structures are in proximity to the proposed construction, exercise extreme caution and utilize whatever precautionary measures that may be required.

C. Repairing Damage:
1. Repair, or have repaired, at Contractor's expense and to the complete satisfaction of the District, the utility company and property owner, all damage to existing utilities, structures, lawns, and other public and private property which results from construction operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The Contractor shall not have any right of property in any suitable materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the District. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the District to be unsuitable for backfilling.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Unless otherwise specifically directed or permitted by the District, begin excavation at the low end of sewer and storm lines and proceed upgrade.
2. Perform excavation for force mains in a logical sequence.

B. Amount of Excavation:
1. Trench width: As shown on the Drawings.
2. Trench depth: As shown on the Drawings.
3. Open Excavation:
a. The extent of open excavation shall be controlled by prevailing conditions.
b. Open excavation shall at all times be confined to the limits as shown on the Drawings.
4. Unauthorized Excavation:
a. Backfill to the specified grade, any excavation beyond the limits stated above and as shown on the Drawings (unless specifically ordered by the District) with thoroughly compacted crushed stone or screened gravel.
b. Backfilling unauthorized excavation shall be at Contractor's expense.

C. Shoring and Bracing:
1. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards.

END OF SECTION

SECTION 02228

BORROW AND BEDDING MATERIAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide, place and compact borrow and bedding material in authorized excavation(s) below normal depth and in other location(s) as shown on the Drawings and/or as specified herein.

B. Related Work Specified Elsewhere:

1. Trench Excavation - Earth, Trench Excavation - Ledge, Trench Backfilling, Compaction, Control and Testing are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gravel Borrow:

1. Uniformly graded granular material having no rocks with a maximum dimension over 6-inches, except where it is used for pipe bedding in which case the maximum size shall be 2-inches.
2. Free from frozen material and other unsuitable material.
3. That portion passing a three inch square mesh sieve shall contain not more than 70 percent passing a 1/4 inch mesh sieve and not more than 10 percent passing a number 200 mesh sieve.

B. Gravel Bedding Material:

1. Shall be either screened gravel or crushed stone and shall be well graded in size from 1/4 inch to 3/4 inch.
2. Clean, hard, and durable particles or fragments.
3. Free from dirt, vegetable, or other objectionable matter, and excess of soft, thin elongated, laminated or disintegrated pieces.
4. Sieve Analysis:

Sieve Designation	% Passing by Weight Square Opening
1"	100
3/4"	90-100
3/8"	20-50
No. 4	0-10
No. 8	0-5

C. Sand:

1. Clean, hard and durable particles or fragments.

2. Sieve Analysis:

Sieve Designation	% Passing by Weight Square Opening
3/8"	100
No. 4	95-100
No. 16	50-85
No. 50	10-30
No. 100	2-10

D. Underdrain Backfill Material:
1. Free from organic matter.
2. Gradations:

Sieve Designation	% by Weight Passing Square Mesh Sieves
Type "B" Underdrain	
1 inch	95-100
½ inch	75-100
No. 4	50-100
No. 20	15-80
No. 50	0-15
No. 100	0-10

Sieve Designation	% by Weight Passing Square Mesh Sieves
Type "C" Underdrain	
1 inch	100
3/4 inch	90-100
3/8 inch	0-75
No. 4	0-25
No. 10	0-5

Filter Fabric Lined Trench

3"-6" coarse aggregate.
Filter fabric in accordance with SECTION 02271.

3. Shall conform to AASHTO T 27

E. French Drain Stone
1. Hard, durable rock.
2. Gradations:

Sieve Designation	% by Weight Passing Square Mesh Sieves
6 inch	90-100
1½ inch	0-40
No. 4	0-5

3. Shall conform to AASHTO T 27 except that the total material sampled shall be sieved and the minimum weight of the sample will be 120 pounds.

F. 3/4"-Crushed Stone: Crushed Stone shall be a uniform material, containing angular pieces, as are those which come from a mechanical crusher. Gradation requirements shall be as follows:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1"	98-100
3/4"	0-30
No. 200	0-3

G. Unsuitable Soil Materials: Shall be those defined in AASHTO M145, soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also, peat and other highly organic soils.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Place bedding material, initial backfill and fill below pipe bedding in layers of uniform thickness not greater than six inches or as shown on the Drawings.

B. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.

C. In excavations below normal depth or where unsuitable materials are excavated, gravel borrow shall be used unless ground water makes such usage not practical; if such is the case, then screened gravel shall be used.

D. No stone 2" in diameter or larger shall be allowed within 12" of the pipe.

E. Where soft silt and clay soils are encountered the trench shall be excavated 6 inches below the normal bedding and backfilled with 6-inches of compacted sand.

F. No stone or rock greater than 12 inches measured at any point shall be placed in the trench backfill.

G. The following schedule gives the minimum bedding requirements for various types of pipe. Dimensions refer to distance below bottom of pipe.

D.I. Pipe Concrete Pipe	6 inches min. gravel borrow.
PVC or ABS Pipe	6 inches min. screened gravel.
Culverts and Storm Drain Pipe	6 inches min. gravel borrow

H. The following schedule gives the minimum initial backfill requirements for various types of pipes.

D.I. Pipe Concrete Pipe	Gravel borrow 6 inches min. over top of pipe.
PVC or ABS Pipe	6 inches min. screened gravel over the top of the pipe.
Culverts and Storm Drain Pipe	Gravel borrow 6 inches min. over top of pipe.

END OF SECTION

SECTION 02250

TRENCH BACKFILLING, COMPACTION, CONTROL AND TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Backfilling work includes backfilling trenches below subgrade and/or backfilling around structures with suitable material removed in the course of excavating and other suitable material as specified herein.

B. Related Work Specified Elsewhere: (When Applicable)
   1. Traffic regulation is specified in Division 1.
   2. Clearing, removal and replacement of paving, trench excavation -earth, trench excavation - ledge, structure excavation, de-watering, borrow and bedding material are specified in the appropriate sections in this division.

1.2 QUALITY ASSURANCE

A. When other than excavated backfill is required, and/or where shown on the Drawings, compact backfill material to an in-place density not less than 90 percent of the maximum density of the material in accordance with ASTM D1557 Method "B".

B. Where backfilling with excavated material, compact to native field density.

C. Determine in-place density in accordance with ASTM D1556 or by other methods as approved by the District.

D. Have density testing performed by an independent soils laboratory as approved by the District, at Contractor's expense.

E. Locations of Tests (when applicable):
   1. Average of one test between each manhole for interceptor sewers and trunk lines.
   2. Average of two tests between each manhole for sewer laterals.
   3. Average of one test on each side of each structure.

F. Requirements for compaction, and the testing thereof establish guidelines for proper backfilling, but in no way relieve Contractor of correcting any settlement which occurs thereafter. All costs for compaction and testing shall be the responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 FINAL BACKFILL MATERIALS

A. Suitable Excavated Material:
   1. Free from large clods, silt lumps or balls of clay.
   2. Free from stones and rock fragments over 50 pounds.
   3. Free from organics, peat, etc.

B. Frozen Materials:
   1. Do not backfill with, or on, frozen materials.
   2. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.

C. Wet Material:
1. Do not mechanically or hand compact material that is too wet, as indicated by water puddling under equipment.
2. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Provide and place all necessary backfill material.
2. Do not allow large masses of backfill material to be dropped into the excavation, as from a grab bucket, in such a manner that may endanger pipes and structures.
3. Place material in a manner that will prevent stones and lumps from becoming nested.
4. Completely fill all voids between stones with fine material.
5. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
6. Deposit backfill material evenly on all sides of structures to avoid unequal soil pressures.
7. Keep stones or rock fragments with a dimension greater than four inches at least one foot away from the pipe or structure during backfilling.

B. Sheeting:
1. Leave sheeting in place when, in the opinion of the District, damage is likely to result from its withdrawal.
2. Completely fill with suitable material and thoroughly compact all voids left by the removal of sheeting.

C. Backfilling in Paved Areas:
1. Backfill in such a manner as to permit the rolling and compaction of the backfilled trench with the adjoining material to provide the required subgrade bearing value for placing aggregate base and subbase materials and paving immediately after backfilling is completed.
2. Where required, place excavated material, that is acceptable to the District for surfacing or pavement subbase, at the top of the backfill to the depths as directed. Bring the surface to the required grade and rake out and remove stones.

D. Backfilling Trenches in Nonpaved Areas:
1. Grade the ground to a reasonable uniformity.
2. Leave the mounding over the trenches in a uniform and neat condition.

E. Bedding and Backfilling Pipelines:
1. Install pipe bedding and initial backfill in accordance with the Borrow and Bedding Section in this division.
2. Deposit and thoroughly compact the remainder of the backfill in twelve inch layers.

F. Placing and Compacting Backfill:
1. The nature of the backfill materials will govern the methods best suited for their placement and compaction.
2. No stone or rock fragment larger than twelve inches in dimension shall be placed in the backfill.

3. No material shall be dropped from a height greater than five feet, unless a timber chute is used to break the fall.
4. Rolling and tamping by mechanical or hand means shall be employed for compacting material in twelve inch lifts.
5. Other types of placing and compacting methods may be employed only when approved by the District.

G. Improper Backfill:
1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required.
2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
3. Excavation, backfilling, compacting work and testing performed to correct improper backfilling shall be performed at Contractor's expense.

END OF SECTION

SECTION 02270

TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The work under this section shall include provision of all labor, equipment, materials and maintenance of temporary erosion control devices as specified herein and as directed by the District.
2. Erosion control measures shall be provided as necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during normal construction operations.
3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control.

B. Related Work Specified Elsewhere:

1. Site work is specified in appropriate sections of this division.

1.2 SUBMITTALS

A. The Contractor shall furnish the District, in writing, his work plan giving proposed locations for storage of topsoil and excavated material before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Baled Hay:

1. At least 14" by 18" by 30" securely tied to form a firm bale, staked as necessary to hold the bale in place.

B. Sand Bags:

1. Heavy cloth bags of approximately one cubic foot capacity filled with sand or gravel.

C. Mulches:

1. Asphalt emulsion, compost, corn stalks, gravel, crushed stone, loose hay, straw, peat moss, straw or pine needles, rotten sawdust, wood chips, wood excelsior, or wood fiber cellulose.
2. Type and use shall be as specified by the "Maine Erosion and Sediment Control on Commercial, Industrial, Residential, Recreation and Government Construction Sites; Environmental Quality Handbook" prepared by the Maine Soil and Water Conservation Commission herein after referred to as the Environmental Quality Handbook.

D. Mats and Nettings:

1. Twisted Kraft paper, yarn, jute, excelsior and wood fiber mats.
2. Type and use shall be as specified by the Environmental Quality Handbook.

E. Seed:
   1. Conservation mix appropriate to the predominant soil conditions as specified in the Environmental Quality Handbook and subject to approval by the District.

F. Sod:
   1. Grown from certified seed of adapted varieties to produce high quality sod free of any serious thatch, weeds, insects, diseases and other pest problems.
   2. At least one year old and not older than three years. Cut with a 1/2 to 1 inch layer of soil.

G. Water:
   1. The Contractor shall provide water and equipment to control dust.

H. Filter Fabrics:
   1. Filter fabric shall be of one of the commercially available brands such as Mirafi, Typar or equivalent. Fabric types for particular applications shall be approved by the District prior to installation.

2.2 CONSTRUCTION REQUIREMENTS

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and other locations as necessary.
   2. Baled hay, sand bags or siltation fence may be used in an arrangement to fit local conditions.

B. Temporary Berms:
   1. Temporary barriers shall be constructed along the toe of embankments when necessary to prevent erosion, sedimentation.

C. Sedimentation Basin:
   1. Sedimentation basins shall be areas where water is temporarily delayed or slowed down, constructed where shown on the plans or as directed by the District.
   2. Capacity shall be equal to the volume of sediment expected to be trapped at the basin during the planned useful life of the structure, or if the periodic removal of debris is practical, the capacity may be proportionately reduced.
   3. Design shall be in accordance with the Standards for Ponds, Grade Stabilization Structure or USDA Soil Conservation Service Engineering Memorandum No. 27 and/or as shown on the Drawings.

D. Siltation fences shall consist of porous filter fabric with a wire mesh backing and shall be supported by posts as per manufacturer's recommendations. Fabric type shall be approved by the District for its filtration properties.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and at other locations designated by the District. The District may modify the Contractor's arrangement of bales and bags to fit local conditions.
   2. Baled hay or sandbags, or both, may be used in other areas as necessary to inhibit soil erosion.

3. Siltation fence, if called for in the plans, shall be located and installed as shown.
4. Sedimentation ponds shall be sited and constructed to the grades and dimensions as shown on the plans and will include drainage pipe and an emergency spillway.

B. Removing and Disposing:
1. When no longer needed, material and devices for temporary erosion control shall be removed or may be left in place and dispersed over the adjacent area, as approved by the District.
2. When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.
3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.
4. Sedimentation basins, if no longer required, will be filled in, the pipe removed, the surface loamed and grass cover shall be established.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish, operate and maintain dewatering equipment for the control, collection and disposal of ground and surface water where necessary to complete the work.

B. Related Work Specified Elsewhere: (When Applicable)

1. Trench Excavation - Earth, Trench Excavation - Ledge, Structural Excavation, and Trench Backfilling, Compaction, Control and Testing, and Temporary Erosion Control are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. Keep work areas dewatered until the structures, pipes, and appurtenances to be built there have been completed to such an extent that they will not be damaged by water.
2. Thoroughly brace or otherwise protect against flotation all pipelines and structures which are not stable.

B. Disposal of Water:

1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid public nuisance, injury to public health, damage to public and private property, and damage to the work completed or in progress.
2. Provide suitable temporary channels for water that may flow along or across the construction site.
3. Provide suitable temporary erosion control.
4. Do not use pipe being installed for dewatering purposes.

C. Damage:

1. Any damage resulting from the dewatering operations, or the failure of the Contractor to maintain the work in a suitably dry condition shall be repaired by the Contractor at his expense.

D. Temporary Underdrains:

1. When necessary, temporary underdrains may be placed in excavations.
2. Underdrain pipe shall be perforated, concrete, corrugated metal or P.V.C. pipe.
3. Entirely surround the underdrain and fill the space between the underdrain and the pipe or structure with underdrain material.

E. Well and Wellpoint System:
   1. If necessary dewater the excavations and trenches with an efficient well or wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated wells and area.
   2. Wellpoint and well system shall be of the type designed for dewatering work and shall be installed with suitable screens and filters so that pumping of fines does not occur.
   3. Pumping units shall be capable of maintaining sufficient suction to handle large volumes of air and water at the same time.

END OF SECTION

SECTION 02485

LOAMING & SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, place, and test topsoil, seed, lime, and fertilizer and protect and maintain seeded areas disturbed by construction work.

B. Related Work Specified Elsewhere (When Applicable): Excavation, Clearing, Site Grading and Backfill are specified in the appropriate Sections of this Division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:

1. Mixture by weight:

Creeping Red Fescue	- 45%
Kentucky Bluegrass	- 30%
Red Top	- 10%
Perennial Ryegrass	- 15%

2. Seed shall have a minimum germination of 85 percent and a minimum purity of 90 percent.

B. Topsoil (Loam): Use stockpiled topsoil from construction site or furnish topsoil as follows:

1. Topsoil shall consist of fertile, friable soil free from subsoil, gravel, roots and stones and shall contain at least 2 percent and not more than 15 percent organic matter as determined by AASHTO T-194.

2. Gradation:

Sieve Designation	Minimum % Passing by Weight
2"	100
No. 4	75
No. 10	60

Sand, silt and clay material passing the No. 10 sieve shall be as follows:

	Minimum %	Maximum %
Sand	5	70
Silt	10	70
Clay	5	36

C. Lime:

1. Ground limestone containing not less than 85 percent total carbonates.

2. Gradation: 60 percent shall pass a 60 mesh screen and 95 percent shall pass a 10 mesh screen.

D. Fertilizer:
1. Fertilizer shall be uniform in composition.
2. Minimum percentage plant food by weight:
a. 10% available nitrogen;
b. 10% available phosphoric acid;
c. 10% available potash.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shape and dress the areas designated for topsoiling.

B. Clear the area of all stones and foreign materials two inches or larger and loosen the subsoil to a depth of two inches by discing or other suitable method.

3.2 PERFORMANCE

A. Placing Topsoil:
1. Topsoil shall only be placed during the seeding period.
2. Spread topsoil over the prepared areas in such quantities as necessary to obtain a minimum compacted thickness of four inches.
3. The loam shall not be hauled over, tramped over or packed in any way other than required in the seeding operation.

B. Lime and Fertilizer:
1. Lime and fertilizer shall be placed when the soil is in a moist condition and at least 24 hours before sowing seed.
2. Lime and fertilizer shall not be applied together.
3. Lime and fertilizer shall be mixed into the soil to a minimum depth of one inch.
4. Application Rates:
a. Lime: 1000 pounds per acre
b. Fertilizer: 1000 pounds per acre

C. Seeding:
1. The recommended seeding periods are from April 1 to June 1 and from August 15 to October 1. Seeding may be done during other periods. Regardless of the time of seeding, the Contractor shall be responsible for a full growth of grass.
2. Sow seed uniformly to the entire area to be seeded. Application rate: 200 pounds per acre.
3. Seeding shall not be performed during unfavorable conditions such as drought, high winds, excessive moisture or other such factors.
4. After seeding, all areas shall be lightly raked to mix seed with the topsoil.
5. Immediately after seeding, the area shall be rolled to remove irregularities and air pockets. Roller weight shall be 60 to 90 pounds per foot.

D. Mulch:
   1. Within 24 hours after seeding and rolling, the area shall be mulched.
   2. Mulch shall be dry, long-fibred hay or straw reasonably free of weeds.
   3. Application: 2 tons per acre.

3.3 PROTECTION AND MAINTENANCE

A. Protection:
   1. Protect the seeded area against traffic or other use.
   2. Erect barricades and place warning signs as necessary.

B. Maintenance:
   1. Properly care for the seeded areas during the period when the grass is becoming established.
   2. The protection period shall extend for 12 months after the completion of the entire project, unless the desired cover is established in a shorter period of time.
   3. Mow the grass at least twice and until project completion.

END OF SECTION

SECTION 02601

MANHOLES, COVERS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct manholes, covers, frames, brick masonry, inverts and waterproofing (on sanitary manholes only) in conformance with the dimensions, elevations, and locations shown herein.

B. Related Work Specified Elsewhere (when applicable):
   1. Final sewer testing is specified in this Division.
   2. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.
   3. Concrete and grout are specified in Division 3.

1.2 QUALITY ASSURANCE

A. Precast Manhole Base, Barrel and Top Sections:
   1. Conform to ASTM C478-84 (AASHTO M99-79I) except as modified herein, and on the Drawings.
   2. Average strength of 4,000 psi at 28 days.
   3. Testing:
      a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
      b. Have tests conducted at the manufacturer's plant or at a testing laboratory approved by the District.
      c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.

B. Manhole Steps
   1. Acceptable Manufactures:
      a. Aluminum Company of America.
      b. Reliance Steel Products, Inc.
      c. M. A. Industries, Inc.
      d. Or equivalent.

C. Frames and Covers:
   1. Acceptable Manufacturers:
      a. Etheridge Foundry Co.
      b. Neenah Foundry Co.
      c. E. L. LeBaron Foundry Company.
      d. Or equivalent.

D. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick. (AASHTO M91-78).
   2. Cement: ASTM C-150 (AASHTO M85-79I).
   3. Hydrated Lime: ASTM C-207
   4. Sand: ASTM C33 (AASHTO M6-65 (1974)).

E. Waterproofing:
1. Acceptable Manufacturers:
a. Minwax Fibrous Brush Coat, Minwax Co., N.Y., N.Y.
b. Tremco 121 Foundation Coating, Tremco Mfg. Co., Newark, N.J.
c. Or approved equal.

PART 2 - PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A. Dimensions, shall be as shown on the Drawings:
1. Base & Riser Sections:
a. Diameter: As shown on the Drawings.
b. Length: As required.
c. Wall Thickness: Not less than 5 inches.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
2. Tops:
a. Diameter: Eccentric cone type, 24 inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
b. Length: 4 feet (3 feet minimum).
c. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
3. Flat Slab Tops:
a. Location: Where shallow installations do not permit the use of a cone-type top and where indicated on the Drawings.
b. Slab thickness: Not less than 6 inches.
c. Constructed to support an HS-20 wheel loading.

B. Openings:
1. Provide openings in the risers to receive pipes entering the manhole.
2. Make openings at the manufacturing plant.
3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
4. Location: To permit setting of the entering pipes at the correct elevations.
5. Openings shall have a flexible watertight union between pipe and the manhole base.
a. Cast into the manhole base and sized to the type of pipe being used.
b. Type of flexible joint being used shall be approved by the District.
1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
2. Kor N Seal made by National Pollution Control System, Inc.
3. Press Wedge II made by Press-Seal Gasket Corporation.
4. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
5. Or equivalent.

C. Joint Gaskets:
   1. Type:
      a. O-ring, continuous ring, round and solid conforming to AASHTO M198-75.
      b. Elastomeric or special composition with texture to assure watertight and permanent seal.

D. Waterproofing:
   1. The exterior surface of all sanitary manholes shall be given two coats of bituminous waterproofing material.
   2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
   3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

2.2 SANITARY MANHOLE FRAMES AND COVERS

A. Standard Units:
   1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
   2. Have machined bearing surfaces to prevent rocking.
   3. Constructed to support an HS-20 wheel loading.
   4. Coated with heavy-bodied bituminous asphalt paint.
   5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the District:
      a. Covers - solid, diamond pattern with "sewer" in 3-inch letters.
      b. Frame - Min. 22 3/8-inch diameter clear opening, with flange bracing ribs.

B. Water Tight Units:
   1. Same features as above for Standard Units, with 22-inch diameter minimum clear opening.
   2. Sealing features:
      a. Inner lid held by a bronze tightening bolt in a locking bar.
      b. Neoprene gasket
      c. Water tight pick hole.

2.3 MANHOLE STEPS

A. Aluminum or polyethylene coated steel safety type designed with a minimum concentrated live load of 300 pounds.

B. Thoroughly clean all surfaces to be embedded with a suitable cleaning agent to ensure that the surfaces are free from all foreign matter such as dirt, oil and grease.

C. Aluminum surfaces to be embedded shall be given a protective coating of an approved heavy-bodied bituminous material. The steps shall become thoroughly dry before being placed into the concrete.

D. All steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12-inches between steps.

2.4 MASONRY

A. Brick:
   1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
   2. Immediately remove rejected brick from the work.

B. Mortar:
   1. Composition (by volume):
      a. 1 part portland cement.
      b. 1/2 part hydrated lime.
      c. 4-1/2 parts sand.
   2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement shall be Type II portland cement.

D. Hydrated lime shall be Type S.

E. Sand:
   1. Shall consist of inert natural sand.
   2. Grading:

Sieve	Percent Passing
#3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 - 3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Manhole Sections:
   1. Perform jointing in accordance with manufacturer's recommendations.
   2. Install riser sections and tops level and plumb.
   3. Make all joints watertight.
   4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Solidly fill annular spaces around pipes entering the manholes with non-shrink grout or sealant approved by the District. Replace damaged manhole sections and tops.
   5. When manhole steps are included in the Work, install barrel sections and tops so that steps are in alignment.

B. Drop Manholes:
   1. The difference in elevation between the invert of the inlet pipe to the invert of the outlet pipe shall not exceed 24 inches without use of a drop structure.
   2. Where difference in elevation exceeds 24 inches, construct a drop manhole as shown on the Drawings or as directed by the District.

C. Adjust to Grade:
   1. Adjust tops of manholes to grade with brick masonry.
   2. Concrete rings are not acceptable for adjusting to grade.

D. Pipe Connections to Manholes: Connect pipes to manholes by coring and watertight joint or as otherwise approved by the District.

E. Invert Channels:
   1. Smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
   2. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole.

3. Stop the pipes at the inside face of the manhole where changes of direction occur.
4. Form invert channels with brick.
5. Shape invert to make smooth transition in vertical grade.
6. Slope the floor of the manhole to the flow channel, as shown on the Drawings.

F. Masonry:
1. Laying Brick:
a. Use only clean bricks in brickwork for manholes.
b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
e. Outside faces of brick masonry shall be plastered with mortar from ½-inch to 3/8-inch thick.
2. Curing:
a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
b. Protect brick masonry from the weather and frost as required.

G. Frames and Covers:
1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
2. Completely fill all voids beneath the bottom flange to make a watertight fit.
3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
4. Clean the frame seats before setting the covers in place.

H. Plugging and Patching:
1. Fill all exterior cavaties with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
2. Touch up damaged water proofing.

I. Cleaning:
1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.

3.2 MANHOLE TESTING

A. General:
1. Perform leakage tests on all manholes.
2. All testing must be performed in the presence of the District.
3. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.

B. Exfiltration Tests Prior to Backfilling:
1. Fill each manhole with water to the top of the manhole frame.
2. After a 15-minute period, if no water is visibly moving down the exterior surfaces of each manhole, the manhole may be considered to be satisfactorily watertight.

C. Exfiltration Tests After Backfilling:
   1. Fill each manhole with water to the top of the manhole frame.
   2. A period of up to 2 hours may be permitted, if the Contractor so wishes, to allow for absorption.
   3. At the end of the absorption period, refill each manhole with water to the top of the manhole frame and begin the 4-hour test period.
   4. At the end of the 4-hour test period, refill each manhole to the top of the manhole frame and measure the volume of water added. The leakage for each manhole shall not exceed 1/16 gallon per foot of diameter per vertical foot (above ground water) per 4-hour period.

D. Infiltration Tests:
   1. When the groundwater is above the bottom of the manhole, infiltration testing may be performed on that portion of the manhole below water level.
   2. After a 15-minute period, if no water is visibly moving down the interior surfaces of a manhole, the portion of the manhole below groundwater may be considered to be satisfactorily watertight.
   3. The remaining portion above the groundwater level must be tested for exfiltration as specified above.

E. Vacuum Test:
   1. Install the testing equipment according to the manufacturer's instructions.
   2. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is two (2) minutes or longer.
   3. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.
   4. If a satisfactory vacuum test cannot be obtained, the manhole shall be water exfiltration tested and repaired as necessary.

F. Manhole Repairs:
   1. Correct leakage by reconstruction, replacement of gaskets and/or other methods as approved by the District.
   2. The use of lead-wool or expanding mortar will not be permitted.

END OF SECTION

TEAM QWP

PAMREX

STRENGTH

PAMREX has a high safety factor with a breaking strength well above the requirements of EN 124.

Designed to withstand the stresses of intense traffic, in terms of large numbers of vehicles, regular use by very heavy vehicles and high speeds, PAMREX is absolute preference in terms of performance and durability in France and Europe.

STABILITY

PAMREX is silent: there is no metal-to-metal contact. Its frame is fitted with an elastomer ring which ensures:

- damping of mechanical stresses caused by the repeated passage of vehicles,
- self-centering and stability of the cover: the ring pinches the lower skirt and works against the suction phenomenon caused by vehicles' tires.

OPERATION

The PAMREX hinge ensures easy opening and operating safety:

- The PAMREX hinge does no come into contract with the frame when the cover is closed and it is, therefore, not subjected to traffic stresses. It is only placed under stress during opening and closing operations,
- in the event of the sewer system being accidentally pressurized, the PAMREX cover opens without coming out of its housing and will re-close under its own weight.
- A handling box and dirt shield removal box have been added to allow easier opening in case of fouling by dirt.

Full opening to 130°, and locking at 90° on closing or for removal.

PAMREX SAFETY

Part Numbers

62113	- Pamrex MH Frame & Cover	- Plain
62113 1	- Pamrex MH Frame & Cover	- SEWER
62113 2	- Pamrex MH Frame & Cover	- DRAIN

WEIGHT		OPENING	HEIGHT
Total	Cover		
236lb	147lb	24"	4"

QUALITY WATER PRODUCTS ❑ P O BOX 419 ❑ SO BARRE MA ❑ 01074 ❑ PH 978/355-4641 ❑ FAX 978/355+6140

SECTION 02610

PIPE & PIPE FITTINGS - GENERAL

PART 1- GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support, and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) specified herein.

B. Related Work Specified Elsewhere (When Applicable):
   1. Excavation and backfill are specified in Division 2.
   2. Concrete cradles, arches, and encasements are specified in Division 3.
   3. Field painting is specified in Division 9.
   4. Valves, gates, pipe hangers, pipe supports, pipe and equipment insulation, and plumbing are specified in the appropriate Sections in Division 15.
   5. Pipe materials are specified in the appropriate sections of Division 2 and/or Division 15.

C. Other Trades: Cooperate with all other trades whose work is to be coordinated with piping work.

1.2 SUBMITTALS TO THE ENGINEER

A. Submit manufacturer's "Certification of Conformance" that pipe and fittings and other piping appurtenances meet or exceed the requirements of these Specifications.

B. Submit other documents as specified in the appropriate Sections of this Division.

1.3 DELIVERY, STORAGE AND HANDLING

A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe and fittings.

B. Do not drop pipe and fittings.

C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations.

D. Assure that materials are kept clean and dry.

E. Do not store materials directly on the ground.

F. Follow manufacturer's specific instructions, recommendations and requirements.

PART 2- PRODUCTS

2.1 MATERIALS

A. Materials are specified in the following Sections in this Division.

2.2 COATINGS (unless otherwise specified)

A. Before exposure to the weather and after thorough cleaning to remove all rust, dirt, grease, and other foreign matter, the equipment and appurtenances specified herein shall be painted in the shop as specified hereinafter.

B. Ferrous surfaces which will be submerged shall be blast-cleaned to near-white metal in accordance with Steel Structures Painting Council Surface Preparation No. 10, Designation SSPC-SP100-63T, immediately before painting.

C. Following cleaning, the surfaces shall be painted in the shop as follows:

1. Interior surfaces of all hydrants, iron body piping, valves, the exterior surfaces of buried valves and gates, and miscellaneous piping appurtenances shall be given a shop finish of an asphalt varnish.
2. Floorstands and similar parts customarily finished at the shop shall be given coats of paint filler and enamel or other acceptable treatment customary with the manufacturer, all suitable for the intended service.
3. Ferrous surfaces which will be submerged shall be shop primed immediately after blast-cleaning to near-white metal, with one coat of polyamide epoxy having not less than 43 percent solids content by volume, applied to a minimum of 3 mils dry film thickness, and which shall be Koppers 654 Primer made by Koppers Co., Inc., Pittsburgh, Pa.; Carboline 193 Primer made by Carboline Co., St. Louis, Mo.; Tnemec 66-1211 made by Tnemec Co., Inc., North Kansas City, Mo.; or an acceptable equivalent product.
4. Ferrous surfaces which are not submerged shall be given two shop coats of Inertol Rustinhibitive Primer 621 made by Koppers Co., Inc., Pittsburgh, Pa.; Carboline Admiral AD-1567 Primer made by Carboline Company, St. Louis, Mo.; Tnemec 77 Chem-Prime made by Tnemec Co., North Kansas City, Mo.; Chromox 13R50 Primer made by Mobil Chemical Co., Edison, N.J.; or an acceptable equivalent product.
5. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable protective coating.

D. Shop coats shall be compatible with and made by the same manufacturer as the field applied coats and shall not require special intercoat preparation for good topcoat bond. All coating surface preparation and coating use, mixing, application, and curing shall be in accordance with the current printed instructions of the coating manufacturer and be as specified herein.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the District to inspect pipe, fittings, gaskets, and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:

1. Defects and damage.
2. Deviations beyond allowable tolerances for joint dimensions.
3. Removal of debris and foreign matter.

D. Examine areas and structures to receive piping for:

1. Defects, such as weak structural components, that adversely affect the execution and quality of work.

2. Deviations beyond allowable tolerances for pipe clearances.

E. All materials and methods not meeting the requirements of this Contract will be rejected.

F. Immediately remove all rejected materials from the project site.

G. Start work only when conditions are corrected to the satisfaction of the District.

3.2 INSTALLATION

A. General:

1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as specified herein.
2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
3. Install adaptors, acceptable to the District, when connecting pipes constructed from different materials.
4. Support all piping not being installed in trenches in accordance with the "Pipe Hangers & Supports" Section in Division 15.

B. Installation in Trenches:

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
6. Set the pipe true to line and grade.
7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
8. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
9. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
10. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
11. Take all necessary precautions to prevent floatation of the pipe in the trench.
12. Bedding and backfill for all pipe materials shall be as specified in Section 02228, Section 02250 and as shown on the Drawings.

C. Temporary Plugs:

1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.

3. Do not use the pipelines as conductors for trench drainage during construction.

3.3 CLEANING AND TESTING

A. Cleaning & Testing Piping - General:

1. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
2. When the installation is complete, test all pipelines in the presence of the District and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications. All testing shall be performed prior to backfilling or concealing, unless otherwise acceptable to the District.
3. Equipment: Supply all labor, equipment, materials, gages, and pumps required to conduct the tests.
4. Retesting: Perform all retesting required by the District at Contractor's expense.

END OF SECTION

SECTION 02615

DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install ductile iron pipe of the type(s) and size(s) in the location(s) specified herein.

B. Related Work Specified Elsewhere: "Cast and Ductile Iron Pipe Fittings" is specified in this Division and "Pipe and Pipe Fittings - General" is specified in the appropriate Section of Division 15.

1.2 QUALITY ASSURANCE

A. Standards (As Applicable):

1. Cement-mortar lining: ANSI A21.4 (AWWA C104).
2. Rubber gasket joints: ANSI A21.11 (AWWA C111).
3. Ductile iron pipe thickness: ANSI A21.50 (AWWA C150).
4. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A21.51 (AWWA C151).
5. Pipe flanges and fittings: ANSI B16.1 and ANSI A21.10 (AWWA C110).
6. Threaded, flanged pipe: ANSI A21.15 (AWWA C115).
7. Cast and ductile iron fittings: ANSI A21.10 (AWWA C110).

1.3 DELIVERY, STORAGE & HANDLING

A. Exercise extra care when handling ductile iron pipe because it is comparatively brittle.

B. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

C. Protect the spherical spigot ends and the plain ends of all pipe during shipment by wood lagging securely fastened in place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe:

1. Unless otherwise shown on the Drawings, the minimum thickness of ductile iron pipe shall be:
   a. For pipe 4 inches in diameter and smaller: Class 51.
   b. For pipe 6 inches in diameter and larger: Class 50.
   c. Pipe with flanges: Class 53.
2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
3. Pipe shall be double thickness cement lined and seal coated unless noted otherwise on the Drawings.
4. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings.

5. Factory applied bituminous coatings shall be furnished on the exterior of all underground piping unless specified otherwise.
6. The outside of pipe within structures and exposed shall not be coated with bituminous coating, but shall be thoroughly cleaned and given one shop coat of Intertol Rustinhibitive Primer 621 by Koppers Co.; Multiprime by PPG Industries; Chromox 13R50 Primer made by Mobil Chemical Co.; or equivalent.

B. Joints:
1. Flanged:
   a. Provide specially drilled flanges when required for connection to existing piping or special equipment.
   b. Flanges shall be long-hub screwed tightly on pipe by machine at the foundry prior to facing and drilling.
   c. Gaskets:
      (1) Ring type of rubber with cloth insertion.
      (2) Thickness of gaskets 12 inches in diameter and smaller: 1/16 inch.
      (3) Thickness of gaskets larger than 12 inches in diameter: 3/32 inch.
   d. Fasteners:
      (1) Make joints with bolt, studs with a nut on each end, or one tapped flange with a stud and nut.
      (2) The number and size of bolts shall meet the requirements of the applicable ANSI standard.
      (3) Nuts, bolts, and studs shall be Grade B meeting the requirements of ASTM A307.
      (4) After jointing, coat entire joint with bituminous material compatible with pipe coating unless other coating is required by Section 09900.
   e. When applicable, provide and install flange clamps as shown on the Drawings.
2. Push-on and Mechanical Joint:
   a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
   b. Provide gaskets manufactured from a composition material suitable for exposure to the fluid to be contained within the pipe.
   c. Bolts and nuts for buried mechanical joints shall be made of A588 steel.
3. Grooved split ring couplings, sleeve couplings, flexible joints and couplings, shall be supplied as specified in "Couplings and Connectors" Section of Division 15.
4. Joint Bracing:
   a. Provide joint bracing to prevent the piping from pulling apart under pressure as required and as shown on the Drawings.

b. Types of bracing:
(1) Pipe and fittings furnished with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with bituminous paint in buried installations and shall be coated with the same coatings as the piping system in interior installations after assembly or, if necessary, prior to assembly.
(2) Mechanical joint ductile iron pipe retainer glands.
(a) Ductile iron.
(b) Ductile iron or A588 steel set screws.
(c) Working pressure 350 psi, up to 8 inches; 250 psi, 8 inches to 16 inches.
(d) Test pressure two times working pressure.
(3) Other types of bracing as shown on the Drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
2. Deviations beyond allowable tolerances for pipe clearances.
D. Immediately remove all rejected materials from the project site.

3.2 INSTALLATION

A. Assembling Joints:
1. Push-on Joints:
a. Insert the gasket into the groove of the bell.
b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
2. Bolted Joints:
a. Remove rust preventive coatings from machined surfaces prior to assembly.
b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.

3. Flanged Joints:
   a. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper torque.
   b. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.
4. Mechanical Joints:
   a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
   b. Lubricate the gasket, bell, and spigot by washing with soapy water.
   c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
   d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
   e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
   f. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
      (1) Range or Torque: 60-90 ft.-lbs.
      (2) Length of Wrench: 10 inches.
   g. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean, and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.
5. Bell and Spigot Joints:
   a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
   b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

B. Fabrication:
1. Tapped Connections:
   a. Make all tapped connections as shown on the Drawings or as required by the District.
   b. Make all connections watertight and of adequate strength to prevent pullout.
   c. Drill and tap normal to the longitudinal axis of the pipe.
   d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A21.51 based on 2 full threads for ductile iron.
2. Cutting:
   a. Perform all cutting as set forth in AWWA C600.
   b. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

C. Pipe Deflection:
   1. Push-on and Mechanical Joints:
      a. The maximum permissible deflection of alignment at joints shall be limited to that given in AWWA C600.
      b. Carefully complete joint assembly prior to attempting any pipe deflection.
   2. Flexible Joints:
      a. The maximum deflection in any direction shall not exceed the manufacturer's instructions and recommendations.

END OF SECTION

SECTION 02616

CAST & DUCTILE IRON PIPE FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install cast iron and/or ductile iron pipe fittings of the type(s) and size(s) in the location(s) specified herein.

B. Related Work Specified Elsewhere: "Pipe & Pipe Fittings - General" is specified in this Division.

C. Options: Either gray cast iron or ductile iron fittings may be furnished.

1.2 QUALITY ASSURANCE

A. Standards:

1. Cement-mortar lining for water: ANSI A21.4 (AWWA C104).
2. Cast and ductile iron fittings: ANSI A21.10 (AWWA C110).
3. Rubber gasket joints: ANSI A21.11 (AWWA C111).
4. Pipe flange and fittings: ANSI B16.1 and ANSI A21.10 (AWWA C110).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Standard Fittings:

1. Pressure rating of 250 psi unless indicated otherwise on the Drawings or as specified.
2. Flange fittings shall be ANSI B16.1, Class 125 unless indicated otherwise.
3. Joints the same as the pipe with which they are used or as shown on the Drawings.
4. Provide fittings with standard bases where shown on the Drawings.
5. Cement lining and seal coat unless noted otherwise on the Drawings.
6. Factory applied bituminous coatings shall be furnished for all underground fittings. All interior or exposed fittings shall receive one shop coat of rust inhibitive primer as per SECTION 15050.

B. Non-Standard Fittings:

1. Fittings having non-standard dimensions shall be subject to the District's review and acceptance.
2. Non-standard fittings shall have the same diameter and thickness as standard fittings and shall meet the specification requirements for standard fittings.
3. The laying lengths and types of joints shall be determined by the particular piping to which they connect.
4. Flanged fittings not meeting the requirements of ANSI A21.10 (i.e., laterals or reducing elbows) shall meet the requirements of ANSI B16.1 in Class 125.

C. Wall Castings:
1. Size, type and location as shown on the Drawings.
2. Dimensions shall conform to ANSI A21.10 except where required. Flange shall be substantially flush with the face of concrete or masonry wall and shall be drilled and tapped for studs.
3. Other dimensions shall be identical to the corresponding parts of standard bell and spigot fittings.
4. A central fin not less than 1/2 inch thick and of the same diameter as the flange shall be cast on the barrel at a point that will locate it midway through the wall to form a waterstop.

2.2 MANUFACTURER
A. Tyler
B. Or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION
A. General:
1. Install in strict accordance with the pipe and fitting manufacturer's instructions and recommendations and as specified or as shown on the Drawings.
2. Concrete thrust blocks or other acceptable thrust resistant system is required at all fittings on pressure pipe. Where thrust blocks are used, these shall be placed against undisturbed soil or screened gravel compacted to 95 percent. Concrete shall be placed so that the joints are accessible for repairs.

B. Fabrication:
1. Tapped Connections:
a. Make all tapped connections as shown on the Drawings and/or as required by the District.
b. Make all connections watertight and of adequate strength to prevent pullout.
c. Drill and tap normal to the longitudinal axis of the pipe.
d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
e. Taps in fittings shall be located where indicated by the manufacturer for that particular type of fitting.

C. Castings in Masonry:
1. Accurately set and align castings to be encased in masonry.
2. Thoroughly clean castings immediately prior to being set in place. Remove all rust, scale and other foreign material.

END OF SECTION

SECTION 02621

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish and install polyvinyl chloride (PVC) pipe of the size(s) and type(s) and in the location(s) specified herein.

B. Do not connect to any force main owned by the Ogunquit Sewer District without written approval from the District.

1.2 QUALITY ASSURANCE

A. Standards:
   1. Schedule 40 and 80 Pipe: ASTM D 1785.
   2. Pressure Rated (SDR) Pipe: AWC7A C 900 (4 inch and larger), ASTM D 2241 (less than 4 inch).
   3. Materials: ASTM D 1784
      a. PVC Normal Impact: Type I, Grade I, PVC 1120.
      b. PVC Normal Impact: Type I, Grade II, PVC 1220.
      c. PVC High Impact: Type II, Grade I, PVC 2110.
      d. CPVC (high temperature): Type IV, Grade I, PVC 4120.
   4. Pipe for use with domestic potable water shall have NSF seal of approval.

B. Manufacturers:
   1. Certain-Teed Corporation.
   2. J-M Manufacturing.
   3. Harvel.
   4. Cabot.
   5. Or equivalent.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Buried Piping:
   1. Pipe and Fittings:
      a. Pipe and fittings shall be gasketed style utilizing an integral bell and spigot.
      b. Pipe class shall be as follows unless otherwise noted on the D rawings:
         1) 4 inch and larger (AWWA C 900) - Class 150 (SDR 18)
         2) Less than 4 inch (ASTM D 2241) - Class 200 (SDR 21)
      c. Pipe Lengths: Laying lengths of 20 feet + 1 inch or as shown on the Drawings.
   2. Joints:
      a. Provide rubber gaskets in sufficient quantity to allow for loss. Gaskets shall meet the requirements of ASTM F-477.
      b. Pipe 4 inch and larger shall have all gaskets installed in the bell by the manufacturer.

3. Adaptors: When applicable, provide adaptors for connecting polyvinyl chloride pipe to pipes constructed from other material.

B. Interior Piping:
   1. Pipe and fittings:
      a. Solvent weld type unless otherwise shown on the Drawings or specified in other Sections in the Division.
      b. Piping, fittings and components: Schedule 40 PVC, normal impact unless otherwise shown on the Drawings or specified in other Sections in this Division.
   2. Joints:
      a. Joints: Solvent weld using solvent supplied by or approved by pipe manufacturer.
      b. Threaded and Screwed Joints: Permitted only on Schedule 80 and heavier pipe.
      c. Couplings and Fittings: Minimum schedule and pressure rating as the pipe.
   3. Provide suitable adaptors for connections to equipment and other piping systems.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the District to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
   1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
   2. Deviations beyond allowable tolerances for pipe clearances.
D. Immediately remove all rejected materials from the project site.

3.2 INSTALLATION

A. Assembling Joints:
   1. Push-on Joints:
      a. Insert the gasket into the groove of the bell.
      b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
      c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
      d. Install thrust blocks at all horizontal and vertical changes of alignment as detailed on the Drawings.
   2. Solvent-Welded Joints:
      a. Solvent weld connections as recommended by the manufacturer.
      b. Connect pipe and fittings only when temperature is above the minimum recommended by the manufacturer.
      c. Threaded adapters shall be connected only with plastic male into metal female.

B. Fabrication:
   1. Tapped Connections:
      a. Make all tapped connections as shown on the Drawings or as required by the District.

b. Make all connections watertight and of adequate strength to prevent pullout.
c. Drill and tap normal to the longitudinal axis of the pipe.
d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A21.51 based on 2 full threads for ductile iron.

2. Pipe Deflection:
   a. Push-on Joints:
      1) The maximum permissible deflection of alignment at joints shall be limited to that given in AWWA C600.
      2) Carefully complete joint assembly prior to attempting any pipe deflection.

END OF SECTION

SECTION 02622

POLYVINYL CHLORIDE (PVC) NON-PRESSURE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and install PVC non-pressure pipe and fittings of the size(s) and type(s) and in the location(s) specified herein.

B. Related Work Specified Elsewhere: (When Applicable)

1. Excavation and backfill, dewatering, pavement, borrow and bedding material, and cleaning and testing requirements are specified in the appropriate sections of this division.

1.2 QUALITY ASSURANCE

A. Manufacturers:

1. Certain-Teed.
2. Johns-Manville.
3. Or equivalent.

1.3 SUBMITTALS TO THE DISTRICT

A. Submit manufacturer's "Certification of Conformance" that pipe and fittings meet or exceed the requirements of these Specifications.

B. Submit other documents as specified in the appropriate Sections of this Division.

1.4 DELIVERY STORAGE AND HANDLING

A. Provide all labor necessary to assist the District to inspect pipe, fittings, gaskets and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:

1. Defects and damage
2. Deviations beyond allowable tolerances for joint dimensions.
3. Removal of debris and foreign matter.

D. Examine area and structures to receive piping for:

1. Defects, such as weak structural components that adversely affect the execution and quality of work.
2. Deviations beyond allowable tolerance for pipe clearances.

E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.

F. Immediately remove all rejected materials from the project site.

2.1 MATERIALS

A. Pipe and Fittings:

1. The polyvinyl chloride pipe and fittings, including those required for stubs, shall conform to ASTM standard specification for PVC Sewer Pipe and Fittings, Designation D 3034 (SDR 35) or F789 (4" to 15"), F679 (18" to 27").

2. Straight pipe shall be furnished in lengths of not more than 13 feet.
3. Saddles will not be allowed.

B. Joints:
1. Joints for the polyvinyl chloride pipe shall be push-on joints using factory installed elastomeric ring gaskets.
2. The gaskets shall be securely fixed into place by the manufacturer so that they cannot be dislodged during joint assembly.
3. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and ground water, and which will endure permanently under the conditions of the proposed use.
4. The joints shall conform to ASTM Specifications for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals, Designation D3212-76.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspection:
1. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight.
2. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length.
3. If a piece of pipe fails to meet this requirement for straightness it shall be rejected and removed from the site.
4. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

B. Jointing:
1. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
2. Pipe and fittings shall be installed to the lines and grades indicated on the drawings. Care shall be taken to insure true alignments and gradients.
3. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation.
4. Each pipe unit shall than be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
5. Joints shall not be "pulled" or "cramped".

C. Pipe Deflection:
1. Pipe provided under this specification shall be installed so there is no more than a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (normal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.

2. The Contractor shall wait a minimum of 30 days after completion of a section of sewer, including placement and compaction of backfill, before measuring the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer and be acceptable to the District.
3. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the District may require at Contractor's expense.

D. Cutting:
1. Cut perpendicular to pipe axis.
2. Carefully chamfer all cut ends to prevent damage to gaskets when pipe is installed.

E. Testing:
1. Clean and test pipe in accordance with appropriate sections of this division.

END OF SECTION

SECTION 02755

FINAL SEWER TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Final sewer testing work includes the performance of testing and inspecting each and every length of sewer pipe, pipe joints and each item of appurtenant construction.
2. Perform testing at a time acceptable to the District, which may be during the construction operations, after completion of a substantial and convenient section of the work, or after the completion of all pipe laying operations.
3. Provide all labor, pumps, pipe, connections, gages, measuring devices and all other necessary apparatus to conduct tests.

B. Related Work Specified Elsewhere (When Applicable):

1. Excavation, backfill, dewatering, pipe, pipe fittings and manholes are specified in the appropriate Sections in this Division and/or Division 15.
2. Manhole testing is specified in Section 02601 - Manholes, Covers and Frames.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. All sewers, manholes, and appurtenant work shall be subjected to tests that will determine the degree of watertightness and horizontal and vertical alignment.
2. Thoroughly clean and/or flush all sewer lines to be tested prior to initiating test procedures.
3. Perform all tests and inspections in the presence of the District and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes.
4. Perform testing by test patterns determined by or acceptable to the District.
5. Remedial Work:
   a. Perform all work necessary to correct deficiencies discovered as a result of testing and/or inspections.
   b. Completely retest all portions of the original construction on which remedial work has been performed.
   c. Perform all remedial work and retesting in a manner and at a time acceptable to the District, all at Contractor's expense.

B. Line Acceptance Tests (Gravity sewers with no active service connections):

1. Test all gravity sewer lines with no active service connections for leakage by conducting a low pressure air test.
2. Equipment:
   a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
   b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
   c. All air used shall pass through a single central panel.
   d. Connect 3 individual hoses:
      (1) From the control panel to the pneumatic plugs for inflation,
      (2) From the control panel to the sealed sewer line for introducing the low pressure air,
      (3) From the sealed sewer line to the control panel for continually monitoring the air pressure rise in the sealed line.
3. Testing Pneumatic Plugs:
   a. Seal test all pneumatic plugs prior to using them in the actual test.
   b. Lay one length of pipe on the ground and seal both ends with the pneumatic plugs to be tested.
   c. Pressurize the sealed pipe to 5 psig.
   d. The pneumatic plugs are acceptable if they remain in place without bracing.
4. Testing Sewer Pipeline:
   a. After the sewer pipe has been cleaned and the pneumatic plugs checked, place the plugs in the sewer line at each manhole and inflate them.
   b. Introduce low pressure air into the sealed sewer pipeline until the air pressure reaches 4 psig greater than the average groundwater pressure.
   c. Allow a minimum of 2 minutes for the air pressure to stabilize to a minimum of 3.5 psig greater than the groundwater pressure. Groundwater is assumed to be at ground surface unless the Contractor can prove by otherwise by test pitting.
   d. After the stabilization period, disconnect the air hose from the control panel to the air supply.
   e. The pipeline will be acceptable if the pressure decrease is not greater than 1/2 psig in the time stated in the following table:

Pipe Diameter (inches)	Time (minutes)
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
14	6.5

15	7.0
16	7.5
18	8.5
20	9.5
21	10.5
24	11.5
27	12.5
30	14.0
36	17.0

6. Test Results:
   a. If the installation fails the low pressure air test, determine the source of leakage.
   b. Repair or replace all defective materials and/or workmanship and repeat low pressure air test at no additional cost to the Owner.

C. Line Acceptance Tests (Gravity sewers with active services):
   1. Test all new gravity sewer lines with active services by conducting a low-pressure air test on all joints using a packer after all services have been connected or capped at the property line and all trenches backfilled but before the surface course of permanent pavement is installed.
   2. Equipment:
      a. Closed-circuit television system.
      b. Testing devices (packer):
         (1) Capable of isolating individual joints by creating a sealed void space around the joint being tested.
         (2) Constructed such that low pressure air can be admitted into the void area.
         (3) Shall contain a pressure gauge accurate to one tenth (0.1) psi in-line with the feed line to monitor the void pressure.
         (4) Capable of performing in sewer lines where flows do not exceed 1/4 of the pipe diameter without resorting to any method of flow control.
   3. Testing Sewer Pipeline Joints:
      a. Test all joints except those with visible infiltration.
      b. Procedure:
         (1) Pull television camera through sewer line in front of the packer.
         (2) Position the packer on each joint to be tested.
         (3) Inflate the sleeves on each end of the packer.
         (4) Apply four (4.0) psi pressure above the existing hydrostatic pressure on the outside of the joint to the void area created around the inside perimeter of the joint.
         (5) Shut off the supply of air once the pressure has stabilized at the required amount.
         (6) Monitor the void pressure for thirty (30) seconds.
         (7) Repair the joint if the pressure drops more than one half (1/2) psi in the thirty (30) seconds.
      c. Water or chemical pressure testing may be used in lieu of air testing subject to review and approval by the District.

d. Re-clean and re-inspect all lines not approved by the District at Contractor's expense.
e. Repairing of Joints:
   1. When a joint fails the pressure test, excavate and repair the failed joint. Repairing joints with chemical grout will not be permitted.
f. The District may request checking of the testing equipment for accuracy.
   1. Perform standard air test on a clean continuous section of pipe.
   2. Repair the equipment if the void pressure drops.
g. Testing Operation Inspection:
   1. Reset each joint, as specified herein, prior to acceptance and final payment for joint testing. Retest all joints that fail until the test requirements are met.
h. The contractor will supply a black and white photograph of every joint that fails the pressure test.

D. Alignment Tests (Gravity Sewers):
1. Perform tests for the correctness of horizontal and vertical alignment on each and every length of gravity sewer pipeline between manholes.
2. Alignment tests to be conducted after all pipe has been installed and backfilled.
3. Beam a source of light through the pipeline and directly observe the light in the manhole at the opposite end of each test section.
4. The length of pipe between manholes, diameter of pipe and amount of light observed in the manhole at the end of each pipe section will determine acceptance of the alignment test by the District.
5. Improper alignment will be corrected by re-excavation and re-setting of pipe at Contractor's expense.

E. Inspection of Appurtenant Installations:
1. Completely inspect, at a time determined by the District, all manholes and inlets to ascertain their compliance with the Drawings and Specifications.
2. Provide access to each manhole and inlet and check the following characteristics:
   a. Shape and finish of invert channels,
   b. Watertightness and finish of masonry structures,
   c. Location, type, and attachment of stops,
   d. Elevation and attachment of frames, covers, and openings,
   e. Pattern and machining of covers, and
   f. Drop connection arrangements.

F. Testing Pressure Sewers:
1. The section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blowoffs are not available at high points for releasing air, the Contractor shall make the necessary excavations backfilling and taps at such points and shall plug said holes after completion of the test.
2. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.

3. Perform pressure and leakage test at 1-½ times the maximum system pressure or 100 psi which ever is greater (based on the elevation of the lowest point of the section under test and corrected to the gage location).
4. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline the section shall be considered as having failed the test. All joints within chambers and all flanged joints shall have no visible leakage.
5. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.

G. Manhole Leakage Testing:
1. Specified in the "Manholes, Covers and Frames" Section in Division 2.

END OF SECTION