

**PONCE DE LEON SPRINGS STATE PARK
RESTROOM IMPROVEMENTS "**

***TECHNICAL SPECIFICATIONS
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100% Submission 10/9/2023

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Note: Contractor to provide shop drawings and manufacturer specifications for Liberty Lift Stations.

SECTION 02 02 05 - DEMOLITION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work includes demolition and removal of all civil and site related materials and debris within the limits of construction. Unless owner has requested to salvage specific material or items; materials resulting from demolition work shall become the property of the Contractor and shall be removed from the limits of the property and disposed of in a manner which is legal and in keeping with local codes. Contractor is required to coordinate with all Utility Agencies Owners (UAO) for the removal and or relocation of infrastructure to ensure existing utilities are abandoned or relocated in accordance UAO's design standards.

1.2 PROTECTION

- A. Protect contiguous and nearby structures from danger by temporary covers, shoring, bracing, and supports. Repair or replace items damaged during the performance of the work.
- B. In the area of the demolition and removal work where pedestrian or vehicle driver safety is endangered, erect barricades with flashing lights. Provide flagmen for traffic control, if required.

1.3 SUBMITTAL

- A. The Contractor shall prepare a detailed description and schedule of their proposed procedure to accomplish the demolition and removal of demolished materials and debris and submit to the Owner for approval before work is started. The procedures shall provide for careful removal and disposition of material specified to be salvaged, coordination with other work in progress and a disconnection schedule of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operation.

1.4 EXPLOSIVE

- A. Use of explosives will not be permitted.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Disconnection of utility services as required, shall be coordinated with the Utility Agency Owner responsible for the service before the start of work.

3.2 DEMOLITION

- A. Only demolish parts of the structure that are indicated on the plans..
- B. When utility lines are encountered, Contractor shall contact utility owner to arrange for removal if necessary.
- C. Salvage materials shall be removed from the owner's property daily. Materials of value shall not be sold at this site. All materials shall be fully and completely removed, no materials shall be buried at the site.
- D. Debris and rubbish shall be removed and transported in a manner that will prevent spillage on streets or adjacent areas. All regulations and fees for disposal are the responsibility of the Contractor.

3.3 RESTORATION OF SITE

- A. After the demolition is complete. The Contractor shall insure all trash and debris resulting from the demolition activities have been removed and the area thoroughly policed for litter.
- B. The construction shall restore all damaged areas to the original site conditions. If the Owner does request that additional fill dirt be brought in, then the Contractor shall bring in the required quantity of select fill dirt and compact and test the backfill in accordance with Section 310220. The area shall then be graded smooth and level and stabilized in accordance with the construction documents.

END OF SECTION 020205

SECTION 03 03 20 – CONCRETE WORK-GENERAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work under this section includes all materials, equipment, and labor and performing all operations for constructing the concrete work including lightweight concrete as shown on the drawings, called for herein, or necessary for the proper completion of the work in accordance with these specifications and to the lines, notes, and dimensions indicated on the drawings or specified herein. Concrete work specifically intended for building and other structural foundations shall refer to the foundation specifications specifically intended for those elements.

1.2 GENERAL REQUIREMENTS

- A. Whenever a standard, regulation, code, specification, or other publication is referenced herein, it shall be applicable on all matters not in conflict with these specifications as if fully set forth herein and as provided in the General or Special Conditions for referenced specifications. Except where a particular edition is called for, such referenced publications shall be the latest edition on the date of the Contract Documents and abbreviations used in the titles thereof are as follows:
 - 1. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania, 19103.
 - 2. ACI: American Concrete Institute, Box 19150, Detroit, Michigan, 48219.
- B. All concrete shall be proportioned, mixed, placed, finished, and cured in accordance with the requirements of ACI 301 "Specifications for Structural Concrete for Buildings", as modified herein, except that concrete for pavement, including sidewalks, driveways, and curb and gutter shall be placed, finished, and cured in accordance with ACI 316.

1.3 MATERIALS - GENERAL

- A. Except where specifically noted otherwise, all concrete shall be readymix, normal weight, as produced by a plant acceptable to the Engineer. Job-mix concrete may be used for small quantities upon specific approval of the Engineer.

PART 2 - MATERIALS

2.1 CEMENT

- A. Cement shall be a single brand of approved American made Portland cement conforming to ASTM C150. All cement shall be gray in color including cement for concrete to receive special finishes.
- B. Air-entraining admixtures are allowable.
- C. Unless otherwise noted, Type I (normal) cement shall be used only in precast prestressed elements: lightweight concrete; concrete cradles; encasements and thrust blocks; concrete fill other than in tanks containing sewage; concrete cast-in-place piling; concrete pavement, sidewalks, curbs, gutters and driveways.
- D. Unless otherwise specified, Type II (sulfate-resistant) Portland cement shall be used in all other concrete and may be used where Type I is specified.

- E. Type III (high-early-strength) cement may be used only with the written permission of the Engineer, but no additional payment will be made to the Contractor for the use thereof.
- F. In addition to the requirements of ASTM C150, cements to be used in exposed concrete shall exhibit no efflorescence when tested in accordance with ASTM C67.
- G. All cement to be used in the work shall be subject to testing to determine conformity to the requirements of the specifications. The methods of testing shall conform to the appropriate specifications but the place, time, frequency, and method of sampling will be determined by the Engineer in accordance with the particular conditions of this project. If required by the Engineer, the Contractor shall furnish sworn certificates of mill tests of cement, in triplicate, at least 7 days before the cement will be used. The Owner reserves the right to make such independent tests as deemed necessary at any time.
- H. Cement which is partially set or which is lumpy or caked shall not be used and the entire contents of the sack of cement or the container of bulk cement which contains damaged, partially set, or lumps of caked cement will be rejected for use.

2.2 AGGREGATES

- A. All aggregates shall be fine washed, natural sand, conforming to ASTM C33.
- B. When directed, the Contractor shall furnish clearly labeled samples of aggregates to the Engineer for approval.

2.3 ADMIXTURES

- A. Admixtures causing accelerates setting of cement in concrete or containing chloride ions shall NOT be used.
- B. Admixtures to provide air entrainment shall conform to ASTM C260.
- C. No other admixture shall be used except with the specific approval of the Engineer.

2.4 WATER

- A. Mixing water for concrete shall be clean, fresh, and suitable for drinking and shall not contain injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. Water from any source other than a municipal water supply shall be shown by test to comply with Florida DOT requirement for mixing water.

2.5 CONCRETE QUALITY

- A. Concrete shall have the following minimum compressive strengths when tested at 28 days in accordance with ASTM C172, ASTM C31 and ASTM C39:
 - 1. Class A 4,000 psi
 - 2. Class C 2,500 psi
- B. Unless otherwise specified or noted, class of concrete shall be as follows:
 - 1. Sidewalks, curb and gutter, splash blocks, pipe cradles and encasements, thrust blocks, and other non-structural concrete as approved by Engineer -----
Class C
 - 2. All other concrete ----- Class A

3. Class A concrete may be used at the option of the Contractor wherever Class C is specified, but at no additional cost to the Owner.
- C. Concrete, when placed, shall be of a plastic consistency such that it can be readily worked into all parts of the forms and around embedded items without segregation of materials or accumulation of free water on the surface. Except as specified otherwise for special finishes, slump as measured in accordance with ASTM C143 shall be as follows:
- | <u>Class</u> | <u>Not Less Than</u> | <u>Not More Than</u> |
|--------------|----------------------|----------------------|
| A | 1-1/2 inches | 3-1/2 inches |
| C | 2 inches | 5 inches |
- D. Air entrainment, as determined in accordance with ASTM C173 of not less than 4 nor more than 6 percent by volume, shall be provided in Class A concrete and Class C concrete exposed to weather, frost, or groundwater.

2.6 CONCRETE PROPORTIONS

- A. Materials used in concrete shall be proportioned in accordance with ACI 211.1 and approved by the Engineer as provided in Paragraph 9.2. Class A concrete shall be proportioned to provide a water/cement ratio not to exceed 0.45 and a cement content of not less than 564 pounds per cubic yard.
- B. Submit to the Engineer for approval not less than 7 days before concrete is to be placed, in duplicate, a report certified by an independent testing laboratory containing the following:
 1. Recommended proportions of materials to be used in concrete.
 2. Result of the testing of all materials in accordance with ASTM specification including sieve analysis, specific gravity, and dry-rodded weight of aggregates.
 3. Result of testing laboratory trial batches in accordance with ASTM C39 and C192.
- C. All testing and analyses of materials shall have been done not more than 4 months prior to the date of submission and the certified report shall state the date thereof.
- D. Proportions of materials shall be based on accurate measurements thereof by weight taken separately.
- E. Costs of the services of the independent testing laboratory in testing materials and determining mix proportions shall be borne by the Contractor.

2.7 PLANT APPROVAL

- A. The Engineer, or his authorized representative, shall have the right and shall be afforded any facility to inspect the plant where concrete is batched including materials used and methods of proportioning, mixing, and delivery of concrete; all of which shall be in accordance with the specifications and meet the approval of the Engineer. No ready-mixed concrete shall be ordered until the Engineer has given his approval thereof.

2.8 MIXING AND DELIVERY

- A. Ready-mixed concrete shall be used. All mixing requirements specified herein shall be

enforced and the Owner's laboratory representative and the Engineer shall have free access to the mixing plant at all times. Except for material and/or procedure otherwise specified herein, ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C94. No water shall be added to the concrete after it leaves the plant except as specifically approved by the Engineer and it shall be so noted on the batch ticket.

- B. Neither the speed of any mixer nor the quantity of material loaded into any mixer shall exceed the recommendations of the manufacturer. Excessive mixing, requiring additions of water to preserve the required consistency, shall be cause for rejection of the batch. Concrete shall not remain in a transit mixer or agitator truck more than 90 minutes after the water is introduced (and not more than 45 minutes if an approved retarding agent is not used). Minimum mixing time shall be 50 revolutions of drum at rated speed.
- C. Equipment necessary to determine and control the actual amounts of all materials entering the concrete shall be provided by the concrete manufacturer. All materials shall be measured by weight, except that water may be measured by volume calculated at 8-1/3 pounds per gallon. One bag of cement will be considered as 94 pounds in weight.
- D. Accompany each batch of concrete delivered to the site shall be a trip ticket that shall indicate the following information: (1) time mix was batched stamped on ticket, (2) brand and type of cement, (3) bags of cement per cubic yard of concrete, (4) planned slump, (5) admixture, and (6) name of supplier. These tickets shall be given to the Engineer when the truck arrives on the job.
- E. Attention is directed to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting. Concrete shall be discharged into forms according to the time limits below after water was first added to the mix and shall be mixed at least 5 minutes after all water has been added.

1. Time Schedule

<u>Ambient Temperature</u>	<u>Time Limit</u>
Less than 85 degrees F	90 minutes
85 degrees F or greater	

2.9 FORMS

- A. Forms shall be securely braced, substantial and unyielding, and of sufficient strength to hold the concrete without bulging between supports, or without deviation from the neat lines as shown on the drawings. Forms shall be mortar tight and shall be constructed of pre-fabricated metal, plywood, or dressed lumber of uniform thickness, with or without a form liner. Where concrete structures are circular or are otherwise shown to have curved surfaces, forms shall be constructed to provide such curvature and shall not consist of a series of flat surfaces.
- B. The spacing of joists and wales shall be such as to prevent warp and bulging and to produce true and accurate surfaces. All form facing shall be free from knot holes, loose knots, cracks, splits, warps, or other defects affecting its strength or the appearance of the finished concrete surface. Fiber board or other manufactured material, approved by the Engineer, may be used as a lining for forms. Where a grout finish is specified, form facing shall be of plywood or other approved material with the number of seams kept to a practical minimum and arranged in an orderly and symmetrical manner.

- C. The interior surfaces of forms shall be adequately oiled, greased, or soaped to prevent adhesion of mortar. Form oil for exposed work shall be non-staining. Before placing of concrete the forms shall be cleaned of all dirt, sawdust, shavings, or other debris and the surfaces shall be dampened.
- D. Special care shall be exercised to secure smooth and tight-fitting forms which can be rigidly held to line and grade and removed without injury to the concrete. All corners in the finished work shall be true, sharp, and clean cut. Alignment of forms and grade of top chamfer strips shall be checked immediately after the placing of concrete in the forms.
- E. Forms shall not be removed until the product of the elapsed number of days after placement and the average daily air temperature at the surface of the concrete equals 100 for walls and vertical surfaces and 500 for slabs and beam soffits and other parts that support the weight of the concrete.
- F. In addition to the above, shores under beams and slabs shall not be removed until the concrete has attained at least 60 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction live loads upon it. Shores under cantilevers shall remain in place at least 14 days after concrete is placed.
- G. Round forms may be constructed of spirally laminated plies of fiber. Total wall thickness shall be as specified by manufacturer with 6 inch (minimum) wide plies. Provide polyethylene coating on interior surface. Approved: A-Coated Sonotube.
- H. Chamfer strips made from dressed dimensional 1 inch by 1 inch lumber cut on the diagonal shall be installed at the top of the forms on all exposed edges of walls, slabs, beams, exposed outside corners, and other structures above grade.
- I. Drip edge shall be made from wood quarter-round and installed where shown. Extruded plastic fillets shall be used where detailed.

2.10 REINFORCING STEEL

- A. In general, reinforcing steel shall conform to the specifications set forth in ACI-301. All reinforcing shall be furnished substantially free from mill scale, rust, dirt, grease or other foreign matter. Reinforcing bars shall conform to the requirements of ASTM A615, Grade 60. All bars number 3 and larger shall be deformed bars.
- B. Reinforcing steel shall be detailed, fabricated and placed according to the methods and standards recommended in the Specifications for Structural Concrete for Buildings, ACI 301.
- C. Splices in reinforcing mats shall be staggered. Horizontal mats shall be supported on metal chairs with all sills or pads below subgrade. Spacers shall be provided for wall and column steel and shall be removed as the concrete is placed.
- D. Wire fabric, unless otherwise shown or specified, shall be 6 inches by 6 inches - No. 10 woven or electrically welded wire fabric conforming to the requirements of ASTM A185.

2.11 EMBEDDED ITEMS

- A. All chairs, sleeves, inserts, hangers, anchor bolts, dowels, nailing strips, or other embedded items shall be accurately set and firmly held in place while the concrete is deposited. Anchors and ties for masonry shall be provided as shown on the drawings or called for in the masonry specifications.

1. All ferrous metals embedment's shall be hot dip galvanized after fabrication.
 2. All aluminum embedments shall be coated with an approved coating to protect them from direct contact with the concrete.
- B. Pipes, conduits, and other items embedded in the concrete shall be so placed and held that they do not displace the reinforcing or weaken the concrete at points of maximum stress or where the concrete section is not sufficient to permit the reduction of area caused by the embedment.
- C. Waterstops shall be 9-inch hollow bulb dumb-bell type PVC for expansion joints, 6 inch flat dumb-bell type for construction joints. All waterstops shall have a minimum thickness of 1/4 inch. Waterstop material shall be continuous with joints made completely waterproof by fusion or solvent welding; welding shall develop 50 percent of the mechanical strength of the section and shall permanently retain its flexibility.
1. All joints below grade shall have waterstops.
 2. All joints in hydraulic structures shall have waterstops to a point two feet above the design overflow level.
 3. All expansion joints shall be full height of the wall.
- D. All embedded items shall be thoroughly cleaned removing all rust, scale, oil, or other foreign matter prior to placing concrete. Drains, pipes, hollow inserts, and similar items shall be protected as approved by the Engineer to prevent the intrusion of concrete.

PART 3 - EXECUTION

3.1 PLACING CONCRETE

- A. Concrete shall be placed in accordance with ACI 301.
- B. All concrete shall be placed during daylight hours allowing sufficient time for adequately finishing the concrete surfaces during daylight hours. The Contractor shall give the Engineer twenty-four (24) hours notice of intent to place concrete to enable prior inspection of forms and of conditions incidental to the pour. No concrete shall be placed until the forms have been approved by the Engineer and until all the reinforcement is in place and has been inspected and approved by the Engineer. No concrete shall be placed in water and forms shall be free from water, dirt, debris, or any foreign matter when concrete is placed. Normal weather limitations for placing concrete shall be adhered to and no concrete shall be exposed to the action of water before final setting.
- C. The method and manner of placing concrete shall be such as to avoid the possibility of segregation or separation of the aggregates. If the quality of concrete as it reaches its final position is unsatisfactory, the method of placing shall be discontinued or adjusted until the quality of the concrete as placed is satisfactory. Open troughs or chutes shall be of metal or metal-lined. Where steep slopes are required, the chutes shall be equipped with baffles or shall be in short lengths that reverse the direction of movement. Where placing operations would involve dropping the concrete freely more than five feet, it shall be deposited through pipes of sheet metal or other approved material. Troughs, chutes, or pipes with a combined length of more than 30 feet shall be used only on written authority from the Engineer. All troughs, chutes, and pipes shall be kept clean and free from coatings of hardened concrete by being thoroughly flushed with water after each run or in its final position. Depositing a large quantity at any point and running or working it

along the forms shall not be done. Special care shall be taken to fill each part of the forms and to work the coarse aggregate back from the face and to force the concrete under and around the reinforcing bars without displacing them. The concrete consistency as measured by slump shall be as specified herein.

- D. Concrete shall be consolidated in accordance with ACI 309 in a manner acceptable to the Engineer. Vibration shall be done by experienced operators under close supervision and the duration shall be held to the minimum necessary to produce thorough compaction without segregation. Where vibrators are not used, all thin section 6-inch maximum thickness work shall be thoroughly worked with a steel slicing rod. All faces shall be well spaded and the mortar flushed to the surface by continuous working with a concrete spading implement acceptable to the Engineer.
- E. In all cases where, on account of the obstructions produced by reinforcing metal, shapes or forms, or any other uncontrollable conditions, difficulty is encountered in puddling the concrete adjacent to the forms, the mortar content of the mix shall be brought into proper contact with the interior surfaces by vibrating the forms. The vibrations shall be produced by striking the outside surfaces of the form with wooden mallets or by other means satisfactory to the Engineer.
- F. No concrete placing shall begin or continue without the express approval of the Engineer each day for each location if the ambient air temperature is less than 40 degrees Fahrenheit, or is predicted to fall below 36 degrees Fahrenheit during the next 24 hours, or 32 degrees Fahrenheit during the next 72 hours. Temperature of concrete when placed shall not be less than 55 degrees Fahrenheit. Chemicals to lower freezing temperature of concrete shall not be used.
- G. When the ambient air temperature is 90 degrees Fahrenheit or above, the Engineer may require pre-cooling of aggregates with water sprays and scheduling of placing successive layers of concrete so as to cause maximum release and dissipation of the heat of setting, or other protective measures. In no case shall temperature of the concrete, forms, or reinforcing exceed 90 degrees Fahrenheit when concrete is being placed and, if necessary, forms and reinforcing shall be cooled by water spray prior to pouring concrete.

3.2 TEST SAMPLES

- A. The Contractor will retain an independent testing laboratory to perform the sampling and testing of concrete furnished. Cost of the services of the laboratory will be borne by the Contractor with payment therefor made directly to the laboratory. The laboratory's representatives shall have free access to all points where concrete materials are stored, proportioned, mixed, or placed and the Contractor shall provide on-site facilities as needed by the laboratory to secure and store samples.
- B. For each 100 cubic yards or portion thereof of each class of concrete placed each day, the laboratory shall take a sample from a batch of its selection as the concrete is being placed. No water shall be added or other change made in any batch after it has been sampled. In addition to other tests, the laboratory will make a set of 4 standard compression cylinders from each sample, one of which will be tested at 7 days, two tested at 28 days and one held in reserve. The Engineer will be furnished with a report of each test made. Testing of concrete at other times as needed by the Contractor will be at his expense and the Engineer shall be furnished with a report of all such tests made.
- C. The Contractor shall advise the Engineer with 24 hours advance notice of the time and location of all concrete placing and make arrangements with the laboratory for the test. Compressive strength of a sample shall be determined by the average of the two

cylinders tested at 28 days. Compliance with the strength requirements of these specifications shall be verified if the average compressive strength of three consecutive samples is not less than the specified strength for the class of concrete, provided no individual sample shall have a strength test result that falls below the specified strength by more than 500 psi.

- E. Concrete which fails to meet strength requirements may be further tested as provided in ACI 318 at the expense of the Contractor or shall be removed as determined by the Engineer.
- F. If tests indicate that concrete delivered to the site does not comply with these specifications, the Engineer may reject such concrete and order changes in materials or proportioning for subsequent work. Rejected concrete shall be removed from the job and replaced as directed by the Engineer.
- G. The Engineer may waive testing requirements on small quantities or concrete elements where strength is not critical.

3.3 CURING AND PROTECTION

- A. All concrete work shall be protected against damage from the elements and defacement of any nature during construction operations.
- B. Water shall not be permitted to rise on concrete within 24 hours after it is placed, nor shall running water be allowed to flow over completed concrete within four days after it has been placed.
- C. All concrete shall be cured in accordance with ACI 308 and shall be treated immediately after concreting or cement finishing is completed to provide continuous moist curing for at least seven days, regardless of the adjacent air temperature. Walls and vertical surfaces may be covered with continuously saturated burlap or kept moist by other approved means. Horizontal surfaces, slabs, etc., shall be ponded to a depth of 1/2" wherever practicable or kept continuously wet by the use of lawn sprinklers, a complete covering of continuously saturated burlap, or by other approved means. The Contractor may, at his option, use a membrane curing compound approved by the Engineer in lieu of water curing of concrete, provided such compounds shall not be used on surfaces that are to receive additional concrete, paint, tile, or other materials that require a positive bond, unless it has been demonstrated that the membrane can satisfactorily serve as a base for such additional applications. The compound shall comply with ASTM C309 and be compatible with floor hardeners used, shall be delivered to the job in the manufacturer's containers, and shall be applied in strict accordance with the manufacturer's printed instructions.
- D. Curing compound for exposed surfaces shall be non-staining.
- E. For at least seven days after having been placed, all concrete shall be so protected that the temperature at the surface will not fall below 50 degrees Fahrenheit.
- F. No manure, salt, or other chemicals shall be used for protection.
- G. The above mentioned seven-day periods may be reduced to three days in each case if high-early- strength cement, as described in Paragraph 2.1.E., is used in the concrete.
- H. Wherever practicable, finished slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

3.4 FINISHING - GENERAL

- A. Unless otherwise noted, strike off concrete surfaces to elevations and profiles indicated and finish with wood or cork float or steel trowel as hereinafter specified, even and true, free from cracks, pockets, or other imperfections. Discontinue as soon as water appears on surface. Finishes, except at warped surfaces, shall be such that irregularities shall not exceed 1/4" as measured by a 10' straight edge.
- B. Following removal of forms, thoroughly wet all surfaces to remain exposed. Fill all honeycombs, tie rod holes, and areas damaged in form removal with grout composed of one part Portland cement to two parts of sand, with water as required, and rub with abrasive stones to smooth, uniform surface.
- C. Any work not formed as indicated on the drawings or that is not of alignment or level or shows a defective surface shall be corrected in a manner satisfactory to the Engineer.
- D. It is expected that forms, concrete, and workmanship shall be such that the quantity of trimming and repair work is kept to a minimum. Defective concrete shall be cut normal to the surface until sound concrete is reached, but not less than 1" deep; the remaining concrete shall be thoroughly roughened and cleaned.
- E. All exposed concrete surfaces, except troweled surfaces and the interior surfaces more than 6 inches below low water level of all concrete tanks, channels, and conduits (both open and covered) which will contain or transmit water, sewage, or sludge, shall be given a grout finish application. Exterior walls shall be so finished to a point 12" below final grade. This operation shall not be undertaken until all the concrete work for the particular structural unit is completed and all mortar splatter and soil stains have been removed.
- F. The grout finish shall be 1:1 by volume cement-sand grout using sand passing the No. 16 sieve. The surface shall be cleaned, thoroughly wetted, and the grout mixed to creamy consistency shall be scrubbed into the surface with a stiff brush. Defective or loose concrete shall be removed and repaired to the satisfaction of the Engineer prior to grouting. Grout shall be cured a minimum of three (3) days by keeping continuously moist with wet burlap or water spray.
- G. Unless otherwise specified, all surfaces not built against forms, such as surfaces of pit floors or tank bottoms and similar surfaces, shall be accurately screened to the required form, wood floated, and steel troweled to a hard even finish. All slabs, walks, and pavement shall be lightly broomed after troweling. The brooming shall be sufficient to mark the surface without appreciably disturbing the troweled finish. Slabs to be painted shall not be broomed.
- H. Unless otherwise directed, all edges and corners which will be exposed to the finished work shall be beveled or rounded by the use of appropriate forms or form inserts, and care shall be taken to prevent chipping or cracking of finished edges.

3.5 NON-SHRINK GROUT

- A. Grout, where called for on the drawings, shall be non-shrink grout. Non-shrink grout shall be a proprietary type grout composed of pre-mixed grouting cement, aggregates, and appropriate additives to which only water needs to be added at the site to produce the finished product. Amount of water to be added shall be the minimum required for the intended purpose (depending on whether it is a dry-pack or self-leveling application) and it shall be in accordance with the manufacturer's instructions. The grout shall be specially formulated to make it absolutely non-shrink and the supplier shall be able to furnish test data from an independent testing laboratory proving their grout to be non-shrink under the conditions of usage anticipated. It shall also be a grout that will have a seven day strength not less than 4,000 psi. The grout shall be placed in a manner that will insure complete filling in of holes under base plates and complete contact with the plates. Exposed surfaces of the non-shrink grout shall be such that it is not subject to corrosive erosion or staining, due either to pertaining to them, and methods of installation shall be submitted for approval to the Engineer during the shop drawing submittal period. Approved for this material are Embeco 636 Grout and/or Masterflow 713 Grout, as manufactured by the Master Builders Company, or equal.

END OF SECTION 030320

221101 - HORIZONTAL DIRECTIONAL DRILLING (HDD)

PART 1 -GENERAL

1.00 DESCRIPTION:

These specifications are for the horizontal directional drilling (HDD) and testing of the proposed force main at Ponce De Leon Springs State Park in Ponce De Leon, Florida. The force main will convey wastewater from proposed lift stations to the existing sewer manhole across Ponce De Leon Springs Road. The force main will be located as shown on the site plan.

1.01 SCOPE OF WORK:

- A. The Contractor shall furnish and install underground pressure mains using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring. This Work shall include all drilling equipment, materials, piping, appurtenances, and labor for the complete and proper installation, testing, and placing into service of pressurized mains; and all required environmental protection and restoration requirements.

1.02 QUALITY ASSURANCE:

- A. Entry and exit points shall be as shown on the drawings, unless otherwise approved in writing by the Engineer. The Contractor shall employ licensed, professional land surveyors to locate the entry and exit points, and to establish horizontal and vertical datum for the bore and the pipe layout and fabrication areas.
- B. The Directional Boring operation is to be operated in a manner to eliminate the discharge of water, drilling mud, and cuttings to any nearby water bodies, or to the land areas involved during the construction process. If inadvertent spills to nearby water bodies occur, the Contractor shall immediately provide environmental controls and clean up to the satisfaction of, and at no additional expense to BDC.
- C. Best Management Practices (BMP's) for erosion control within the Contractor's work area shall be implemented and maintained at all times during drilling and back-reaming operations to prevent siltation and turbid discharges in excess of State Water quality Standards pursuant to Rule 62-302, F.A.C. Methods shall include, but are not limited to the immediate placement of turbidity containment devices such as turbidity screen, silt containment fence, hay bales, and earthen berms, etc. to contain the drilling mud.
- D. The Contractor's operations shall be in conformance with the Directional Crossing Contractors Association (DCCA) published guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

1.03 GENERAL:

- A. Provide the following equipment and materials for the horizontal directional drilling installation of pressure mains:
 - 1. A directional drilling rig of enough capacity to perform the bore and pullback operations
 - 2. A drilling fluid mixing, delivery, and recovery system of enough capacity to complete the crossing
 - 3. A drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused

4. A magnetic guidance system to accurately guide boring operations
 5. A vacuum truck of enough capacity to handle the drilling fluid volume
 6. Trained and competent personnel shall operate the system
 7. Miscellaneous equipment and materials required to complete the installation in accordance with the plans and permit requirements
- B. All equipment shall be in good, safe operating condition with enough supplies, materials, and spare parts on hand to maintain the system in proper working order throughout the drilling and pressure main installation.

1.04 FORCE MAINS:

- A. Pipe shall be fusible HDPE pipe with ductile iron pipe size (DIPS) outside diameters (OD) in accordance with AWWA C906. The dimension ratio (DR) of the pipe shall be DR-11 and shall be suitable to withstand the pull-back forces required for the directional drilling without any permanent deformation in the pipe section or strength.
- B. Fusible HDPE pipe for horizontal directional drilling applications shall be joined by means of zero leak-rate thermal heat butt-fusion welds. Joints shall provide axial pullout resistance. The bending radius pressure main shall not exceed 80 percent (0.80 X) of the manufacturer's recommended maximum bending radius for the size and type of pipe. Pipe for potable water applications shall be NSF Approved.
- C. The tracer wire shall be a direct burial #10 AWG high-strength copper-clad steel with a 30-mil high-density polyethylene coating on the outside for protection. The tracer wire shall be rated for 30 volts and meet APWA color coding requirements for the utility application. Approved products include Copperhead Industries, LLC - #10 AWG HS-CCS Tracer Wire; Pro-Line Safety Products - #10 AWG Pro-Trace HF-CCS Tracer Wire; or approved equal.

1.05 INSTALLATION:

- A. Erosion and sedimentation control measures and on-site containers shall be installed to prevent drilling mud from spilling out of entry and/or exit pits. Drilling mud shall be disposed of off-site in accordance with local, state, and federal requirements and/or permit conditions.
- B. Pilot Hole: Pilot hole shall be drilled on bore path with no deviations greater than 2% of depth over a length of 100-feet. If the pilot hole does deviate from bore path more than 2% of depth in 100-feet, the Contractor shall notify BDC. BDC may require the Contractor to pullback and re-drill from the location along bore path before the deviation.
- C. Reaming: Upon successful completion of pilot hole, the Contractor will ream the borehole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.
- D. Pullback: After successfully reaming borehole to the required diameter, Contractor shall put the pipe through the borehole. In front of the pipe shall be a swivel and barrel reamer to compact bore-hole walls. Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into borehole. During pullback operations, the Contractor shall not apply more than the maximum safe pipe pull pressure at any time. A break away head rated at the maximum safe pull pressure shall be utilized.

- E. During pullback, drilling fluid pressures and flow rates shall be continuously monitored. The pressures shall be monitored at the pump and within the annular space with a down hole pressure sensing tool located within thirty (30) feet of the drilling head.
- F. Tracer Wire: A minimum of three continuous tracer wires shall be attached with nylon wire ("zip") ties at different radial locations around the pipe to ensure continuity in at least one wire subsequent to installation. Contractor shall be required to provide as many wires as necessary to maintain continuity throughout the length of the directional bore. Splices along the length of the bore shall be permitted only in the event of a break in the tracer wire during installation. In such event, the wire shall be joined using a proper sized swage crimp on stripped bare wire ends with a double heat-shrink wrap.
- G. The pipe entry area shall be graded to provide support for the pipe to allow free movement into the borehole. The pipe shall be guided in the borehole to avoid deformation of, or damage to, the pipe. If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until BDC has been consulted.
- H. The pipe shall be pulled back through the borehole using the wet insertion construction technique. The pipe shall be installed full of water.
- I. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.
- J. A boring log shall be kept with horizontal and vertical location every 10-feet prior to over ream and product pipe pullback. The horizontal location of the bore shall be marked in the field during the bore. The Surveyor shall locate these marks and include this information with the bore depths in the Record Drawings. The Surveyor may make a note on the drawing page containing the directional drill and provide an exception for the directional drill only, as the directional drill route cannot be uncovered and physically located.
- K. The contractor shall be considered as having completed the requirements of any directional boring when he has successfully completed the work and tested the pipe to the satisfaction of the BDC construction project manager.
- L. At the completion of construction, the Contractor shall remove all temporary facilities installed by the Contractor. Unused soil, aggregate, and other materials shall be removed and disposed of at approved sites in accordance with all Federal, State, and Local regulations. Any damage to streets, lawns, common areas, and sidewalks shall be restored to original or better conditions. All disturbed areas shall be re-vegetated.

1.06 TESTING:

- A. Perform hydrostatic testing for leakage following installation of the directional drill.
- B. The total test duration (time), including initial pressurization, initial expansion, and time at test pressure must not exceed 8-hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be depressurized and allowed to "relax" for a minimum of 8-hours before it is brought back up to test pressure. The test procedure consists of the initial expansion phase and leakage test phase.

- C. The test pressure for all pressure pipe shall be 150-psi.
- D. Initial Expansion Phase: During the initial expansion phase, the test section is pressurized to the test pressure and enough make-up liquid is added each hour for 3- hours to return to test pressure.
- E. Leakage Test Phase: The leakage test phase follows immediately and shall be either 2 or 3-hours in duration. At the end of the time test, the test section shall be returned to test pressure by adding a measured amount of liquid. The amount of make-up liquid added shall not exceed the values provided in the following Table.

Pressure Test Table - Allowance for Make-up Water Under Pressure*								
Test Duration (hours)	2	4	6	8	12	16	20	24
	Allowance/100-feet of Pipeline (gallons)							
2	0.11	0.25	0.60	1.00	2.30	3.30	5.50	8.90
3	0.19	0.40	0.90	1.50	3.40	5.50	8.00	13.30
*Applies to test period and not to initial expansion phase								

Mandrel Testing: Perform mandrel testing through the entire length of the installed pipe. The mandrel size shall be 90% of the inside diameter of the pipe.

PART 2 -FRAC-OUT PLAN

2.00 INTRODUCTION

This horizontal directional drilling frac-out contingency and response plan provides preventive and mitigative measures to be used by FDEP Bureau of Design and Construction and its contractor during pipeline installation using horizontal directional drilling (HDD) technology. HDD is a proven and widely-accepted trenchless construction technique that is often preferred for its minimal impact to the ground surface and the environment. Although the great majority of HDD installations are completed without incident, it is possible for the drilling fluid used in the HDD process to be inadvertently released to the ground surface, and this plan outlines the approach to manage this risk. This is a preliminary plan, and more specific procedures will be developed by the contractor based on site-specific conditions prior to the start of drilling, and submitted to the construction manager for review and approval.

The HDD process utilizes pressurized drilling fluids to achieve a variety of goals, including:

- Suspending and transferring soil cuttings to the ground surface at the bore entry or exit point
- Stabilizing the walls of the borehole to prevent borehole collapse
- Lubricating the drill string and, during pullback, the product pipe, to reduce frictional resistance
- Offset groundwater pressure to prevent flushing of the borehole
- Cooling the downhole equipment and cutting tools

HDD operations potentially pose a risk to water bodies and land-based features through inadvertent returns of pressurized drilling fluid to the surface, commonly referred to as “frac-outs” or “releases.” A frac-out occurs when the drilling fluid is released to the ground surface through pathways in the soil. Drilling fluid typically consists of a mixture of bentonite, fresh water, and soil cuttings. Bentonite is a natural clay, which is extremely hydrophilic and can absorb up to ten times its weight in water.

A bentonite-based drilling fluid usually contains no more than 5 percent bentonite. Other additives such as attapulgite clay or synthetic polymers can be added to improve performance. These mixtures are not hazardous or toxic, but could potentially affect the water quality of a water body if introduced, or cause damage to a surface feature such as a roadway.

Frac-outs can occur at any place along an HDD installation, although the potential is higher for occurrence near the entry and exit points (locations where soil cover over the advancing drill bit is relatively shallow). The contingency and response plan detailed in the following sections outlines measures:

- To minimize the potential for releases
- To monitor for the timely detection of frac-outs
- To minimize the impact should a frac-out occur through containment, corrective action, and cleanup
- For notification of affected parties

2.01 PLANNING AND PREVENTION

All work will be performed in accordance with environmental permits and regulations. The contractor will use nontoxic bentonite or polymer mixtures of drilling mud to ensure that, if a frac-out occurs, it will not result in toxicity to marine life in stream.

The contractor performing the HDD must have experienced personnel onsite who are familiar with and experienced with the procedures for this type of installation. Before drilling activities begin, the contractor must submit any certifications and documentation for key personnel who will be performing drilling work, including the field supervisor, drill rig operator, steering hand, and pipe fusion welder. A trenchless construction inspector must be present for all HDD activities.

Before pilot drilling commences, a safety meeting is required, when the approved site-specific frac-out contingency plan will be discussed. The field crew members will review the procedures for preventing frac-outs and monitoring for frac-out detection, along with a review of the protocols for responding to a release, including the storage location of the response equipment and materials.

Prior to drilling, the entry and exit areas will be clearly marked and the limits of the work area(s) will be flagged. Erosion and sediment controls (including silt fencing, straw wattles, and temporary sediment trap) will be employed at the entry and exit worksites. In addition, containment equipment including earth-moving equipment, portable pumps, straw bales and straw wattles, hand tools, silt fencing, turbidity screens, sand bags, silt curtain for in-water work, and/or lumber will be stored in a readily available location at the project site. A vacuum truck will be on site or on call to be employed as necessary.

2.02 MONITORING PROCEDURES

Once drilling begins, the contractor will continuously monitor operations for evidence of an inadvertent release, such as abnormally high annular pressures or loss of circulation. The borehole pressure will be maintained as low as possible for a successful drilling operation, and will be continuously monitored by the contractor to identify abnormal changes, excessive increases, and loss of fluid volume or return flows.

The drilling fluid components will be continually tested and adjusted to adapt to the conditions of the subsurface. The contractor will monitor and document drilling fluid properties.

During all pilot drilling, reaming, and pullback operations, the contractor will visually inspect along the borehole alignment, including surface waters along the path, for evidence of a release. The monitor will have communication equipment, such as a radio or mobile phone, operational at all times during HDD activities, and will maintain direct communication with the HDD control cab. The drill rig operator will inform the alignment monitor in the case that, given the current mud pressures, volumes, and circulation, the operator believes there is an elevated risk for a frac-out event.

HDD operations during the crossing may be performed 24 hours per day to minimize the risk of HDD failure. Continuous operation maintains borehole integrity and minimizes the risk of borehole collapse, annular pressure spikes, and drill string or product pipe seizing. If operations continue before or after daylight hours, the worksite(s) will be well-lit using floodlights to allow for release detection, as well as a safe work environment.

2.03 RESPONSE PROCEDURES

Should the results of the monitoring indicate that a frac-out is suspected, a monitor will be immediately dispatched to visually observe the area of the alignment. The contractor will take a combination of the following response procedures to minimize the volume of drilling fluid that is released and mitigate the severity of the potential frac-out:

- Decrease pump pressure
- Slow the advance rate
- Pull the drill string back
- Temporarily stop drilling operations and shut down mud pump
- Swab the borehole
- Adjust the drilling fluid parameters
- Make a slight change in the borepath alignment

If the frac-out is confirmed by an observed release to the surface or turbidity plume in the water, the contractor will attempt to advance the drill head past the known frac-out point. The contractor may determine that sealing a fissure is required.

In the event of a release, the contractor will assess the amount and location of the release, document the impact with notes and photographs, and then take corrective actions to contain the released fluid.

Land Release

If a land release is detected, the contractor will take immediate corrective action to contain the release and to prevent or minimize migration off site or into the water.

- The contractor will create a containment area by installing berms, silt fences, and/or straw bales to prevent drilling fluid or silt-laden water from flowing along the ground.
- The containment measures will be focused particularly between the location of the release and the stream to prevent mud flow into the water.
- Construct pits and/or berms using hand tools and/or heavy equipment around the frac-out point to contain further releases onto the ground.
- Contractor will employ a vacuum truck as necessary to assist in the removal of the released fluid. Submersible pumps will be placed within the release area to capture material until the vacuum truck arrives.

- If the amount of an on-land release does not allow practical collection, the affected area will be diluted with fresh water and allowed to dry.
- If the release cannot be contained, drilling operations will be suspended until appropriate containment is in place. Small collection sumps may be constructed to pump the released fluid back into the mud processing system.
- After the HDD installation is complete, the frac-out area will be cleaned and all drilling mud disposed at an appropriate facility. All containment structures will be removed.

Waterbody Release

If release occurs within a waterbody the contractor will take immediate corrective action to contain the release and minimize the impact to marine life and human health & safety.

- In shallow water, the contractor may install temporary dams with sandbags to isolate the released fluid from migrating further into the waterbody. Contractor will employ a vacuum truck as necessary to assist in the removal of the released fluid.
- Wherever necessary, the contractor will create a containment area by installing a silt curtain around the area of turbidity.
- Waterbody releases will be evaluated based on the extent and accessibility of the release area to determine the best method of cleanup. In some cases, recovery and cleanup of drilling fluid released into large bodies of water are not practical, as recovery measures have potentially greater impact to the environment than allowing the water-soluble drilling fluid to dissipate slowly.
- Whenever possible, the released fluid will be removed from the site and disposed at an appropriate facility. All containment structures will be removed.
- If the release cannot be contained, drilling operations will be suspended until appropriate containment is in place.

After successful containment and removal of the released material, operations will be able to continue (with the appropriate agencies' approval). All the activities associated with the frac-out response will be documented, and measures to prevent another release will be discussed.

2.04 NOTIFICATION

In the event of an inadvertent release, the contractor will take immediate corrective action, as identified above, to contain the release and to minimize or prevent impacts. The contractor will immediately notify FDEP park personnel at Ponce De Leon Springs State Park and FDEP Bureau of Design and Construction (BDC). The BDC within 24 hours will notify the Florida Department of Environmental Protection permitting authority of the release.

The following information will be provided:

- Date and time of inadvertent release
- Location(s) of release and proximity to sensitive feature
- Quantity and type of material released and amount of recovered materials
- Containment and cleanup measures that have been completed and that are planned

The Contractor will work with the respective agencies to identify and complete any additional containment or cleanup measures.

2.05 ABANDONMENT

A borehole will need to be abandoned if a frac-out cannot be avoided, or if a frac-out has occurred that cannot be controlled, and mitigation measures have been determined to not be effective. The borehole will be completely abandoned, grouted, and a new alignment determined. Any borehole abandonment locations will be documented and shown on as-built documents.

The following steps will be implemented during abandonment of the borehole:

- Determine the new alignment for the HDD crossing.
- Insert casing, as necessary to remove the pilot string.
- Pump a thick grout plug into the borehole to securely seal the abandoned borehole.

END OF SECTION 221101

SECTION 31 02 20 - EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work includes all clearing, excavation, borrow, filling, backfilling and grading indicated on the Drawings and necessary for the proper completion of the project, including for pipes, structures (excluding buildings), and pavement. Recommendations contained within the geotechnical report (if applicable) will super cede testing and compaction requirements provided in this specification.

1.2 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

- A. All work shall be performed in accordance with Florida Department of Transportation standards, specifications and indexes and in accordance with other state and local requirements.
- B. Current editions or revisions of the following specifications and standards will apply unless specifically noted otherwise herein or on the Drawings.

1. American Society for Testing and Materials (ASTM) Standard

ASTM C 33-85	Concrete Aggregate
ASTM D 698-78	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 Kg) Rammer and 12 in. (304.8 mm) Drop. Standard Proctor.
ASTM D 1556-82	Test Methods for Density of Soil in Place by the Sand-Cone Method.
ASTM D 1557-78	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (45 Kg) Rammer 2 and 18 in. (457 mm) Drop. Modified Proctor.
ASTM D 2487-83	Classification of Soil for Engineering Purposes
ASTM D 2922-76	Density of Soil and Soil-Aggregate in place by Nuclear Methods (Shallow Depth)
ASTM D 3017-78	Moisture Content of Soil and Soil-Aggregate in place by Nuclear Methods (Shallow Depth)

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

AASHTO T-99	Standard Proctor
AASHTO T-180	Modified Proctor

1.3 SUBMITTALS

- A. Contractor shall have reports submitted to the Engineer as required in the testing portion of this Section.

1.4 RELATED WORK

- Concrete Curbs, Curbs and Gutters and Sidewalks
- Stabilized Subbase
- Limerock Base Course
- Asphaltic Concrete Paving
- Water Distribution Systems
- Sanitary Sewers
- Stormdrainage Culverts and Structures
- Concrete Work General
- Pre-cast Concrete Structures
- Pre-Cast Stormdrain Structures

1.5 SITE CONDITIONS

- A. Character of Excavation Material: Prior to submitting his bid, the Contractor shall satisfy himself as to the character and amount of different soil materials, groundwater and the subsurface conditions to be encountered in the work to be performed. Information and data, when furnished, are for the Contractor's general information. However, it is expressly understood that any interpretation or conclusion drawn there from is totally the responsibility of the Contractor.
- B. Subsurface Investigation: If subsurface information is included as an appendix of these specifications it is the results of soil borings and soil classification and testing made at the exact locations only. While the soil borings and information are representative of subsurface conditions at their respective exact locations, local variations in soils and groundwater will be encountered.
- C. Existing Underground Facilities: Underground structures and utilities shown on the drawings are located according to the best available records. However, it shall be the Contractor's responsibility to acquaint himself with all information, and to accurately locate and uncover all underground structures and utilities along the line of work in order to avoid conflicts with existing facilities. Underground utilities shall be located by the Contractor far enough in advance of the trench or site excavation and pipe laying operations to assure ample opportunity to make the necessary adjustments to avoid conflicts. The Owner shall not be held accountable for inaccuracies or omissions in the locations or grade of facilities of this type.
- D. Conflicts: Where actual conflicts are unavoidable, work shall be performed so as to cause as little interference as possible with the service rendered by the facility disturbed. The Owner may require the Contractor to work in off hours (i.e. 1:00am or Holidays) in order to minimize disturbance. Facilities or structures damaged in the prosecution of the work shall be repaired immediately in conformance with the best standard practices or according to the direction of the owner of such facility, to the extent required, including replacement, at no cost to the Owner.

PART 2 - MATERIALS AND EQUIPMENT

2.1 BACKFILL

- A. The following shall define the terms used in the plans and specifications. Backfill material specifications apply to fill material associated with the sitework and that is five feet beyond the footprint of the buildings. The contractor will need to review the structural fill requirements identified in the geotechnical report prepared by GSE, September 2020.
 - 1. Topsoil - shall be the upper most layer of soil usually dark in color and approximately 6 inches thick, rich in organic matter.
 - 2. Gravel Bedding - Gravel bedding shall consist of well-graded crushed stone or crushed gravel meeting the requirements of ASTM Designation C-33, Graduation 67 (3/4-inches to No. 4). Air cooled blast furnace slag, alone or in combination with crushed stone and/or crushed gravel, conforming to ASTM C-33 requirements may also be used.
 - 3. Select Backfill - shall be a select granular material free from organic matter and of such size and gradation that desired compaction can be readily attained. Select backfill is defined as those complying with AASHTO soil classification Groups A-1 and A-3 having a maximum size not to exceed 3 inches with at least 95% passing the 1 1/2 inch sieve and not more than 10% passing the No. 200 sieve with a coefficient of uniformity of six or greater. The liquid limit shall be less than 15. In most situations the existing backfill will not meet these requirements, therefore, select backfill is material which must be transported to the site from an approved borrow pit.

4. Suitable or Common Backfill - shall be a satisfactory soil material free from organic matter, muck, marl and rock exceeding 3 inches in diameter. At least 95% shall pass the 1 1/2 inch sieve. Common backfill shall comply with AASHTO soil classification Groups of A-2-5, A-2-6, A-2-7, A-4 and A-5. providing that the liquid limit shall be less than 35. Suitable backfill is usually considered on site material that meets these requirements.
5. Existing or Unsatisfactory Backfill - shall be material obtained from the Contractor's excavations to be used in areas not requiring specific compaction densities. This material shall not be used for pipe bedding nor under streets, street shoulders, or structures common unsuitable material shall comply with AASHTO soil classification Groups of A-6 and A-7. Under no conditions are destroyed pavement materials, curbs, broken concrete, etc., to be included in the backfill.
6. Concrete Encasement - shall be of portland cement type with a compressive strength at 28 days of 2500 psi.
7. Clean Sand - shall be a quartz material with less than 5 percent of the soil particles finer than the No. 200 mesh sieve, a uniformity coefficient greater than 1.5 and an effective grain size of 0.20 to 0.55 millimeters in diameter. Clean sand is required for filter material requiring good permeability.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Safety

1. In the Contractor's use of streets and highway for the work to be done under these Specifications he shall conform to all City, State, and local laws and regulations. The Contractor shall provide, erect, and maintain effective barricades, danger signals, and signs on all intercepted streets or highways for protection of the work and safety of the public rights-of-ways shall be provided with lights which shall be kept burning at all times between sunset and sunrise.
2. The Contractor shall be responsible for all damages resulting from any neglect or failure to meet these requirements. Where conditions require the presence of a watchman to fulfill the requirements stated herein, same shall be furnished without extra cost to the Owner.
 - a. Access to Fire hydrants shall be maintained at all times. Do not block or barricade with spoil, materials or equipment for any period of time.

B. Maintenance of Service

1. The Contractor shall arrange his work to cause minimum disturbance of normal pedestrian and vehicular traffic and will be held responsible for providing suitable means of access to all public and private properties during all stages of the construction. Should the construction work require repairs, changes or modifications of other utilities, it shall be the responsibility of the Contractor to provide for the maintenance of continuous water, electric, telephone, and gas as well as sewage and other utility services to all present customers of such utilities, unless approval in writing is secured from the utility company for interruption of such service. A minimum of one lane of traffic shall be maintained at all times. Contractor shall keep all disturbed roads graded smooth and passable. If the road becomes impassable, the Contractor shall stabilize with dry, select backfill. The Owner may require the Contractor to work in off hours (i.e. 1:00am or Holidays) in order to minimize disturbance.

C. Limits of Construction

1. In locations where the work is to be installed in streets or road rights-of-way the activities of the Contractor shall be confined to these public properties. Where the use of private property is deemed necessary by the Contractor to facilitate construction work arrangement for such use with the property owner shall be the responsibility of the Contractor. The Contractor shall save the Owner harmless from all claims by adjacent property owners for trespassing or damage due to the activities of the Contractor in the prosecution of the work.

D. Existing Utilities

1. The Contract Documents contain data relative to existing public and private utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.
2. All existing improvements such as pavements, conduit, poles, pipes, overhead wires and other structures, shall be carefully supported and fully protected from injury. The Contractor shall be responsible for damages to these existing utilities and shall, in case they are damaged, restore them to their original condition at no cost to the Owner.
3. Contractor shall give written notice to the Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of work. This can be accomplished by making the appropriate contact with the utility companies listed on Sheet 2 of the Construction Drawings.

E. Property Protection

1. Trees, fences, poles, and all other property shall be protected unless their removal is authorized; and any property damaged shall be satisfactorily restored by the Contractor at the Contractor's expense to a condition equal to or better than that existing prior to beginning the work.

3.2 CLEARING AND GRUBBING

- A. On all areas within limits of clearing and grubbing indicated on the Drawings or specified where earthwork is to be done, all timber, brush, stumps, roots, rubbish, and unsuitable material shall be removed to a depth of not less than one foot below the ground surface. Sound trees and shrubs which do not interfere with the construction and are elsewhere indicated or directed not to be removed, shall be protected properly from damage. The surface shall be plowed to a depth of not less than six (6) inches and all stumps, roots and other perishable matter thus exposed shall be removed to a depth of not less than one foot. Any deposits of muck, peat, bark or trash occurring within the limits of clearing and grubbing or where directed by the Engineer shall be removed to their full depth and backfilled with suitable backfill as specified herein. Material removed during clearing and grubbing shall be hauled to in accordance with local laws and regulations. Landfill fees shall be paid by the Contractor.

All shrubbery, ornamental trees and other such plantings including those within construction area shall be fully protected. If it becomes necessary to remove any grass, shrubbery or planting to accomplish the work, it shall be satisfactorily replaced before the work will be accepted. All areas

disturbed during construction shall be restored to a condition equal to or better than that existing prior to beginning the work.

- B. Trees and shrubs selected for preservation shall have their root systems protected from construction traffic, surface storage of materials, and any type of land disturbance within the drip line of the tree or shrub. The drip line of a tree or shrub is the outer outline of the tree crown where it intercepts the ground. Barricade all trees or tree groups which are selected for preservation if the possibility of root damage, surface soil disturbance within the drip line, soil compaction, or impact with construction equipment is prevalent. Barricading shall consist of continuous wood fencing constructed to the outline of the tree crown and shall be sturdy, highly visible and shall be maintained during the construction.

3.3 EROSION AND FLOODING CONTROL

- A. During construction operations, the Contractor shall install and maintain temporary erosion and flooding control features to the extent necessary to prevent pollution of streams and lakes, detrimental effects on public or private property adjacent to the construction or damage to work on the Project. Additional erosion control devices may be requested by the Engineer to protect the property described above. This shall be done immediately when directed by Engineer at no additional cost to the Owner.
- B. The Contractor shall attempt to limit the surface areas of erodible earth exposed by clearing and grubbing, excavation or filling operations.
- C. Temporary features may include, but not be limited to silt fences, temporary grassing, sodding, mulching, sandbagging, slope drains, sediment basins, sediment checks, artificial coverings or berms. All City, County, State and Federal ordinances will be complied with.
- D. The contractor shall comply with The Florida Development Manual -- A Guide to Sound Land and Water Management, Department of Environmental Regulation -- Stormwater Management Practices.

3.4 DUST CONTROL

- A. If, in the opinion of the Owner or the Engineer, it is necessary to control dust during construction period, the Contractor shall furnish and spread water or calcium chloride at points where dust is a nuisance, or as directed by the Engineer, at no additional cost to the Owner.

3.5 PAVEMENT AND SIDEWALK REMOVAL AND REPLACEMENT

- A. Pavement and sidewalk shall be removed and replaced as follows unless shown otherwise on the Drawings.
- B. Pavement, which is to be removed for open-cut trenching, shall be cut vertically with a power-driven friction saw prior to removal. The surface shall be scored to sufficient depth to provide uniform, straight break lines. All removal of pavement shall conform to local, County, State or Federal requirements where applicable. Under no condition shall pavement be cut with a trenching machine, power shovel or backhoe. Width of cut of pavement or sidewalk shall be two feet wider than top of trench, one foot on each side of trench. In the event that trench excavation becomes wider than initial cut, pavement or sidewalk shall be recut to at least one foot back from all edges of actual excavation by the Contractor at his own expense.

1. All cut lines shall be parallel to or at right angles to the longitudinal axis of the pipeline.

- C. Pavement, driveway or sidewalk material shall be separated from other excavated materials and shall not be placed in backfill, but shall be satisfactorily disposed of by the Contractor. Base materials may be salvaged and stockpiled for reuse, but such reuse of base materials shall be subject to the review of the Engineer.
- D. All pavement and sidewalk removed shall be replaced with base and surface materials which conform as closely as possible in thickness and quality to materials removed. All painted street markings and other traffic control devices shall be restored to former conditions. Use Safety Coatings Co. Roadrunner Traffic marking paint, or approved equal, and Ferro Co. glass spheres or approved equal. Pavement with traffic control devices and sidewalks shall be replaced as soon as practicable after compaction of backfill. Replacement pavement shall be tapered at curb.
- E. Workmanship and materials shall be in accordance with best standard practice for work of this type, and shall conform to the requirements of Section 330-12, Surface Requirements of Florida Department of Transportation Road and Bridge Manual.
- F. All necessary barricades, detours, lights and other protective measures shall be provided for protection of both pedestrians and vehicular traffic and shall conform to Florida DOT specifications where no local agency has specifications.

3.6 STATE HIGHWAY AND RAILROAD RIGHTS-OF-WAY

- A. Pipe crossings and installations along all railroads and State highways shall be in accordance with the applicable portions of American Railroad Engineers Association (AREA) Specifications for "Pipeline Crossing under Railroad Tracks for Non-Flammable Substances" or Florida DOT "Utility Accommodation Guide" and with details shown on the drawings. Verify the existence of a formal permit to work on the right-of-way at each specific location prior to any work at that site and notify the owner of the right-of-way as required by that permit. Furnish the Engineer and the Owner with a copy of any separate certificate of insurance that is required by the owner of the right-of-way.

3.7 CURB AND GUTTER REMOVAL REPLACEMENT

- A. Curb or curb and gutter removal, where required in construction of this work, shall be held to a minimum. Curb and gutter material to be removed shall be carefully separated from trench excavation material and shall be satisfactorily disposed of by the Contractor.
- B. The Contractor shall replace all curb or curb and gutter which has been removed. Curb or curb and gutter shall be replaced as soon as possible after backfill is placed and compacted and shall be a duplicate in all respects to original construction. Workmanship shall be in accordance with the controlling agency (City, County, State).

3.8 RESTORATION OF ROADWAY CROSSINGS AND DRIVEWAY CROSSINGS

- A. Clay, marl, shell or similar roadways and driveways that are crossed or traversed by trenches shall be restored to existing conditions prior to excavation. The Contractor may reclaim existing material, or he may furnish and compact new material. There will be no additional compensation for this type of restoration unless specifically called for in the Special Provisions or on the Bid Proposal.
- B. Final and complete restoration of crossings in existing public roadways shall be completed not more than 24 hours subsequent to the final lift of the backfill.

3.9 EXCAVATION

A. General

1. Excavation shall be performed in accordance with all State, County and local regulations. Blasting will not be permitted except by written approval of the Engineer for each specific location where it is to be performed. Excavation shall conform to the dimensions indicated or specified for the pipeline or structure and topography and subgrade conditions encountered.
2. The Contractor shall notify the Engineer in due time to permit him to inspect completed excavations, and no pipes or concrete shall be placed in excavations or upon subgrades until they have been approved by the Engineer.
3. In areas where excavation may endanger existing structures, roads or utilities, Contractor will provide suitable support to these existing facilities so as to insure that damage will not occur. Contractor shall submit proposed method of support of these facilities to the Engineer for approval. The Contractor shall obtain written approval from the facility concerned before proceeding with any construction which might undermine or endanger existing facilities.

B. Control of Water

1. Furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during construction. Dewater and dispose of water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public. The Contractor shall at all times have on-hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies and shall have available at all times competent workmen for operation of pumping equipment. Dewatering systems shall not be shut down between shifts, on holidays or weekends, or during work stoppages without written approval from the Engineer.
2. Control of ground water shall be such that softening of the bottom of excavations or formation of "quick" conditions or "boils" shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of natural soils.
3. Static water level shall be drawn and maintained one-foot below bottom of excavation so as to maintain undisturbed state or natural soils and allow placement of backfill to required density. Dewatering system shall be installed and operated so that ground water level outside excavation is not reduced to extent that would damage or endanger adjacent structures or property.
4. Release of ground water to its natural static level shall be performed in a manner so as to maintain undisturbed state of natural foundation soils, prevent disturbance of compacted fill or backfill and prevent flotation or movement of all structures and pipelines.
5. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

C. Shoring, Sheet piling and Bracing

1. Excavations shall be shored and sheeted in accordance with requirements of the Department of Labor Occupational Safety and Health Administration (OSHA) with members of sizes and arrangement sufficient to prevent injury to persons, damage to structures, injurious caving, or erosion. They shall be designed, furnished, placed, maintained and removed by the Contractor.

Sheeting and shoring design shall be submitted to the Engineers as a shop drawing prior to installation and shall bear the seal of a structured engineer registered in the State of the job site.

2. Design, planning, installation and removal of all sheeting, shoring, sheet piling and bracing shall be accomplished in a manner so as to maintain required trench or excavated section with an undisturbed state of soils at and below excavation bottom.
3. Sheet piling and timbers used in trench excavations shall be withdrawn in such a manner so as to prevent subsequent settlement or misalignment of pipe or additional backfill loadings which might overload pipe. Where, in the opinion of the Engineer, removal of sheeting and shoring will or may cause damage to the work or to adjacent buildings, utilities or property, the Engineer may direct Contractor to leave all or a portion of sheeting and shoring in place. Sheeting and shoring shall also be provided as necessary to keep excavations within the available right-of-way.
4. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

D. Excavation for Pipe System

1. Common Excavation

- a. Machine excavation shall be carried to a depth above final pipeline grade that will allow final grading using hand tools, as indicated on the Plans. Care shall be taken to not excavate below required depth. If excavations is carried below required depth, overcut depth shall be backfilled with select backfill material or gravel bedding material furnished at Contractor's expense and compacted to provide pipe support at least equal to that of original material.
- b. Contractor may, at his option, elect to overcut trench and backfill with select backfill or bedding material. If Contractor so elects, depth of overcut shall be such that a minimum of two inches of compacted backfill material will result under lowest projection of pipe bell. No additional payment will be made for this overcut or for furnishing and placing of the required backfill material.
- c. The Contractor shall exercise sound construction practices in excavating trench and maintaining it so no damage will occur to any foundation structure, pole line, pipeline or other facility because of slough of slopes or from any other cause. If, as a result of excavation, there is a disturbance of ground that endangers other property, the Contractor shall immediately take remedial action at his own expense. No act of the Owner or his representatives shall in any way affect liability of the Contractor for damages, expenses or costs that may result from trench excavation.
- d. Trees, stumps and roots within limits of trench excavation shall be removed to a depth of at least 12 inches below bottom of trench.

2. Trench Requirements

- a. Width of trench banks from bottom to 12 inches above top of pipe shall not exceed 18 inches nor be less than 12 inches on each side of the pipe with the exception of pre-assembled pressure pipe in non-paved areas for which the minimum trench width shall be pipe diameter plus 1 inch on each side of the pipe.
- b. Trenches for gravity sewers shall be of such depth that the invert of pipe will be at elevations shown on the plans, or as may be determined by the Engineer. Trenches shall provide a minimum cover of 36 inches for water mains and 48 inches for sewage force mains over barrel of pipe, except as otherwise shown. Greater depth may be required to accommodate appurtenances or avoid obstruction.
- c. Excavation for appurtenances shall be made to a size that will allow at least 12 inches between their outer surfaces and embankment or shoring.
- d. The trench shall be dry when the bottom is prepared. A continuous trough shall be excavated by hand to receive the bottom 120 degrees of the pipe barrel. In addition, bell holes shall be excavated so that only the barrel of the pipe receives bearing pressure from, and is uniformly supported by, the bottom of trench. Preparation of trench bottom and placement of pipe shall be such that final position of pipe is true to line and grade and uniformly supported throughout barrel of each pipe length. When pipe is placed in select backfill over rock or other overdepth, additional backfill of same material shall be tamped on each side of barrel to height of spring line, thus forming a trough of firm, compacted bedding.

3. Pipe Interferes and Encasements

- a. In no case shall there be less than 4 inches between any two pipelines or between pipelines and structures. Pipe deflections shall be performed in accordance with the plans and as contained herein. Wherever there is more than 4 inches but less than 18 inches clearance between sewers, sewer house laterals, force mains and water mains or water services, then a concrete encasement shall be provided for a distance of 10 feet on each side of the obstruction pipe. Wherever there is more than 4 inches but less than 1.0 foot clearance between any two pipe lines, other than water or sewer, or between pipe lines and structures, then a concrete encasement shall be provided for a distance of 3 feet on each side of the obstruction pipe.
- b. The Engineer shall have full authority to direct the placement of the various pipes and structures in order to facilitate construction, expedite completion and to avoid conflicts.

E. Excavation for Structures

- 1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection, or as shown on the Drawings.
- 2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.

3. In areas underlain by expansive clay, undercutting or excavation of clay pockets will be required beneath footings and slab areas as may be shown on the drawings and directed by the Engineer. Post-hole diggers may be used to determine the depth to the clay materials in all of the footing bottoms. Heavy clay that is encountered within a zone that is four (4) feet below the bottom of any footing or floor slab should be undercut and replaced with suitable or common backfill material. The width of undercutting in the footing should extend at least four (4) feet beyond the edge of the footing or slab to provide a non-expansive water barrier above the clay. Other clay pockets discovered during construction may also require complete removal upon the recommendation of the geotechnical engineer.

F. Unsuitable Material

1. Unsuitable materials are soils exposed at the bottom of excavations that are compressible, expansive, contain extraneous rubble, or offer uneven foundation support. Unsuitable materials/soils will include, but not be limited to, mulch, peat, expansive clays, boulders, rubble, any portion of trees or similar vegetation, wood, or unyielding material such as rock.
2. The Contractor shall notify the Engineer immediately when unsuitable material is encountered. The Engineer will investigate questionable material to determine its suitability. Should the Engineer require soils testing be performed to aid in his determination, then tests revealing suitable materials shall be paid for by the Contractor.
3. Where the Engineer determines that unsuitable material is present below the excavation which will not provide adequate support the Contractor shall remove the unsuitable material as directed by the Engineer and replace the unsuitable material with Select backfill. Prior to the excavation of any unsuitable material, written approval must be obtained from the Engineer. The approval shall state the linear feet of excavation. No payment shall be made for the removal of any unsuitable bedding material if prior approval is not obtained.

3.10 BACKFILL AND COMPACTION FOR PIPES

A. General

1. Contractor shall not perform any backfilling operation other than that necessary to hold pipe in place until the locations of connections and appurtenances have been recorded on the "as-built" drawings and the line has been inspected and released for backfilling. Backfill and compaction shall be performed as specified herein and as shown on the drawings. Backfilling of trenches shall progress as rapidly as the construction, testing and acceptance of work permits. In areas subject to traffic temporary backfill or base material is required to provide a smooth stable driving surface until final base and/or pavement can be constructed.

B. Haunching and Initial Backfill

1. After pipe has been properly laid and inspected backfill shall be carefully placed and compacted around the pipe in loose horizontal layers not exceeding 6 inches loose depth, equally on both sides of pipe and shall be spaded (walked in) and compacted with hand tampers to obtain the required density. This shall continue to a level of one foot above the top of the pipe.

C. Subsequent Backfill

1. Above the level of initial backfill, the trench shall be filled in horizontal layers and mechanically compacted to the density required up to 3 feet below the base of pavement or structures, up to 6 inches in areas to receive topsoil, seeding, or soiling and up to final grade in non-paved streets.

D. Backfill and Compaction Requirements for Pipe (unless shown differently on the plans)

1. Paved Areas

- a. Initial - Select backfill in 6" lifts at 100%.
- b. Subsequent - Select backfill in 8" lifts at 100%.
- c. Top 3 feet below road base - Select backfill in 6" lifts at 100%.

2. Unpaved Street and Street Shoulder Areas

- a. Initial - Suitable backfill in 6" lifts at 95%.
- b. Subsequent - Suitable backfill in 8" lifts at 95%.

3. Off Street Areas

- a. Initial - Suitable backfill in 6" lifts at 95%.
- b. Subsequent - Unsuitable or existing backfill in 18" lifts compact till firm.

NOTE: Density listed are maximum dry density in accordance with AASHTO T-99 Standard Proctor Density.

3.11 BACKFILL AND COMPACTION FOR STRUCTURES

- A. For the area under the structure and within a 2 foot of the perimeter, compact the top 12 inches of subgrade and each 6 inch layer of select backfill or fill material to 100% Standard Proctor density.

3.12 GRADING

- A. Grading shall be performed at such places as are indicated on the drawings, to the lines, grades, and elevations shown or as directed by the Engineer and shall be made in such a manner that the requirements for formation of embankments can be followed. All unacceptable material encountered, of whatever nature within the limits indicated, shall be removed and disposed of as directed. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.
- B. Grade all areas as indicated. Fill shall be brought to finish grades shown and shall be graded to drain water away from structures.
- C. Overall area grading for which no grades are indicated within the limits of construction and outer limits of clearing and grubbing, all holes and other depressions shall be filled, all mounds and ridges cut down and the area brought to sufficiently uniform contour that the Owner's subsequent mowing operations will not be hindered by irregular terrain. This work shall be done regardless of whether the irregularities were the result of the Contractor's operations or originally existed. Permanent ponds or other permanent water areas, as so designated by the Engineer, will not be required to be filled.

3.13 TESTING

A. General

1. Contractor shall comply and pay for the services of an independent testing laboratory in accordance with Section 01410 "Testing and Laboratory Services" to perform testing specifically indicated herein.
2. Exact location of the test shall be selected by the Engineer or his representative. If the Engineer, after being notified by the Contractor, is unable to be present during the test, the laboratory personnel shall randomly select testing locations that are representative of the work being tested. All cost of this testing and providing of certificates shall be a subsidiary obligation of the Contractor with the cost included in the item for which the testing is associated.
3. The minimum testing rate shall not prevent the Contractor nor the testing laboratory from performing additional testing to insure the construction is in accordance with the plans and specifications.
4. A minimum of two (2) copies of reports of test results of all maximum dry density and optimum moisture content determinations and all in-place density tests shall be submitted to the Engineer. Reports must be signed by a registered Professional Engineer.
5. The Contractor shall repair all test holes and borings resulting from the testing and retesting of his work at no cost to the Owner. Any areas failing to pass the tests as called for, and interpreted by the Engineer, shall immediately be brought into conformance with these Specifications at the Contractor's expense.

B. Minimum Schedule of Test Required

1. Determination of the soil classification for each type of soil material used to determine its suitability for use as defined herein and in accordance with the AASHTO or Unified Soil Classification System.
2. Determination of maximum dry density and optimum moisture content for each type of soil to be compacted to a specified density.

At least one determination will be made for each soil used. Tests shall be performed in accordance with the appropriate ASTM or AASHTO Standards.

3. In-place (in situ) density test shall be made in accordance with ASTM and AASHTO Standards and shall be made at a frequency to assure contract requirements are met but in no case less than the following:
 - a. Pipeline backfill at the rate of one test for each 50 linear feet of trenchline for each backfill lift. A backfill lift shall never be considered to be greater than one foot in thickness. In unpaved areas, testing rate by be reduced to one test for each 150 lineal feet of trenchline for each backfill lift.
 - b. Structure backfill at the rate of one test for each 2000 square feet for each backfill lift (maximum lift of 12 inches).
 - c. Pavement, sidewalk and curb backfill at the rate of one test for each 50 lineal feet of street for each backfill lift (maximum lift of 12 inches).

3.14 MAINTENANCE

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

END OF SECTION 310220

SECTION 31 02 51 – STABILIZED SUBBASE

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this Section includes all labor, materials, transportation and equipment necessary to properly construct a Type B stabilized roadbed having a Limerock Bearing Ratio (LBR) of 40. The required LBR shall be obtained by stabilizing the roadbed material with crushed limerock, oyster shell, coquina shell or any other material specified in Section 914 of the FDOT Standard Specifications.

1.2 RELATED WORK

- A. The following items of related work are included and specified in other Sections of these Specifications:
 - 1. Earthwork
 - 2. Limerock Base Course
 - 3. Curbs and Gutters
 - 4. Asphalt Concrete Surface Course

1.3 COMPLIANCE WITH STANDARDS

- A. Except as modified or supplemented herein, all work in this Section shall meet the requirements and standards listed. In case of conflict between the referenced Specifications or standards, the one having the more stringent requirements shall govern.
 - 1. American Association of State Highway and Transportation
 - 2. Officials - AASHTO
 - 3. Florida Department of Transportation - FDOT

1.4 SUBMITTALS

- A. Submit reports to Engineer demonstrating materials comply with requirements herein.
- B. Test Results: Submit results of all tests conducted to the Engineer.

PART 2 - MATERIALS

2.1 CRUSHED SHELL

- A. Crushed shell shall be mollusk shell (i.e. oysters, mussels, clams, cemented coquina, etc.). Steamed shell will not be permitted. At least 97 percent, by weight, of the total material shall be retained on the No. 4 sieve. Not more than 20 percent, by weight, of the total material shall pass the No. 200 sieve. The determination of the percentage passing the No. 200 sieve shall be made by washing the material over the sieve.

2.2 LOCAL MATERIALS

- A. Local materials shall be high bearing value soils or sand-clay material. Material passing the 40 mesh sieve shall have a liquid limit not greater than 30. The plasticity index shall not be greater than 10. No blending of materials to meet these requirements will be permitted unless authorized by the engineer. When blending is permitted, the blended material shall be tested and approved prior to being spread on the roadway.

PART 3 - EXECUTION

3.1 APPLICATION

- A. The stabilizing material shall be spread, mixed and compacted in accordance with Section 160 of the FDOT Standard Specifications.

3.2 TESTING

- A. Contractor shall comply and pay for the services of an independent testing laboratory in accordance with section 01410.

- 1. Bearing Value Tests

- a. Bearing value samples will be obtained and tested for approximately each 500 square yards of pavement area, as directed by the engineer.

- 2. Density Requirements

- a. Minimum density requirements at any location in the stabilized subbase area will be as shown on the plans and set forth in Section 310220 - "Earthwork". Density tests will be made for approximately each 500 square yards of pavement area as directed by the engineer. The contractor shall dewater the subbase, if required, to ensure proper compaction.

END OF SECTION 310251

SECTION 31 02 52 – LIMEROCK BASE COURSE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this Section includes all labor, materials, transportation and equipment necessary to properly perform all work specified here, indicated on the drawings or reasonably implied to complete the construction of base course composed of limerock. It shall be constructed on a prepared subgrade, in accordance with these Specifications and in conformity with the lines, grades, notes and typical cross-sections shown on the Drawings and in the Plans. Included as a part of this work are the following items:

- 1. Limerock Base Course (single and double course)

1.2 RELATED WORK

- A. The following items of related work are included and specified in other Sections of these Specifications:
 - 1. Earthwork
 - 2. Stabilized Subgrade
 - 3. Curbs and Gutters
 - 4. Asphalt Concrete Surface Course

1.3 SCHEDULE

- A. The Contractor, at his option, may construct a Limerock Base Course when such an alternate is shown on the Plans. If selected for construction it shall be used throughout the project. It shall NOT be mixed with other types of base courses for construction of contiguous portions of the work.
- B. Limerock Base Course construction shall not commence (nor shall limerock material be placed on the roadway) until the drainage system (including underdrains) is completed and 100 percent functional and the curbs and gutters, if any, have been properly constructed.
- C. Base Course construction shall commence within 24 hours of completion of the stabilized subgrade work.

1.4 COMPLIANCE WITH STANDARDS

- A. Except as modified or supplemented herein, all work in this Section shall meet the requirements and standards listed. In case of conflict between the referenced Specifications or standards, the one having the more stringent requirements shall govern.
 - 1. American Association of State Highway and Transportation Officials – AASHTO
 - 2. Florida Department of Transportation – FDOT

1.5 SUBMITTALS

- A. Submit reports to Engineer demonstrating materials comply with requirements herein.
- B. Test Results: Submit results of all tests conducted to the Engineer.

PART 2 - MATERIALS

2.1 LIMEROCK

- A. The Limerock material shall meet the requirements of FDOT "Standard Specifications for Road and Bridge Construction", Section 911. At the Contractor's option limerock of either Miami or Ocala formation may be used but only limerock of one formation may be used on this contract. The material shall originate in quarries currently on the FDOT approved list for limerock base material sources. Provide certificate of conformance to the requirements of Section 911, FDOT.

2.2 PRIME COAT (REQUIRED)

- A. The material used for prime coat shall be cut-back Asphalt Grade RC-70 or RC-250 meeting the requirements of Section 916-2, of the FDOT Specifications, Emulsified Asphalt Grades SS-1 or CSS-1, SS-1H or CSS-1H diluted in equal proportion with water; Asphalt Emulsified Grades AE-60, AE-90, AE-150 or AE-200 diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; special MS-Emulsion diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; Asphalt Emulsion Prime (AEP) meeting the requirements of Section 916-4, of the FDOT Specifications, or other types and grades of bituminous material which may be called for in the Plans or Special Provisions.
- B. The Contractor may select any of the specified bituminous materials unless the Plans or Special Provisions indicate the use of a specific material. Types and Grades of bituminous material other than those specified above may be allowed if it can be shown that the alternate material will properly perform the function of prime coat material.

2.3 COVER MATERIAL FOR PRIME COAT (REQUIRED)

- A. If an emulsified asphalt is used for prime coat, the Engineer may require that cover material be hot-asphalt coated (mix to contain from two to four percent asphalt-cement) if necessary to achieve a prime coat which will remain reasonably intact until the surface course is placed. If material other than emulsified asphalt is used for the prime coat, the cover material shall be either sand (bare or hot-asphalt coated) or screenings, at the Contractor's option. The sand shall be non-plastic and free from any appreciable amount of silt, clay balls and root particles, and from any noticeable sticks, trash, vegetation or other organic matter.

2.4 TACK COAT

- A. Unless a specific type or grade of material is called for in the Plans or Special Provisions, the material used for tack coat may be any of the following: Emulsified Asphalt, Grades RS-2 or CRS-2; Emulsified Asphalt, Grades SS-1 or CSS-1, SS-1H or CSS-1H (all diluted in equal proportions with water); Emulsified Asphalt, Grades AE-60, AE-90, AE-150 or AE-200, diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; Emulsified Asphalt, Grade CRS-2H; Special MS-Emulsion; Asphalt Emulsion Prime (AEP) (may be diluted with water at the ratio not to exceed 6 parts emulsified asphalt to 4 parts water) meeting the requirements of Section 916-4, of the FDOT Specifications.

PART 3 - EXECUTION

3.1 LIMEROCK BASE COURSE

- A. Equipment to construct the base course shall be as set forth in Section 200-3, FDOT Specifications.

- B. Limerock shall be transported to the point where it is to be used (placed on the roadbed) by hauling over previously placed rock and deposited at the end of the preceding spread material.
- C. The limerock shall be spread, compacted, finished, tested, primed and maintained in accordance with Sections 200-5 through 200-9 (inclusive) of the FDOT Specifications.
- D. In addition to the above requirements, the following shall apply:
 - 1. Section 200-7 shall only apply when the asphalt concrete surface course is to be paid for by the ton.
 - 2. The Contractor shall not be compensated for areas of limerock base that are thicker than shown on the Plans or Drawings. Areas of excess thickness shall not be used to compensate for areas of deficient thickness as set forth in Section 200-9.
 - 3. In maintaining the base the Contractor is required to place sandbag berms at each inlet so as to divert stormwater into the inlet. In all road sections with a grade greater than 2%, per the Drawings, the Contractor shall place sandbag berms at distances no greater than 200 feet between inlets.

3.2 PRIME COAT AND COVER MATERIAL (REQUIRED)

- A. Equipment to construct the prime coat and spread the cover material shall be as set forth in Section 300-3, FDOT Specifications.
- B. Cover material shall be transported over the portions of the roadbed previously coated with cover material.
- C. The prime coat and cover material shall be constructed in accordance with Section 300-4, -5, and -6 of the FDOT Specifications.

3.3 TACK COAT

- A. When a tack coat is required it shall be constructed as set forth in Section 300-7 of the FDOT Specifications.

3.4 TESTING

A. General

- 1. Testing Agency - The Agency shall be approved by the Engineer, and shall be the type and possess the degree of experience required. If required, furnish evidence of agency's ability to perform the test required in this Specification.
- 2. All testing shall be arranged and paid for by the Contractor.
- 3. The horizontal and vertical locations of the tests shall be reported. Station numbers shall be used with distances right or left of centerline or baseline. Testing to comply to Section 01410.

B. Frequency of Tests

- 1. LBR Test - One (1) for each 750 tons or portion thereof delivered to site. The LBR shall be conducted by the quarry and results sent to the Engineer.

2. In-situ Density - One (1) for each 500 square yards or part thereof finished as a unit, but in no case less than two tests or at intervals of not more than 200 feet.
3. Thickness - Thickness of the base shall be determined at all density test sites at intervals of not more than 200 feet.
4. Proof Rolling - Prior to asphaltic concrete placement, the base shall be proof-rolled with heavy pneumatic-tired rollers having unit pressures of 200 psi. All soft, loose, or yielding areas of base shall be excavated and filled with sand-asphalt hot mix (500 lb. Marshall Stability) and compacted.
5. Contractor shall provide template and conduct cross section/crown test in the presence of the engineer.

END OF SECTION 310252

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing vegetation where improvements are proposed.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, moving, and removing site utilities or abandoning site utilities in place.
 - 7. Temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Retain one of first two paragraphs below; revise to define "topsoil" according to local practices if required. Topsoil is raw material that typically needs screening and amending before meeting planting soil mix requirements. First paragraph assumes topsoil depth is known and shown or specified; second paragraph assumes that Contractor will identify and determine depth of existing topsoil. Coordinate with "Topsoil Stripping" Article.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct pre-construction conference at Project site.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Engineer or Owner.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material. in Section 312000 "Earth Moving."
1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag/Wrap a 1-inch (25-mm) blue vinyl tie tape flag around each tree trunk at 54 inches (1372 mm) above the ground.
- C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect/Engineer.

3.4 EXISTING UTILITIES

- A. Contractor to gain approval from Owner before disconnecting and sealing indicated utilities that serve existing structures before site clearing.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner and Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections and with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections and Section 024116 "Structure Demolition" and Section 024119 "Selective Structure Demolition."

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
 3. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm) and compact each layer to a density equal to adjacent original ground.
- 3.6 TOPSOIL STRIPPING
- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 2. Do not stockpile topsoil within protection zones.
 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
 4. Stockpile surplus topsoil to allow for respreading deeper topsoil.
- 3.7 SITE IMPROVEMENTS
- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.
- 3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS
- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 32 02 51 – CONCRETE CURBS, CURBS AND GUTTERS, AND SIDEWALKS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes all labor, materials, transportation and equipment necessary to properly perform all work specified here, indicated on the Drawings, or reasonably implied to complete the construction. Included as a part of the work of this Section, but not necessarily limited by it, are curbs, curbs and gutters and sidewalks.

1.2 REFERENCED SPECIFICATIONS

- A. All materials and methods of construction shall conform to the requirements of the "Florida Department of Transportation, Standard Specifications for Road and Bridge Construction" therein.
- B. Section 310220 - Earthwork

PART 2 - MATERIALS

2.1 CONCRETE

- A. Curbs, curbs and gutters shall be Class I concrete as required in Section 346 of the FDOT Standard Specifications. Concrete for retaining walls shall be Class II as specified therein.

2.2 REINFORCEMENT

- A. Any steel reinforcement shall conform to the requirements of Section 415 of the FDOT Standard Specifications.

2.3 JOINT MATERIALS

- A. Joint materials shall be in accordance with Section 932-1, FDOT Standard Specifications.

PART 3 - EXECUTION

3.1 CURBS AND CURBS AND GUTTERS

- A. Curbs and curbs and gutters shall be formed, excavated for, placed, constructed jointed, finished, cured and backfilled, and the concrete tested in accordance with Section 520 of the FDOT Standard Specifications.

3.2 SIDEWALKS

- A. Sidewalks shall be formed, excavated for, placed, jointed, finished and cured in accordance with Section 522 of the FDOT Standard Specifications.

3.3 MACHINE PLACEMENT

- A. Curbs, curbs and gutters, and sidewalks may be placed by machines at the Contractor's option. The finished product shall be true to line, grade and cross-section as shown on the Drawings.
- B. Notwithstanding Sections 520 and 522 of the FDOT Standard Specifications, the following shall apply to items placed by machines.

- C. Contraction joints shall be sawed. Joints shall be sawed as soon as the concrete has hardened sufficient that raveling will not occur and within 24 hours of placement. Sawing shall be with mechanically driven carborundum or diamond saws. The depth of cut shall not be less than 2 inches.
- D. Construction joints shall be sawed. The time element for sawing shall be as set forth above. Construction joints occur at the beginnings and ends of runs by machine placement. Saw cuts shall be made the full height of vertical faces before the wasted material is removed.

END OF SECTION 320251

SECTION 32 02 52 – ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes all labor, materials, transportation and equipment necessary to properly perform all work specified here, indicated on the Drawings, or reasonably implied to complete the construction. Included as a part of the work of this Section, but not necessarily limited by it, are the following items:

- 1. Superpave Asphalt Concrete (SP) PG-67-22 Traffic Level B with Reclaimed Asphalt Pavement Material (RAP) maximum of fifteen percent (15%)

1.2 RELATED WORK

- A. The following items of related work are included and specified in other Sections of these Specifications:

- 1. Earthwork
 - 2. Base Course
 - 3. Curbs and Curb and Gutters

1.3 DESCRIPTION OF PAVING

- A. Pavement shall be constructed over the existing pavement or bases constructed as specified, and shall conform to grades, lines, and dimensions as indicated on the Drawings. Type of surface course to be specified on the Plans.

1.4 COMPLIANCE WITH STANDARDS

- A. All work in this Section shall meet requirements and recommendations of applicable portions of standards listed. In cases of conflict between the referenced Specifications or standards, the one having the more stringent requirements shall govern.

- 1. American Association of State Highway and Transportation Officials – AASHTO
 - 2. Florida Department of Transportation - FDOT

1.5 SUBMITTALS

- A. Mix Design - Submit mix design for approval by the Engineer. No asphalt pavement shall be constructed until the mix design is approved.
- B. Test Reports - Submit test reports indicating the results of testing specified herein to the Engineer.

1.6 JOB CONDITIONS

- A. Existing Conditions - Examine surfaces to receive work specified herein, for defects that will adversely affect the execution and quality of the work, and for deviations beyond allowable tolerances. Do not start work until all unsatisfactory conditions are corrected.

B. Environmental Requirements - Temperature and weather conditions shall be within the requirements specified in Sections 334 of the FDOT Standard Specifications.

C. Protection of Work

1. Protect graded surfaces from damage by other construction work. Replace damaged materials.
2. Do not permit traffic on finish until surfaces have hardened sufficiently to prevent marring or distorting.

PART 2 - MATERIALS

A.1 ASPHALTIC CONCRETE

A. Superpave Asphaltic Concrete (SP) shall meet Section 334, FDOT Standard Specifications.

B. Notwithstanding the above, the following shall also apply:

1. Gravel, when used in any of the above mixtures, shall be crushed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. 1. Superpave Asphaltic Concrete (SP) shall meet Section 334, FDOT Standard Specifications.

3.2 TESTING

A. General

1. Testing Agency - The Agency shall be approved by the Engineer
2. The Contractor shall arrange and pay for all tests required herein.
3. Except as modified herein below, the type, number, frequency, and methods of testing and the evaluation and meaning of test results shall be as set forth in Sections 334 of the FDOT Standard Specifications as applicable to Superpave.

B. Field Testing

1. The project shall be tested at random intervals for each 2000 tons, or fraction thereof, of each type of asphaltic concrete. The following tests shall be conducted as a minimum:
 - a. Mix Proportions - Each day's production shall be tested for compliance with the mix design as to gradation and asphalt content.
 - b. Surface Requirements, Density and Thickness - Each 300 linear feet of paving lane or part thereof shall constitute a Lot and shall be tested for surface requirements, density and thickness.

END OF SECTION 320252

SECTION 32 02 93 – SODDING, SEEDING, AND MULCHING FOR SITE STABILIZATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to stabilize disturbed areas with seeding and mulching as shown on contract drawings and as specified. Sod and seed species to be approved by the Florida Park Service. Contractor must submit variety/species of sod or seed to Owner, or Owner's representative, for approval prior to placing.
- B. Areas to receive Centipede (or approved equal) sod shall be:
 - 1. Five foot wide strip along edge of all asphaltic concrete paving constructed as a part of this contract. This includes roadways and parking areas.
 - 2. Five foot wide strip around the perimeter of all concrete structures constructed or reconstructed as a part of this contract. This includes drainage structures, slabs, and pump stations. However, sod is not required around manholes nor fences.
 - 3. All side slopes interior/exterior of the proposed stormwater management facility
 - 4. All areas in lawns disturbed by Contractor.
 - 5. Five foot wide strip along the outer edge of the all sidewalks constructed or reconstructed as a part of this contract.
 - 6. All Landscape areas.
- C. Areas to receive seed and mulch shall be:
 - 1. All areas disturbed by Contractor that are not required to be sodded.
 - 2. All areas indicated on the drawings.

1.2 SUBMITTALS

- A. Contractor shall submit to the Owner's representative a signed statement of total weight for each type of seed and fertilizer actually installed on the project with copies of purchase receipts.

PART 2 - MATERIALS

2.1 MULCH

- A. The mulch used shall be dry mulch straw, hay, pine straw, leaf litter, shredded or fine bark, as approved by the owner.

2.2 SEED

- A. Grass seed shall be approved by the owner. Seed, which has become wet or moldy shall not be used. All seed shall meet the requirements of Section 570 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction 1991.

2.3 FERTILIZER

- A. Commercial fertilizer shall be allowed if approved by the Owner. Contractor shall comply with the State fertilizer laws. The numeral designations for fertilizer indicate the minimum percentage

(respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash, contained in the fertilizer. The chemical designation shall be 12-8-8. Either dry or liquid fertilizer may be used.

2.4 SOD

- A. Sod shall be 99.9% centipede, or owner approved equal. Sod shall meet the applicable requirements of Sections 575 and 981, of the "Florida Department of Transportation Standard Specification for Road and Bridge Construction", (1991). Sod netting is not allowed.

2.5 WATER

- A. The Water used in the grassing operations shall be free of excess and harmful chemicals, acids, alkalies, or any substance, which may be harmful to plant growth or obnoxious to traffic. Saltwater shall not be used.

PART 3 - EXECUTION

3.1 LAWN BED PREPARATION

- A. Areas to be seeded shall be cleared of all rough grass, weeds, and debris, and the ground brought to an even grade as approved. The soil shall then be thoroughly tilled to a minimum 8-inch depth. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.2 SEEDING AND MULCHING

- A. Fertilizing, seeding or mulching operations will not be permitted when wind velocities exceed 15 miles per hour. Seed shall be planted or sown only when the soil is moist and in proper condition to induce growth.
- B. Apply the lawn seed with a drop type spreader at the rate of eight (8) pounds per one thousand (1,000) square feet.
- C. Apply half the seed in one direction and the remainder at right angles to the first seeding.
- D. After applying the seed, rake the seed into the seed bed and roll with a lawn roller.
- E. Seeded areas shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations, using at least 1 1/2 tons of hay or straw per acre. Hay with noxious seeds or plants will not be acceptable. Rotted, brittle, molded hay will not be accepted. It is intended that mulch shall allow some sunlight to penetrate and air to circulate, at the same time shading the ground, reducing erosion and conserving soil moisture. Thickness of covering shall be adequate to hold soil but sufficiently loose and open to favor development of grass. Immediately following spreading of mulch, material shall be anchored to soil by means of a seed drill, dish harrow set to cut only slightly, or other suitable equipment which will secure mulch firmly and prevent loss or bunching by wind or rain, or may be anchored with string lines placed at sufficient intervals. On slopes where machinery cannot be used mulch may be retained in place by hand spading, string lines, or non-metallic open weave fabric. Unless rain is imminent, mulched areas shall be watered immediately after placing. Upon completion, surface or mulched areas shall be free from clods of earth, bumps, or waterholding pockets and to required grades.

3.3 SODDING

- A. Sodding shall be incorporated into the project at the earliest practical time in the life of the

contract. No sod which has been cut for more than 72 hours shall be used unless specifically authorized by the Engineer after his careful inspection thereof. Any sod, which is not planted within 24 hours after cutting, shall be stacked in an approved manner and maintained properly moistened.

- B. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.
- C. The sod shall be placed on the prepared surface, with edges in close contact, and shall be firmly and smoothly embedded by light tamping with appropriate tools.
- D. Where sodding is used in drainage ditches, the setting of the pieces shall be staggered such as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas the offsets of individual strips shall not exceed six inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.
- E. On areas where the sod may slide, due to height and slope, the Engineer may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.
- F. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed from the work.

3.4 MAINTENANCE

- A. Maintenance shall begin immediately following the last operation of grassing and continue until final acceptance. Maintenance shall include watering, mowing, replanting, and all other work necessary to produce a uniform stand of grass.
- B. Sufficient watering shall be done by the Contractor to maintain adequate moisture for optimum development of the lawn areas. Grassed areas shall receive no less than 1.5 inches of water per week.
- C. Grassing will be considered for final acceptance when the permanent grass is healthy and growing on 95 percent of the area with no bare areas wider than twelve (12) inches.

END OF SECTION 320293

SECTION 33 02 66 – WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Work under this section consists of furnishing all materials, supplies, equipment and labor in accordance with the requirements set forth herein and as shown on the drawings.

1.2 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

- A. The work under this contract shall be in strict accordance with the following codes and standards:
 - 1. Local, county and municipal codes;
 - 2. American Society for Testing and Materials (ASTM);
 - 3. American National Standards Institute;
 - 4. American Water Works Association (AWWA);
 - 5. American Association of State Highway and Transportation Officials (AASHTO);
 - 6. Florida Department of Environmental Regulation (FDER)
 - 7. Florida Department of Transportation Specifications (DOT);
 - 8. Federal Specifications;
 - 9. United States Department of Commerce Commercial Standards (CS); and
 - 10. All local government rules and regulations.

1.3 CONTRACTOR LICENSE

- A. Contractor and Subcontractor shall possess valid licenses required by state and local codes. All water main work shall be performed by a State of Florida licensed Underground Utility Contractor. All plumbing work on private property shall be performed by a licensed plumber.

1.4 SHOP DRAWINGS AND SUBMITTALS

- A. Shop drawings shall be submitted for items included under this Section and shall include the following minimum information:
 - 1. Full details of pipe, fittings, special joints, and assembly thereof, including manufacturer's name;
 - 2. Joint materials and details;
 - 3. Catalogue cuts, dimensions and full details of all castings, valves and appurtenances;
 - 4. Certifications as specified herein; and
 - 5. Reinforcing steel bending and setting drawings.
- B. Furnish sworn certificates in duplicate that all tests and inspections required by the Specifications under which the materials were manufactured have been satisfied.

1.5 RELATED WORK

- A. Testing
- B. Earthwork

1.6 INSPECTION

- A. All pipe and fittings to be installed under this Contract may be inspected at the site of manufacture for compliance with these Specifications by an independent laboratory selected by the Owner. The manufacturer's cooperation shall be required in these inspections. The cost of inspection by an independent laboratory will be borne by the Owner.

1.7 MANUFACTURER TESTING OF PIPE AND FITTINGS

- A. Each joint of pipe 6 inches in diameter and larger shall be hydrostatically tested at the point of manufacture as required by the appropriate AWWA Standard. Owner may request that certificates of compliance be furnished with the material.
- B. All ductile and cast iron fittings to be furnished under this Contract shall be inspected and tested at the foundry as required by the AWWA Standard C-110, Section 10-10.
- C. Provide letters of certification of all tests.

PART 2 - MATERIALS AND EQUIPMENT

2.1 GENERAL

- A. Unless otherwise specified or shown on the drawings, materials and equipment shall be the standard product of a manufacturer and shall comply with the Contract Documents and applicable standards for such materials or equipment.

2.2 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe shall conform to the requirements of AWWA C-150 unless other wise noted on the plans. The pipe shall be Class 51 thickness. Glands for mechanical joints shall be ductile iron or cast iron. Pipe shall be as manufactured by American Case Iron Pipe Co., Clow, or equal.
- B. Fittings shall conform to the requirements of AWWA C-110. Fittings shall be mechanical joint and shall have a 350 psi minimum working pressure. Fittings shall be as manufactured by U.S. Pipe Co., American Cast Iron Pipe Co., Clow or equal.
- C. Flanged fittings shall conform to ANSI B16.1, screwed-on flanges, faced and drilled to ANSI Class 125-pound template. They shall provide 1/16-inch full face gaskets of red sheet rubber.
- D. Joints shall conform to the requirements of AWWA C-111.
- E. Coatings and Linings of the internal surfaces of all ductile iron pipe and fittings for water mains shall be coated with a cement lining and seal coat in accordance with AWWA C104. The outside surface shall be coated with a bituminous coating approximately one mil thick.
- F. All pipe shall be given a factory hydrostatic test of not less than 600 pounds per square inch.

2.3 POLYVINYL CHLORIDE PIPE (PVC) AND FITTINGS

- A. PVC pipe for potable water in sizes 4 inch through 12-inch shall conform to AWWA Standard C900-89, "PVC Pressure Pipe for Water". Laying lengths shall be 20 feet $\pm$ 1 inch for all sizes.
- B. Pipe shall have an integral bell end or extruded coupling with gasket seal which is in compliance with the requirements of ASTM D3139, "Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals".

- C. Pipe shall be Class 150 (DR 18) with cast iron outside dimensions. Each piece of pipe shall be hydrostatically tested to 600 psi. Marking shall include nominal size and O.D. Base (e.g. 6 inch C.I.), material code designation number (PVC 1120), dimension ratio number (DR 18), AWWA pressure Class 150, AWWA designation AWWA C900, as manufacturer's name and production code. All PVC pipe shall be Underwriters Laboratory (UL) and Factory Mutual approved.
- D. PVC pipe in sizes under 4 inches shall be 200 psi (SDR 21) in IPS dimensions manufactured from 1120 PVC resin. Pipe shall have integral wall bells or extruded couplings with gasket seals. Pipe shall be marked with manufacturer's name, size, material code (PVC 1120), pressure rating (200 psi), DR number (DR21).
- E. All taps on PVC pipe will be made through saddles or tapping sleeve and valve.
- F. Fittings for pipe smaller than 4 inches in diameter shall be PVC. Fittings for pipe 4 inches and larger shall be Ductile Iron conforming with the requirements of ANSI/AWWA C153/21.53-84.

2.4 WATER SERVICE PIPING

- A. Type "K" copper tubing with bronze compression fittings shall be used for ¾ inch through 2-inch services. Copper tubing size outside dimension ratio – 9 (SDR-9). No substitutes will be allowed. No flared or solder joints shall be allowed.

OR

- B. High Density Polyethylene (HDPE) tubing for water supply shall conform to AWWA C901. For HDPE tubing ¾" to 2" in diameter, dimensions shall conform to ASTM D2737 with copper tubing OD Base.

HDPE tubing pressure rating shall be Pressure Class 200 psi with a minimum working pressure of 150 psig, and comply with ASTM D 1598, D1599, D1693, D3350 and AWWA 901.

HDPE tubing material shall conform to ASTM D3350, Standard Code PE 3408, and shall have minimum cell classification of PE 35434C.

OR

- C. PVC pipe in sizes under 4 inches shall be 200 psi (SDR 21) in IPS dimensions manufactured from 1120 PVC resin. Pipe shall have integral wall bells or extruded couplings with gasket seals. Pipe shall be marked with manufacturer's name, size, material code (PVC 1120), pressure rating (200 psi), DR number (DR21).

2.5 DETECTABLE BURIED WARNING TAPE AND COPPER LOCATION WIRE

- A. Detectable buried pipe warning tape shall be 2 inches minimum width, long lasting plastic with metalized foil core specifically designed for non-metallic pipes and shall be placed over all PVC water lines and fittings. Metalized core shall be detectable to depths of up to 6 feet by use of commercially available pipe location equipment. Tape shall be furnished in manufacturer's standard color and roll length and shall be imprinted continuously with the following words unless otherwise approved: CAUTION BURIED WATER MAIN BELOW. Detectable buried warning tape shall be equal to or better than Terra Tape "D", as manufactured by Griffolyn Company Inc., 10020 Mykawa Road, Post Office Box 33248, Texas, 77033

- B. In addition to the installation of the detectable buried warning tape over all PVC water lines, the Contractor shall install an 14 gauge insulated copper wire directly on top of all PVC water lines and taped every ten feet for location purposes. The wire shall be continuous and all connections taped. Three feet of excess wire shall be left in all valve boxes. Each fire hydrant shall have one wrap of the wire around the barrel located at final grade and connected to the wire on the water main. No additional payment will be made for this wire and tape installation and will be included in the unit price per linear foot for PVC water pipe.

2.6 VALVES AND GATES

A. General

1. Unless otherwise indicated, valves three (3) inches and smaller shall be all brass or bronze, and valves larger than three (3) inches shall be iron body, bronze mounted. Unless otherwise indicated, gate, ball, globe, angle, and check valves three (3) inches and smaller shall be provided with threaded connections; those larger than three (3) inches shall be provided with connections as indicated. Connections shall conform to the herein above specified piping connections.
2. All valves shall be ample strength to withstand and operate satisfactorily under the working pressures and shall be subject to the test pressure specified herein. All valves shall be rated for a minimum cold water working pressure of 150 psi and a minimum test pressure of 300 psi, except as otherwise specified herein.
3. Tests shall be made in the shop with a hydrostatic water pressure, cost of tests to be merged in the cost of the valves, and any valves which leak or which show any defects shall be rejected.

B. Gate Values 4" and Larger (Resilient Wedge)

1. All valves in size four inch through 12 inch shall be of the resilient wedge gate type. Valves shall be manufactured to meet all applicable requirements of AWWA Standards for Resilient Seated Gate Valve C509-80. All valves of this type shall be bubble tight at 200 psi water pressure.
2. Valves shall have non-rising stems open by turning counter clockwise (left) and with two inch square operating nut with arrow cast in metal to indicate direction of opening.
3. The inside of the valve body and bonnet shall be lined with an epoxy coating. The lining shall be a two-part thermosetting epoxy resin applied by the manufacturer and equal to Endurall 3300.
4. Each valve shall have the manufacturer's name, pressure rating and year manufactured cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure.
5. All valves shall be the mechanical joint type as manufactured by Mueller, Clow, American, Dresser or equal.
6. Each valve shall be equipped with a valve box. For this project a total of two (2) tee handle socket valve wrenches shall be furnished by the Contractor to the Owner. The cost of value wrenches and boxes shall be included in the price of the valve.
7. All internal coatings shall be ANSI Standard 60 certified.

C. Gate Valves, Under 4 inches (Bronze)

1. Gate valves three (3) inches in size and smaller shall be 125 lb. bronze, rising stem, double wedge disc, union or screwed bonnet type. Valves shall be of a design to permit repacking under pressure. Unless otherwise indicated valves shall be equipped with handwheels. Each valve shall be equipped with a valve box.

2.7 VALVE BOXES

- A. All valves installed underground shall be provided with adjustable cast iron valve boxes to fit the depth of earth cover over the valve. Boxes shall be three piece adjustable screw type with a minimum inside diameter of 5". Boxes shall be furnished with case iron covers marked "Water" and so constructed as to be tight and non-rattling. Boxes shall be so designed as not to bear on the valve or pipeline or transmit any surface loads thereto.

2.8 FIRE HYDRANTS

- A. All fire hydrants shall fully comply with AWWA C-502 and be a mechanical-joint, dry barrel-traffic type as manufactured by Mueller Centurian No. 423 or equal. The size shall be six (6) inches in diameter by three (3) feet in length with a 1-1/2 inch Pentagon operating nut and equipped with two 2-1/2 inch hoses and one 4-1/2 inch pumper connections. The hydrant shall be painted fire engine red with caps equipped with chains.

2.9 HOSE BIBS

- A. Hose bibs shall be Crane No. 58 or equal of size shown on the Drawings.

2.10 CORPORATION STOPS AND CURB STOPS

- A. All corporation stops and curb stops shall be maintained and dimensioned in accordance with AWWA Standard C800. All compression fittings shall be designed for use with copper tubing size (CTS) service lines. "Ball type or Oriseal" valves shall be used in all sizes. Either Ford (pack joint), A. Y. McDonald (T-series), or Mueller (110 series) is approved for use. No substitutes.
- B. All corporation stops and curb stops will conform to the inlet and outlet configuration as listed below:

CORPORATION STOPS				
SIZE	3/4"	1"	1½"	2"
INLET	cc thread	cc thread	IP thread	IP thread
OUTLET	compression	compression	compression	compression

CURB STOPS				
SIZE	3/4"	1"	1½"	2"
INLET	compression	compression	compression	compression
OUTLET	female IP thread	female IP thread	female IP thread	female IP thread

2.11 SERVICE SADDLES

- A. For 3/4 inch and 1 inch taps on PVC pipe, a service saddle with a single 2 inch wide stainless steel band or strap shall be furnished. The saddle shall be of cast or ductile iron and shall be epoxy, nylon, or PE coated (10 mils minimum). Approved styles are Ford FC101, Romac 101N and Rockwell 315, or Cascade Model CNS1, or approved equal.
- B. For 1 1/2 inch and 2 inch taps on PVC pipe, a more stable saddle is required. Saddles for these taps shall have either two each stainless steel 2 inch straps or a single stainless strap a minimum of 3 1/4 inches wide. The saddle body shall be cast or ductile iron and shall be coated with epoxy or nylon. Approved styles are Ford FC202, Romac 202N and Rockwell 317, Cascade Model CNS2.
- C. As an equal alternate, service saddles may be Continental "Fasttap" model #5263-31-2506-00.

2.12 REPAIR OR JOINING CLAMPS

- A. If repair or joining clamps are required, Contractor shall notify Engineer for approval indicating make and model and intend use. Clamps shall be of non-corrosive material (i.e., stainless steel, cast iron, bronze) as manufactured by Rockwell or equal.

2.13 TAPPING SADDLES, SLEEVES AND CROSSES

A. Tapping Saddles

- 1. Tapping saddles shall be fabricated of ductile iron or steel and suitable for either wet or dry installation as manufactured by American Cast Iron Pipe Company, U.C. M. Corporation, or approved equal. The sealing gasket shall be the o-ring type suitable for the applicable service. The outlet flange shall be ANSI B16.1, 125 lb. standard.
- 2. The straps and bolts shall be corrosion resistant alloy steel.

B. Tapping Sleeves and Crosses

- 1. Tapping sleeves and crosses shall be of mechanical joint type with outlet flange per ANSE B16.1, 125 lb. standard as manufactured by Mueller No. 615 or 715, or approved equal.

C. Cut-In Sleeves

- 1. Cut-In sleeves shall be mechanical joint type class 150 ductile iron as manufactured by Mueller.

2.14 METER BOXES (if applicable)

- A. Meter boxes shall be concrete, plastic, or cast iron unless otherwise indicated on the plans or in the Bid Proposal. The inside dimensions shall be approximately 11" x 24", rectangular in shape with a hinged cast iron lid for reading the meter. The box shall be large enough to house the back flow preventor, meter, curb stop, and hand valve.

2.15 DOMESTIC WATER METER

A. General

- 1. The domestic meter shall be a positive displacement, 5/8 inch by 3/4 inch size unless otherwise indicated on drawings. It shall meet AWWA standards for displacement type

cold water meters. The water meter shall be a Rockwell SR or approved equal.

B. Meter Construction

1. Main Case
 - a. The meter shall have a bronze main case. The bronze case must be able to withstand internal pressure and external stress without distortion, cracking or breaking to cause leaking or to interfere with the proper operation of the meter. The meter shall have a strainer to prevent foreign material from entering the measuring chamber.
2. Register
 - a. The register shall be hermetically sealed and magnetically driven. The registration reading shall be U.S. gallons with a 10 gallon sweepband and shall have a capacity of 1,000,000 gallons.
3. Accuracy and Operating Range
 - a. Normal operating flow range of the meter shall be 1 to 20 gallons per minute and accuracy at the normal flow range shall be 100 ± 1.5 percent of actual flow. Low flow registration shall be 95 percent at 1/4 gallons per minute. Maximum pressure loss at 20 gallons per minute shall not exceed 11 psi. Maximum operating pressure shall be 140 psi.

C. Workmanship and Materials

1. The supplier and manufacturer shall warrant the meter including register for a period of twenty-five (25) years. The supplier shall replace or repair, without charge, those parts in which a defect has developed within the specified warranty period upon return of such parts.
2. The meter installation shall be warranted for a period of twelve (12) months.

2.16 GLOBE SERVICE VALVES (HAND VALVE)

- A. Globe service valves (hand valves) shall be installed inside meter box. Valves shall be 3/4" size with 3/4" iron pipe threads end configuration. Globe service valves shall be Ford G11-333 or approved equal.

2.17 ANGLE BALL METER VALVES

- A. Angle ball meter valves shall be 5/8" size with inlet pack joint for 3/4" plastic tubing. Angle ball meter valves shall be Ford BA43-232W or approved equal.

2.18 RESIDENTIAL BACKFLOW PREVENTER

- A. Residential backflow preventers shall be Mueller RPZ Model H-14242 or approved equal.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Safety

1. In the Contractor's use of streets and highway for the work to be done under these Specifications he shall conform to all City, State, and local laws and regulations. The Contractor shall provide, erect, and maintain effective barricades, danger signals, and

signs on all intercepted streets or highways for protection of the work and safety of the public rights-of-ways shall be provided with lights which shall be kept burning at all times between sunset and sunrise. The Contractor shall be responsible for all damages resulting from any neglect or failure to meet these requirements. Where conditions require the presence of a watchman to fulfill the requirements stated herein, same shall be furnished without extra cost to the Owner.

B. Maintenance of Service

1. The Contractor shall arrange his work to cause minimum disturbance of normal pedestrian and vehicular traffic and will be held responsible for providing suitable means of access to all public and private properties during all stages of the construction. Should the construction work require repairs, changes or modifications of other utilities, it shall be the responsibility of the Contractor to provide for the maintenance of continuous water, electric, telephone, and gas as well as sewage and other utility services to all present customers of such utilities, unless approval in writing is secured from the utility company for interruption of such service.

C. Limits of Construction

1. In locations where the work is to be installed in streets or road right-of-way the activities of the Contractor shall be confined to these public properties. Where the use of private property is deemed necessary by the Contractor to facilitate construction work arrangement for such use with the property Owner shall be the responsibility of the Contractor. The Contractor shall save the Owner harmless from all claims by adjacent property owners for trespassing or damage due to the activities of the Contractor in the prosecution of the work.

D. Existing Utilities

1. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.
2. All existing improvements such as pavements, conduit, poles, pipes and other structures, shall be carefully supported and fully protected from injury. The Contractor shall be responsible for damages to these existing utilities and shall, in case they are damaged, restore them to their original condition at no cost to the owner.
3. Contractor shall give written notice to the Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of work. This can be accomplished by making the appropriate contact with the following utility companies listed on page 2 of the plans.

3.2 PIPE INSTALLATION

A. Connections to Existing Mains

1. It is the Contractor's responsibility to make exploratory excavations and/or use other methods available to locate valves, fittings and piping prior to construction of any underground piping system and to adjust the new piping layout to agree with existing piping layout prior to construction and at no additional cost to the Owner. All adjustments

shall be subject to approval by the Engineer prior to installation.

2. Prior to any connection to existing mains, all new water mains and service lines must have passed all pressure and disinfection test as required herein and written permission must be obtained from the Engineer authorizing the connection. The Engineer's authorization shall only be given after a clearance or partial clearance is issued by the Florida Department of Environmental Regulation.
3. Contractor shall have all fittings and equipment and adequate labor on-hand so as to make as quick as possible connection to minimize interruption of water service. Engineer shall specify time of day and day of week for connection to minimize effects of interruption. Contractor shall notify Engineer and utility owner 48 hours prior to connection. Engineer may require Contractor to use restraint rods, retainer glands or other methods in place of thrust blocks to avoid time required for concrete to harden.

B. Separation

1. Water and sewer separation shall adhere to F.A.C. 62-555.314. Water and sewer lines shall maintain a horizontal separation of 10 feet or a vertical separation of 18 inches. When this is not possible, concrete encasement of pipe for a distance of ten feet each side of the sewer main shall be used. In lieu of the concrete encasement, ductile iron pipe may be used. A minimum vertical separation of 6 inches shall be maintained with all other utilities.

C. Excavation, Backfill and Compaction

1. Excavation, backfill and compaction shall meet the requirements of Section 02200, Earthwork and as shown on the drawings.

D. Field Layout

1. Only approximate location of lines are indicated on drawings. Field adjustment of location will be required. Consult Engineer for proper adjustments.

E. Depth of Cover

1. Where elevations are not indicated, lay water main lines with a minimum of 36 inches of cover unless shallower depths are specifically indicated on the drawings. Greater depths will be permitted where required to miss obstructions or for proper installation of valves, hydrants, or specials. Pipe shall not be deflected more than manufacturer's recommendation.
2. Service lines shall have a minimum cover of 18 inches.

F. Well Pointing

1. Water shall not be allowed in the trench at any time. An adequate supply of well points, headers or pumps, all in first class operating conditions, may be used to remove the water. The use of gravel and pumps shall also be an acceptable means of removing the water. The trench shall be excavated no more than the available pumping facilities are capable of handling. This discharge from pumps shall be routed to natural drainage channels or emptied into drains or storm sewers.

G. Ductile Iron Pipe (D.I.P.)

1. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA Standard Specification C600 and the Handbook of Ductile Iron Pipe, 6th Edition.

H. Polyvinyl Chloride Pipe (PVC)

1. PVC pipe and fittings shall be installed in accordance with the Handbook of PVC Pipe, 2nd Edition.

I. Pipe Laying

1. The bottom of the trench shall not be excavated below the specified grade. If undercutting occurs, the bottom of the trench shall be brought up to the original grade with approved material, thoroughly compacted as directed by the Engineer.
2. After placing a length of pipe in the trench, the spigot end shall be centered in the bell, the pipe forced home, brought to correct alignment, and covered with an approved backfill material.
3. When pipe laying is not in progress, the open ends of pipe shall be closed by a water tight plug or other approved means. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
4. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe.
5. Lines shall be laid reasonably straight and any change in grade following the contour of the ground shall be made in long sweeping curves and no abrupt changes in direction or grade will be allowed except as indicated on the Drawings.

3.3 INSTALLATION OF COPPER LOCATION WIRE AND DETECTABLE WARNING TAPE

- A. Installation of the 14 gauge insulated copper wire and the detectable buried warning tape shall be installed by the Contractor over all PVC and plastic water mains and service lines as indicated on the Drawings and specified here, except the detectable tape is not required over service lines. Following trenching and laying of the water main line, the trench shall be backfilled and compacted as specified elsewhere to a depth of 16 inches $\pm$ 2 inches measured from ground level. Tape shall then be placed into the trench with the wording side visible and centered directly above the pipe below. Installation of the tape shall be in accordance with the manufacturer's recommendations, except as otherwise specified or approved. Tape shall run continuously. Where splicing is required, tape shall be over-lapped a minimum of 12 inches.
- B. Following placement of the tape, the trench shall be backfilled with due caution to prevent displacement or damage to the tape. After the tape has been installed and the trench backfilled, the Contractor shall perform a detection test using a commercially available pipe detector furnished by the Contractor. Any undetectable tape shall be replaced by the Contractor to the satisfaction of the Engineer at no additional expense to the Owner.

3.4 VALVES AND FITTINGS

- A. All valves and fittings shall be set and joined to the pipe in the proper location as specified in the Drawings. A valve box shall be provided for every valve. This valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the final grade or as may be specified in the Drawings.

3.5 THRUST BLOCKS

- A. Longitudinal thrust along pressurized pipe lines at bends, tees, reducers, and caps or plugs shall be counteracted by enough weight of concrete to counterbalance the vertical and horizontal thrust forces. Where undisturbed trench walls are not available for thrust blocking, the Contractor shall furnish and install suitable pipe harnesses or ties designed and manufactured for this purpose. Harnesses and/or ties shall be approved by the Engineer.
- B. Thrust blocks shall be sized for 150 psi hydrostatic pressure, with dimensions as indicated on the Water Detail Sheet. Restrained joints shall be used where directed by the drawings and may be used at other locations with prior approval by the Engineer. Joints shall be protected by felt roofing paper prior to placing concrete thrust block.
- C. Concrete for thrust blocking shall be no leaner than one part cement, 1 1/2 parts sand, and 5 1/2 parts aggregate having a compressive strength of 2000 psi. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.
- D. In lieu of thrust blocking, with the approval of the Engineer, pipe harnesses and/or ties or restrained push-on or restrained mechanical joints may be used.

3.6 RESTRAINED JOINTS

- A. Sections of piping designated on the drawings as having restrained joints or those requiring restrained joints due to insufficient time to allow curing of concrete thrust blocks shall be constructed using pipe and fittings with restrained "locked-type" joints, retainer glands, or tie rods, and the joints shall be capable of holding against withdrawal for line pressures up to 150 pounds per square inch (psi). Tie rods, clamps, or other dissimilar metal shall be protected against corrosion by hand application of a 2.0 mils thick bituminous coat. Bolts, nuts, and tie rods shall be hot dipped galvanized, low alloy, high-strength steel. Tie rods, tie bolts, and hairpins shall have a minimum diameter of 3/4 inch, and 7000 pound tensile strength.
- B. Contractor shall submit type and method of restrained joints to Engineer for approval prior to use.

3.7 SERVICE TAPS

- A. All tapping shall follow manufacturer's recommended procedures. Taps will be located at 10:00 or 2:00 on the circumference of the pipe. Direct taps will be allowed only on ductile iron pipe. All other materials will be tapped with a saddle. Teflon tape for sealing and lubricating will be used on the threads of all corporation stops. Torque on corporation stops will not exceed manufacturer's recommendations. Allowance for any possible movement in the main will be made by making a half loop in the service piping at the tap and compacting backfill to 100 percent standard proctor under this loop.

3.8 SERVICE LATERALS

- A. Water Service laterals shall be continuous with no joints from the water main to the water meter unless specifically allowed by the Engineer. However, in no case will joints be allowed under roadways.
- B. Laterals may be installed by the open trench method except for paved areas. Under paved areas service laterals shall be installed by the dry-uncased boring method unless otherwise specifically indicated on the plans.
- B. The dry-uncased boring method or "push-pull" method shall be used to eliminate the need for open cutting of streets or sidewalks. The Contractor shall use equipment specifically designed for this purpose such as the Mighty Mole or the Trojan Workhorse Pusher. The push rod shall be of

the size compatible with the service lateral. The rod shall be pushed under the paved area and then the pipe attached and pulled back through. The pits for the operation shall be no closer than 3 feet to the edge of payment. In no case shall a wet boring method be allowed.

3.9 PRESSURE AND LEAKAGE TESTS OF WATER DISTRIBUTION PIPING

- A. Contractor shall furnish all gauges, meters, pressure pumps, equipment, fittings, and labor needed to test the line. The cost of these items shall be included in price of pipe. Contractor shall notify Engineer 48 hours prior to start of test. All pipe installed shall be tested and written acceptance issued by the Engineer prior to connection of new line to existing water system. The pressure test shall include service lines to the curb stop.
- B. The Contractor may test the system with joints exposed or backfilling complete at his option. The contractor shall obtain and pay for all water used. Care shall be used to prevent backflow of test water into potable water source. Potable water source shall be disconnected prior to pressurizing test line. Water used during test shall be taken from a container, not directly from the existing water system.
- C. The pressure required for the field hydrostatic pressure test shall be 150 psi. The Contractor shall provide temporary plugs and blocking necessary to maintain the required test pressure. Corporation cocks at least 3/4 inches in diameter, pipe risers and angle globe valves shall be provided at each pipe dead-end and high points in order to bleed air from the line. Duration of pressure test shall be at least two hours. All leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves and accessories shall be removed and replaced. The pipe lines shall be tested in such section as may be directed by the Engineer by shutting valves or installing temporary plugs as required. The line shall be filled with water, all air removed, and the test pressure shall be maintained in the pipe for the entire test period by means of a gasoline or electric driven test pump to be furnished by the Contractor. Accurate means shall be provided for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage.
- D. No pipe installation will be accepted until or unless the leakage (evaluated on a pressure basis of 150 psi) is less than 2.2 gallons per 24 hours per thousand feet per inch nominal diameter. The following tabulates the allowable leakage.

Allowable Leakage Per 1000 ft of Pipeline (In Gallons)								
Duration of Test	Nominal Pipe Diameter							
	2"	3"	4"	5"	6"	8"	10"	12"
1 hour	0.18	0.28	0.37	0.46	0.55	0.74	0.92	1.10
2 hour	0.38	0.56	0.74	0.92	1.10	1.48	1.84	2.20

- E. Where any section of a main is provided with concrete reaction backing the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction backing was installed. If high early-strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least three (3) days have elapsed.

3.10 FLUSHING OF COMPLETED PIPELINES

- A. Following the hydrostatic test and backfilling, each section of completed pipeline shall be as thoroughly flushed as possible. A minimum flow shall be used for flushing that will insure a velocity in the pipe of 2.5 feet per second. Water required for testing and flushing shall be furnished by the Contractor. The water shall be from a potable water source satisfactory to the Owner.

3.11 DISINFECTING POTABLE WATER PIPELINES

- A. Following flushing, the Contractor shall disinfect all water distribution mains and service lines in accordance with AWWA Specification C651-86 and with the State of Florida Health Standards. Water shall be fed slowly into the system applying sufficient chlorine to produce a dosage in excess of 50 ppm at the farthest point in the system from the point of application. The chlorine solution then shall be retained in the line for a minimum period of 24 hours. At the end of this time if a minimum chlorine residual of 5 ppm is not obtained, the procedure shall be repeated. During the disinfection process all valves shall be operated. After disinfection, the water shall be flushed from the system at its extremities until excessive chlorine residuals are eliminated. The water shall also be flushed through the service lines. The lines shall then be refilled with potable water. Bacteriological sampling and analysis of the replacement water shall be taken by the Contractor as directed by the Engineer or County Health Department and submitted to the nearest approved bacteriological laboratory. Disinfection shall not be considered satisfactory until laboratory reports are satisfactory to the Division of Health and clearance granted by F.D.E.P. Each sample point shall have two consecutive passing tests taken no less than 24 hours apart.
- B. For water main sections less than 200 feet in length, a minimum of 2 bacteriological sample points shall be tested, one from each end of the pipe section. For water main sections greater than 200 feet in length, a minimum of 3 bacteriological sample points shall be tested, one at each end and one near the midpoint of the section of pipe. But in no case shall less than one bacteriological sample point be tested for each 300 lineal feet of pipe.
- C. Water required for disinfection, testing and flushing shall be furnished by the Contractor. The water shall be from a potable water source satisfactory to the Owner. All cost associated with disinfecting including the cost of the water shall be included in the unit cost of the pipe and no separate payment will be made for this item.
- D. Contractor shall not make any connection to existing water system nor place any water line in operation until all pressure and bacteriological test have been successfully completed and written authorization issued by the Engineer with clearance granted by F.D.E.P.
- E. NOTE: H.T.H. should be applied at a rate of 0.7 pounds per 1000 gallons. Calcium hypochlorite tablets (H.T.H.) containing 70 percent available chlorine may be used when water mains are 12 inches and smaller and lengths up to 2,500 feet. The water main shall be disinfected with a concentration of 50 PPM chlorine. The H.T.H. tablets shall be glued with a #1 Permatex. They shall be placed one foot from the end of the top innerside of the pipe. The following table was computed with 20 feet joints of pipe.

4" pipe use 1 H.T.H. tablet or 0.5 lb. per 1000 feet of pipe
6" pipe use 2 H.T.H. tablets or 1.0 lb. per 1000 feet of pipe
8" pipe use 3 H.T.H. tablets or 1.8 lb. per 1000 feet of pipe
10" pipe use 5 H.T.H. tablets or 3 lb. per 1000 feet of pipe

12" pipe use 7 H.T.H. tablets or 4.1 lb. per 1000 feet of pipe

- F. Tablets shall be placed in each section of pipe, fire hydrants, and hydrant branches.

3.12 RESTORATION OF DAMAGED SURFACES, STRUCTURES AND PROPERTY

- A. Where pavement, trees, shrubbery, fences or other property and surface structures not designated as pay items, have been damaged, removed or disturbed by the Contractor whether deliberately or not, such property and surface structures shall be replaced or repaired at the expense of the Contractor to a condition equal to that before work began within a timeframe approved by the Engineer.

END OF SECTION 330266

SECTION 33 02 73 – SANITARY SEWERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work includes furnishing all labor, materials, equipment and incidentals necessary for the complete installation of all gravity sewer lines, manholes, fittings and appurtenances as shown on the drawings and as specified herein.

1.2 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

- A. The work under this contract shall be in strict accordance with the following codes and standards:
 - 1. Local, county and municipal codes;
 - 2. American Society for Testing Materials (ASTM);
 - 3. American National Standards Institute;
 - 4. Southern Building Code - Standard Plumbing Code; and
 - 5. Florida Department of Environmental Regulation. (FDER)

1.3 CONTRACTOR LICENSE

- A. Contractor and Subcontractor shall possess valid licenses required by state and local codes. All sewer main work shall be performed by a State of Florida licensed Underground Utility Contractor. All plumbing work on private property shall be performed by a plumber licensed in the local community or county of the job site.

1.4 SHOP DRAWINGS AND SUBMITTALS

- A. Shop drawings shall be submitted for items included under this Section and shall include the following minimum information:
 - 1. Full details of pipe, fittings, special joints, and assembly thereof, including manufacturer's name;
 - 2. Joint materials and details;
 - 3. Catalogue cuts, dimensions, full details and loading capacity of manhole frames and coverings;
 - 4. Certifications as specified herein; and
 - 5. Reinforcing steel bending and setting drawings.
- B. At the Engineer's option, furnish sworn certificates that all tests and inspections required by the Specifications under which the materials were manufactured have been satisfied.

1.5 RELATED WORK

- Testing
- Earthwork
- Boring and jacking

PART 2 - MATERIALS AND EQUIPMENT

2.1 GENERAL

- A. Unless otherwise specified or shown on the drawings, materials and equipment shall be the standard product of a manufacturer and shall comply with the Contract Documents and applicable standards for such materials or equipment.

2.2 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe shall conform to ANSI A21.51. Ductile iron shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi. Thickness of pipe to be supplied shall be one class greater than that required under Table 50.12 AWWA C150 (ANSI 21.50) and not less than Class 51 unless specifically called out on the Drawings.
- B. Pipe shall be supplied in lengths not in excess of a nominal 20 feet. Pipe shall be rubber-ring type push-on joints.
- C. All ductile iron pipe fittings shall be cast iron or ductile iron. Fittings shall meet the requirements of ANSI Specifications as applicable. Rubber gasket joints shall conform to ANSI A21.11 for push-on joints.
- D. Ductile iron pipe shall be coated inside with a polyethylene liner and on the outside with a bituminous coating to a dry film thickness of at least 1.0 mils in accordance with ANSI A21.51. The polyethylene liner materials shall be virgin polyethylene complying with ASTM Designation D1248 compounded with sufficient additives to resist ultraviolet rays during aboveground storage of the pipe. The polyethylene shall be fused to the interior of the pipe by heat forming a tightly bonded lining a minimum of 20 mils thick extending from the spigot end to the barrel socket. A two-part epoxy liner may be used in lieu of the polyethylene liner with the Engineer's prior approval.

2.3 POLYVINYL CHLORIDE PIPE

- A. Gravity sewer lines and laterals shall be polyvinyl chloride pipe and shall conform to ASTM Designation D-3034. Pipe shall be SDR-35.
- B. Joints shall be of the bell and spigot type with rubber sealing ring in accordance with ASTM D-3212. The bell shall consist of an integral wall section with a solid cross section rubber ring factory-assembled.
- C. Fittings installed in polyvinyl chloride pipe lines shall conform to the same specifications as the pipe line in which they are installed.
- D. In addition to the requirements of ASTM specifications, the pipe shall not be out-of-round or crooked in alignment as determined by the Engineer. Any length of pipe in sizes 6-inch through 12-inch diameter whose inside diameters measured at right angles to each other vary more than 1/8-inch may be rejected.
- E. Material shall meet or exceed the requirements of ASTM Designation 1784, Type 1, Grade 1 (12454-B). All PVC materials shall be stored in accordance with the manufacturer's specifications (not in direct sunlight). PVC pipe and fittings which show signs of ultraviolet degradation will be considered substandard and unfit for use.

- F. All wyes, fittings, laterals and manhole couplings shall be manufactured by the pipe manufacturer. No saddles will be allowed for new pipe or as determined by the Engineer. Adapters shall be suitable for pipe supplied. All joints shall be rubber gasket. Asbestos cement manhole couplings will not be allowed.

2.4 PRECAST CONCRETE MANHOLES

- A. Precast concrete manhole base, barrel, and eccentric top sections shall conform to Specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C-478, except as otherwise specified below.
- B. The minimum wall thickness for the various size barrel sections shall be 5 inches.
- C. Barrel sections shall have tongue and groove joints, with "Ram-Nek" as manufactured by the K.T. Snyder Company, Houston, Texas, or approved equal; or O-ring gaskets set in preformed indentations conforming to ASTM C-443 standard specifications, or Federal specification SS-S-0210 (GSA-FSS).
- D. Concrete shall conform to ASTM C-94, Type II cement, with a compressive strength of 4,000 psi. Mortar shall be composed of one part cement to two parts sand.
- E. The date of manufacture and the name of the manufacturer or trademark shall be clearly marked on the outside of each precast section when the form is removed and on the inside after painting. Sections shall be cured by an approved method for at least 2 days prior to painting and shall not be shipped until at least 2 days after having been painted. Sections shall not be shipped until at least 7 days after removal from the forms.
- F. Top sections shall be eccentric cones, except where cover over the top of the pipe is less than 4 feet and these manholes shall have vertical walls with a flat precast concrete slab top. Precast concrete slabs over top section, where required, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading. The tops of bases shall be suitably shaped to mate with the precast barrel section.
- G. The interior and mating surfaces of the manhole shall be coated with a heavy duty coal tar epoxy coating containing not less than 72.9% by volume nonvolatile solids, approved equal to (or superior to) Koppers 300-M. This coating shall consist of a primer as specified by the manufacturer and a top coat for a total minimum thickness of 16 dry mils.
- H. Top of cone shall be set between 3 inches and 18 inches below bottom of manhole cover frame. It is the intent of Specifications to provide a minimum of 3 inches to accommodate future grade changes without disturbing manholes. Riser unit sections shall be used to bring the top of the cone within the required 18 inches. The remaining distance between the top of the cone and the bottom of the cover frame shall be mortared and bricked if the distance is less than 6 inches. If the distance is between 6 and 18 inches, precast leveling rings shall be used. The leveling rings shall be a minimum of 2 inches thick and have at least one continuous #3 reinforcing bar. Leveling rings shall not be used for more than 18 inches vertical adjustment.
- I. Where pipes enter or exit manholes, a "Kor-N-Seal" molded neoprene boot with stainless steel internal and external bands as manufactured by the National Pollution Control Systems, Inc., Nashua, New Hampshire, or a polyurethane joint with a short transition joint as manufactured by Mooreform Corporation, Centralia, Illinois, or an approved equal (or superior) connection shall be provided.
- J. Manholes with precast invert channels formed directly into a precast concrete manhole base shall be used except at junctions with existing mains, in which case, cast-in-place manhole bases shall be used. The floor outside the channel shall be smooth and sloped downward toward the

channel. The unit shall be of the Moore Base Design as manufactured by Mooreform Corporation, Centralia, Illinois, Tru-Contour as manufactured by A-LOK Products, Inc. 697 Main Street, Tully Town, Pennsylvania, or an approved equal or superior unit.

- K. Manholes shall include manufacturer provided steps. Manhole steps shall be aluminum or plastic, ASTM C-478, grouted in place using Embeco 167 mortar or other approved method. Steps will be placed over the downstream side of the manhole.
- L. All precast sections shall be case with non-penetrating lifting inserts. Approved: A-Lok Products Corp., Tullytown, Pennsylvania 19007.

2.5 MANHOLE FRAMES AND COVERS

- A. Manhole frames and covers shall be gray or ductile cast iron, free from cracks, holes and cold shuts, and shall conform to ASTM A48-83 Class 40 for gray iron castings or ASTM A 536, Grade 60-45-12, for ductile iron castings. Frames and covers shall conform to details shown on the drawings including lettering. Bearing surfaces shall be machined to provide even bearing surfaces or shall have a non-rocking feature. Frames and covers shall be designed to withstand an HS 20-44 loading as defined in AASHTO Specifications.

2.6 MANHOLE PICK

- A. Contractor shall furnish Owner with two manhole picks of the type recommended by the manhole frame and cover manufacturer to allow ease of removal of cover. Contractor shall submit cut sheet of manhole pick for Engineer's approval prior to delivery. Cost of manhole picks shall be included in the price of the manhole.

2.7 NONSHRINK GROUT

- A. Grout shall be inorganic, non-shrink, nonmetallic type grout similar to Thoroseal or equal. Grout shall be placed with a tamping stick to ensure complete filling in holes and space around pipe.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Safety:

- 1. The Contractor use of streets and highway for the work to be done under these Specifications he shall conform to all City, State and local laws and regulations. The Contractor shall provide, erect, and maintain effective barricades, danger signals, and signs on all intercepted streets or highways for protection of the work and safety of the public. Rights-of-way shall be provided with lights which shall be kept burning at all times between sunset and sunrise. The Contractor shall be responsible for all damages resulting from any neglect or failure to meet these requirements. Where conditions require the presence of a watchman to fulfill the requirements stated herein, same shall be furnished without extra cost to the Owner.

B. Maintenance of Service:

- 1. The Contractor shall arrange his work to cause minimum disturbance of normal pedestrian and vehicular traffic and will be held responsible for providing suitable means of access to all public and private properties during all stages of the construction. Should the construction work require repairs, changes or modifications of other utilities, it shall be the responsibility of the Contractor to provide for the maintenance of continuous water, electric, telephone, and gas as well as sewage and other utility services to all present

customers of such utilities, unless approval in writing is secured from the utility company for interruption of such service.

C. Limits of Construction:

1. In locations where the work is to be installed in streets or road rights-of-way the activities of the Contractor shall be confined to these public properties. Where the use of private property is deemed necessary by the Contractor to facilitate construction work arrangement for such use with the property Owner shall be the responsibility of the Contractor. The Contractor shall save the Owner harmless from all claims by adjacent property owners from trespassing or damage due to the activities of the Contractor in the prosecution of the work.

D. Existing Utilities:

1. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.
2. All existing improvements such as pavements, conduit, poles, pipes and other structures, shall be carefully supported and fully protected from injury. The Contractor shall be responsible for damages to these existing utilities and shall, in case they are damaged, restore them to their original condition at no cost to the owner.
3. Contractor shall give written notice to the Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of work. This can be accomplished by making the appropriate contact with the utility companies indicated on the plans.

E. Backfill for pipes, structures, and roadways: All trenching, backfill, earthwork, and compaction testing shall be in accordance with Section 02200 Earthwork and other applicable sections.

3.2 MANHOLE INSTALLATION

- A. Manholes shall be pre-cast with pre-cast invert channels except cast-in-place manhole bases may be used when connecting to existing mains.
- B. Manholes constructed over existing sanitary sewers shall be installed in a manner such that wastewater flow is not interrupted. Care shall be taken in excavating for the manhole so that the existing line is not broken or disjointed in such a way that sewage leakage occurs. Only after the new line has been approved by Engineer shall the existing line be cut into in such a way that a smooth invert may be grouted forming the transition between the new pipe and the existing pipe that is to remain in service. The pipe to be abandoned shall be plugged with grout and bricks to form a watertight plug extending a minimum of 3 inches beyond the outside face of the manhole wall.
- C. Manholes are to be constructed completely water tight except for the cover. Any water infiltration will cause the manhole to be unacceptable.
- D. Manhole invert elevations shall not deviate more than 0.20 feet from design elevations; manhole top elevations no more than 0.5 inches in pavement areas and 2.0 inches elsewhere from design elevations. Center line of manhole ring & cover shall not deviate more than 18" from designed horizontal location. Top elevations shown on the plans are approximate. Manhole tops shall be 1 inch above the finished ground or flush with finished pavement.

- E. Set precast concrete sections vertical and in true alignment. Install O-ring rubber gasket in the recess in the base of previously set section or prime and double seal joint surfaces with "Ram-Nek" pre-molded plastic joint sealer or approved equal.
- F. Completely plug seal and smooth all holes in sections used for their handling and the annular space between the wall and entering pipes with nonmetallic, non-shrink grout. Finish grout smooth and flush with the adjoining interior and exterior manhole wall surfaces and make watertight.
- G. Manholes located within the limits of proposed street paving are to be constructed a minimum of 1.0 feet below proposed finished street grade as shown by the Plans. After street base course is completed, the base is to be cut around the manhole and removed, the manhole cover is to be adjusted to conform to the finished street grade, and the excavated area backfilled with concrete (8:1 sand-cement mix to within 8 inches of the finished base grade and 2,800 psi concrete for the top 8 inches troweled to conform to finished base grade). Cost of adjustment is to be included in the manhole price.
- H. Set manhole frames and lids to conform accurately 1.0 inch above the finished ground or flush with finish pavement as shown or as directed by the Engineer. Set frames on manholes concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flanges of the frame will be completely filled and made watertight. Place a ring of mortar around the outside of the bottom flange at least 1 inch thick and pitched.

3.3 GRAVITY SEWER LINE INSTALLATION

- A. Gravity sewer lines shall be laid according to the details shown on the drawings or specified herein, and according to applicable portions of ASTM Designation D-2321, Underground Installation of Flexible Thermoplastic Sewer Pipe. Ductile iron pipe shall be installed in accordance with the requirements of Section VII of the Handbook of Ductile Iron Pipes, 4th Edition. The type of bedding to be used shall be as shown on the drawings, specified herein, or as directed in writing by the Engineer.
- B. Sewer mains shall be laid by use of a laser beam directed along the interior of the pipe. The laser equipment shall be of the type specifically designed for such use. The sewer main shall at all points be within 0.1+ feet of the vertical design elevation and be within 0.2+ feet of the horizontal design location.
- C. The trench bottom shall be graded to the proposed elevation of the pipe line and the bottom shaped to fit the lower quadrant of the pipe unless special bedding material is required. Holes shall be excavated at each bell so that pipe is uniformly supported along the entire length of the barrel only and not the bell. Pipe bedding shall be as described in Section "Earthwork".
- D. The storage of pipe on the job site shall be done in accordance with pipe manufacturer's recommendations and with the approval of the Engineer. Pipe shall be protected during handling against impact shocks and free fall. Pipe laying shall not precede backfilling by more than 100 feet without approval from the Engineer.
- E. The laying of the pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so that joint may be properly assembled without overstressing the bells. The jointing of the pipe shall be done in strict accordance with the pipe manufacturer's instructions and shall be done entirely in the trench.
- F. Each time the work on the sewer is halted for more than one hour, the ends of the pipe shall be

sealed to prevent foreign material from gaining entrance to the pipe.

- G. Concrete encasement shall be used where indicated on the drawings. In all cases where sewer mains cross water mains with minimum clear distance between top of sewer and bottom of water main of less than 18 inches, sewer shall be ductile iron pipe or 6-inch thick concrete encased PVC ASTM D-3034 for a distance of 10 feet to either side of point of crossing. Dimensions of encasement or of cradles shall conform to those shown on the drawings. Each pipe shall be supported on brick at two points to allow minimum thickness of concrete to be placed under pipe. Concrete shall be placed carefully around and over pipe to avoid displacement or floating of pipe. Trench shall be dewatered properly before placing of concrete. Backfill shall not be placed over a concrete cradle or arch until 24 hours after pouring unless authorized by the Engineer.
- H. Joint seals in polyvinyl chloride pipe and fittings shall comply with ASTM Designation D-3212. Laying instructions of the manufacturer of the pipe and joint shall be followed explicitly. Any pipe having defective joint surfaces (bell and spigot) shall be rejected.

3.4 LATERAL INSTALLATION

- A. A lateral connection shall be provided for each platted lot or parcel. Location of lateral connections shall be determined by the Engineer in the field.
- B. Service connections shall be extended to the property line as shown on the drawings and adequately sealed with plugs or caps prior to beginning tightness tests. Six inches of crusher-run gravel or bedding rock shall be placed in front of the plugs or caps and over the top of the last 3-feet of pipe laid.
- C. The Contractor shall maintain a record of service connection locations in conjunction with the "As-Built Plans" and, upon completion of work, shall furnish a copy of record to Engineer. The record shall include (1) location of wye branch and end of sewer connection referenced to next downstream manhole of each run, (2) offset of end of service as referenced from center line of main sewer pipe, (3) depth at end of service, and (4) distance from service end to nearest lot corner (reference lot corner shall be clearly indicated on the record). End of service pipe shall be marked with a 3'-0" minimum length of #4 rebar buried underground directly over end of service and extending to one inch above ground.
- D. Service connections shall be constructed perpendicular to the sewer, unless otherwise indicated on a straight line and a constant grade of not less than 2 percent (1/4 inch per foot) and not greater than 100 percent (i.e., 45 degrees from horizontal). Riser piping is not acceptable. Inverts of service connections at property lines shall be established so as to provide a minimum grade of 2 percent to the center of the lot or parcel with a minimum invert depth of 4 feet, unless otherwise indicated by the drawings.
- E. No special fittings shall be used for a service connection constructed from a manhole. Service lines from manholes shall have crown elevation of service pipe matching that of effluent sewer. A shaped invert shall be provided from the wall of the manhole to shaped invert of main sewer.
- F. When installing service connections on existing sewer mains not having wyes or tees, the Contractor shall install tapping tees or saddles. The opening in the sewer main shall be cut using a diamond tipped power driven cutter for clay pipe or a saw of the type recommended by the manufacturer of PVC pipe. Tapping tees or saddles shall be installed using an epoxy type jointing compound provided by the saddle manufacturer and stainless steel bands.

3.5 HOUSEHOLD HOOKUPS

- A. Under on circumstance shall household/building connection be attempted until all sewer main and pumpstation tests have been accepted by the Engineer and written authorization issued by the Engineer to proceed with hookups.
- B. Contractor shall connect new service lateral to existing house plumbing in a manner acceptable to the Engineer, and in accordance with local plumbing codes. Fittings with bends greater than 45 degrees shall not be used. Cleanouts shall be installed where indicated on the drawings, but a minimum of one at the property line, one at the house connection, and one for every 90 degree change in direction of the lateral.
- C. Contractor shall connect all sanitary and gray water drains from the house or building (including washing machine drains) to the new service lateral.
- D. The Contractor shall ensure that all laterals within the right-of-way are deep enough to receive the private service line while maintaining a minimum slope of 1/4 inch per foot on the private service.
- E. Contractor shall cooperate with property owner to minimize disturbance and restore all damaged trees, grass, structures, etc.

3.6 ABANDON EXISTING SEPTIC TANKS

- A. Where house or building is connected to new sewer system by Contractor, the Contractor shall abandon the existing septic tank by locating and disconnecting it, pumping it out and filling it with clean sand. The area shall be resodded. While being disconnected, the Contractor shall bypass the tank to the replaced private service line to the service connection at the right-of-way. Household sewage service shall not be interrupted.
- B. Contractor shall work closely with property owner to minimize disturbance.
- C. Septage pumping and disposal shall be by a licensed septage hauler.

3.7 TESTING

A. General:

- 1. All sanitary sewers installed under this contract shall be tested for tightness, deflection, and alignment. All service laterals from the main to the right-of-way line shall be included in the tightness test. Sanitary sewers will not be accepted by the Owner until the sewers have been tested and do in fact meet the criteria stated. All test shall be conducted by the Contractor in the presence of the Engineer. Contractor shall notify Engineer 48 hours prior to test. Contractor shall furnish all gauges, meters, pressure pumps, equipment fittings, and labor needed to test the line. The cost of these items shall be included in the installation price of pipe. Generally, the sewers will be tested from manhole to manhole. It is recommended the test be conducted on each section as soon as that section is complete in order to detect potential problems on future sections. All lines which fail to meet these tests shall be repaired and retested as necessary, until test requirements are met. The Engineer reserves the right to require the Contractor to test the first section between the manholes laid by each pipe crew under this contract.

B. Tightness Test (Low Pressure Air Test):

- 1. It is critical that the sewer system be constructed in a water tight fashion in order to eliminate infiltration and exfiltration. All sewer mains, laterals, and manholes shall be visually inspected. Any observed indications of infiltration shall require the Contractor to

determine the source and make the necessary corrections. In addition, the sewer mains and laterals shall be subject to a low pressure air test to be performed in the following manner:

- a. The Contractor shall have completed to installation of the sewer main section including the associated manholes and laterals. The laterals shall have been installed to right-of-way and a temporary air tight plug installed. In order to locate leaks, backfill operations need to be complete only to one foot above the top of pipe. At the Contractor's option and risk additional backfill may be added prior to the test.
- b. The Contractor shall clean and remove all debris, silt, earth or other material from the sewer prior to testing. The sewer shall be flushed with water by the Contractor. None of this water or debris shall be allowed to enter the existing sewer.
- c. Equipment specifically designed for low pressure air testing of sewer pipe shall be used and the Contractor shall supply the Engineer with such information so as the Engineer may be reasonable assumed the equipment is property functioning and calibrated.
- d. Test plugs shall be installed in the pipe at the upstream and downstream manholes.
- e. In order to compensate for groundwater table, all gauge pressures listed herein shall be increased by adding 0.5 psi for each foot of groundwater depth above the invert of the pipe.
- f. Air shall be added slowly to the test portion of the pipe until the internal air pressure is raised to 4.0 psig. A stabilization time of 5 minutes will be used to allow entering air to equalize with the temperature of the pipe wall.
- g. At the end of the stabilization time, the internal air pressure shall be observed, and the time required for the pressure drop from 3.5 to 3.0 psig recorded. The minimum time allowed for this 0.5 psi pressure drop for 8 inch main with laterals shall be 5 minutes for manholes spaced less than 300 feet apart and 6 minutes for manholes spaced between 300 and 400 feet apart. For pipe sizes differing from this established standards shall be used.
- h. Should testing on any sections of pipe line disclose an air loss greater than that permitted, the Contractor shall repair the defective area at his own expense. Following corrections, the sewer shall be tested again.

C. Tightness Test (Infiltration):

1. All sewer mains shall be subject to infiltration test. The test consists of observing and measuring the groundwater infiltration into the new sewer main. The maximum allowable infiltration rate for any section of sewer main shall be 4 gallons per 1,000 lineal feet of sewer main per hour. (This allowance takes into account service laterals and is based upon the standard 50 gallons per inch of diameter per mile per day). The Contractor shall conduct the infiltration test in the presence of the Engineer prior to the acceptance of the sewer main.
2. All manholes shall be inspected for infiltration. Visual inspection of manholes 24 hours after backfilling and compaction are complete shall indicate no leakage into the manhole when groundwater is present. When groundwater is not present, each manhole shall be

sealed at each pipe penetration and filled with water to a level above the last joint. This level shall be marked and the manhole shall be re-inspected after 4 hours. Any change in water level shall be indication of infiltration and further inspection and repair of the leakage shall be completed.

D. Deflection Test (Mandrel Test):

1. After the completion of all backfilling operations on a section of sewer main, a deflection test shall be conducted to determine the out-of-roundness of the pipe. The maximum allowable deflection shall be 5%. The test shall consist of passing a 5% deflection mandrel through the entire length of the pipe without the mandrel becoming stuck nor requiring the use of excess force. For 8 inch pipe the mandrel shall have a minimum diameter of 7.2 inches. The mandrel may be floated through the pipe using clean water but must be attached to a string of sufficient strength to allow it to be retrieved if it becomes stuck. This test may be performed in conjunction with pipe flushing.

E. Alignment Test (Lamp Test):

1. After the completion of all backfilling operations on a section of sewer main an alignment test shall be conducted. After the pipe is flushed, a high beam 12 volt lamp with lamp diameter of the approximate size of the pipe diameter shall be placed at one end of the section of pipe. A hand mirror shall be used at the opposite end of the pipe to observe the light. The full diameter of the pipe/light shall be visible when viewed between the consecutive manholes. If less than 1/2 of the pipe/light diameter can be observed, the alignment is unacceptable.

3.8 CLEANING

- A. At the conclusions of the work, the Contractor shall thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest outlet. Debris or water from the lowest outlet shall not be introduced into the Owner's sewage collection system. If, after this outlet cleaning obstructions remain, they shall be removed. After the pipe is cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Engineer will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired by the Contractor.

END OF SECTION 330273

SECTION 33 02 93 – STORM WATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This section covers the storm water management practices that the Contractor shall employ in accordance with the NPDES permit governing storm water discharges during construction and in accordance with erosion control practices specified in other sections.
- B. The Owner has petitioned the DEP for the storm water discharges during construction at this site to be covered by the NPDES General Permit for Construction Activity. A Notice of Intent (NOI) to be covered under this permit has been filed by the Owner. The Contractor is required to file a separate NOI at least forty-eight (48) hours prior to any earth disturbing activities.
- C. The Contractor shall manage the discharge of storm water from the site in accordance with the NPDES permit and this document. The Contractor shall be responsible for conducting the storm water management practices in accordance with the permit. The Contractor shall be responsible for any enforcement action taken or imposed by Federal or State agencies, including the cost of fines, construction delays, and remedial actions resulting from the Contractor's failure to comply with the permit provisions.
- D. The Contractor shall monitor the suitability of the designated management practices to achieve the storm water quality provisions of the permit, and shall notify the Owner of the need to change management practices. If changes are ordered by the Owner, an adjustment in Contractor's fee shall be considered in accordance with the General Conditions. However, the Contractor's failure to monitor or report deficiencies to the Owner will result in the Contractor being liable for fines and construction delays resulting from any Federal or State agency enforcement action.

PART 2 - CONTROLS

2.0 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings and this Stormwater Pollution Prevention Plan (SWPPP).
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

2.1 EROSION AND SEDIMENT CONTROLS STABILIZATION PRACTICES

Stabilization practices for this site include:

- A. Land clearing activities shall be done only in areas where earthwork will be performed and shall progress as earthwork is needed.

- B. Temporary seeding of all areas for which soil-disturbing activities have temporarily ceased for a period of more than 21 days will be commenced by the 14th day.
- C. Permanent seeding and planting for vegetative establishment of all unpaved areas within 7 days where construction activities have permanently ceased.

STRUCTURAL PRACTICES

Structural practices for this site include:

- A. Silt fence
- B. Inlet protection and outlet protection
- C. Storm sewer

2.2 SEQUENCE OF MAJOR ACTIVITIES

The general contractor will be responsible for implementing the following erosion control and storm water management control structures. The general contractor may designate these tasks to certain subcontractors as he sees fit, but the ultimate responsibility for implementing these controls and ensuring their proper functioning remains with the general contractor. The order of activities will be as follows (refer to the plans for details):

CONSTRUCTION SEQUENCE

1. Post all applicable permit placards. The permit placards shall not be nailed to trees.
2. Flag or stake the proposed limits of clearing prior to demolition commencement.
3. Contractor shall meet with Leon County Environmental Inspector prior to construction commencement.
4. Construct tree barricades or fences around protected trees in the vicinity of any vehicular traffic and as shown on the plans.
5. Designate vehicular pathways within the limits of the site.
6. Designate employee parking areas, materials storage areas, and topsoil storage areas.
7. Designate refueling areas away from the water bodies or watercourses onsite.
8. Construct sedimentation control devices.
9. Follow any requirements of notification prior to construction stated in the Environmental Management Permit.
10. Clear and grub site within the limits of clearing. Stabilization and additional erosion control measures will be required in areas where immediate construction is not taking place.
11. Remove topsoil from all areas of the site where improvements are to be constructed. Stockpile onsite for redistribution on slopes and shoulders.
12. Relocate all underground utilities, install storm drainage pipes required, rough grade road and construct all swales. Protect all storm drain inlets with hay bales and filter fences (per F.D.O.T. Index 102) until a permanent vegetative cover is established.
13. Construct all remaining improvements as indicated in the plans and specifications.
14. Clean out any sediment and debris from stormwater structures, as required.
15. Seed, fertilize and mulch all disturbed areas not paved or sodded with minimum 80% coverage of a perennial type ground cover within 90 days of planting. At least 75% coverage must be provided by a seasonal coverage within 30 days of planting.

STORM WATER MANAGEMENT

Grading and storm sewer will provide storm water drainage.

When construction is complete, all unpaved areas will be stabilized with vegetation consisting of either seed and mulch or grass.

2.3 OTHER CONTROLS

WASTE DISPOSAL

All waste materials will be collected and stored in accordance with all local and state solid waste management regulations.

SANITARY WASTE

All sanitary waste will be collected from the portable units a minimum of three times per week by a licensed portable facility provider in complete compliance with local and state regulation.

OFF-SITE VEHICLE

A stabilized construction exit will be provided to help reduce tracking of sediments. The paved street adjacent to the site entrance will be inspected daily and swept as necessary to remove any excess mud, dirt, or rock tracked from the site. Dump trucks hauling material from the construction site will be covered with a tarpaulin. The job site superintendent will be responsible for seeing that these procedures are as followed.

CONCRETE WASTE FROM CONCRETE TRUCKS

Emptying of excess concrete and/or washout from concrete delivery trucks will not be allowed on the job site. If such excess concrete and/or washout residue is found on the job site it will be cleaned up immediately and not allowed to come in contact with storm water discharges.

This residue will be disposed of in accordance with Part VII of this plan and all applicable state and federal regulations. The job site superintendent will be responsible for seeing that these procedures are followed.

HAZARDOUS SUBSTANCES AND HAZARDOUS WASTE

- A. All hazardous waste materials will be disposed of in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed. Material Safety Data Sheets (MSDS's) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction trailer office. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.
- B. The contractor will implement the Spill Prevention Control and Countermeasures (SPCC) Plan found within this SWPPP and will train all personnel in the proper cleanup and handling of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job site superintendent to properly train all personnel in the use of the SPCC plan.

- C. Any spills of hazardous materials which are in quantities in excess of Reportable Quantities as deemed by EPA regulations shall be immediately reported to the EPA National Response Center 1-800-424.8802.
- D. In order to minimize the potential for a spill of hazardous materials to come into contact with storm water the following steps will be implemented.
 - 1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, under cover, when not in use.
 - 2. The minimum practical quantity of all such materials will be kept on the job site.
 - 3. A spill control and containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
 - 4. All of the product in a container will be used before the container is disposed of.
 - 5. All products will be used in strict compliance with instructions on the product label.
 - 6. The disposal of excess or used products will be in strict compliance with instructions on the product label.

CONTAMINATED SOILS

- A. Any contaminated soils (resulting from spills of materials with hazardous properties) which may result from construction activities will be contained and cleaned up immediately in accordance with the procedures given in the Spill Prevention Control and Countermeasures (SPCC) Plan and in accordance with applicable state and federal regulations.
- B. The job site superintendent will be responsible for seeing that these procedures are followed.

COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The contractor will obtain copies of any and all local and state regulations which are applicable to storm water management and pollution minimization at this job site and will comply fully with such regulations. The contractor will submit written evidence of such compliance if requested by the Owner or any agent of a regulatory body. The Contractor will comply with all conditions of the NPDES General Permit for Construction Activities, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allowing regulatory personnel access to the job site and to records in order to determine compliance.

The owner has petitioned the appropriate regulatory agencies for authorization and recommended measures needed in dealing with endangered species located on the proposed site.

2.4 MAINTENANCE INSPECTION PROCEDURES

Erosion and Sediment Control Maintenance and Inspection Practices

- A. The following is a list of erosion and sediment controls to be used on this site during construction practice.
- I. Stabilization practices for this site include:
Temporary seeding
Permanent seeding and planting
 2. Structural practices for this site include:
Stabilized construction exit(s)
Silt fences
Storm water Detention Ponds
Hay bales for storm sewer inlet and outlet protection.
- B. The following inspection and maintenance practices will be used to maintain erosion and sediment controls.
1. All control measures will be inspected at least once each week and following any storm event of 0.25 inches.
 2. All measures will be maintained in good working order. If repairs are found to be necessary, they will be initiated within 7 days of report.
 3. Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
 4. Silt fences will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are securely in the ground.
 5. Temporary and permanent seeding will be inspected for bare spots, washouts and healthy growth.
 6. A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is attached.
 7. The job site superintendent will be responsible for selecting the individuals who will be responsible for these inspections, maintenance and repair activities, and tilling out inspection and maintenance reports.
 8. Personnel selected for the inspection and maintenance responsibilities will receive training from the job site superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls that are used onsite in good working order.

2.5 INSPECTION AND MAINTENANCE REPORT FORMS

Inspectors shall complete the forms provided in Appendix A when performing all inspections.

2.6 SPILL PREVENTION CONTROL AND COUNTERMEASURES (SPCC) PLAN

MATERIALS COVERED

The following materials or substances with known hazardous properties are expected to be present onsite during construction:

Concrete	Cleaning solvents
Detergents	Petroleum based products
Paints	Pesticides
Paint Solvents	Acids
Fertilizers	Concrete additives
Soil stabilization activities	

MATERIAL MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff

2.7 GOOD HOUSEKEEPING

The following good housekeeping practices will be followed onsite during the construction project:

- A. An effort will be made to store only enough product required to do the job.
- B. All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or other enclosure.
- C. Products will be kept in their original containers with the original manufacturer's label in legible condition.
- D. Substances will not be mixed with one another unless recommended by the manufacturer.
- E. Whenever possible, all of a product will be used up before disposing of the container.

Manufacturer's recommendations for proper use and disposal will be followed
The job site superintendent will be responsible for ensuring proper use and disposal of materials.

2.8 HAZARDOUS PRODUCTS

These practices will be used to reduce the risks associated with hazardous materials:

- A. Products will be kept in original containers with the original labels in legible condition.
- B. Original labels and material safety data sheets (MSDS's) will be procured and used for each material.
- C. Product containers and any surplus product must be disposed of per manufacturer's or local/state/federal government recommended methods.
- D. A spill control aid containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

2.9 PRODUCT SPECIFIC PRACTICES

The following product specific practices will be followed on the job site:

A. Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any petroleum storage tanks used on site will be installed per all appropriate local/state/federal regulations. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

B. Fertilizers

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

C. Paints, Paint Solvents, and Cleaning Solvents

All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and federal regulations.

D. Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

2.10 SPILL PREVENTION PRACTICES

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup.

A. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

B. Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite in the spill control and containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.)

C. All spills will be cleaned up immediately after discovery.

D. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 302 list and oil) will be immediately reported to the EPA National Response Center, telephone 1-800-424-8802. Reportable quantities of some substances which may be used at the job site are as follows:

1. oil-appearance of a film or sheen on water
2. pesticides usually 1 lb.
3. acids 5000 lb.
4. solvents, flammable 100 lb

OWNER CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signed: _____ Position: _____

Printed Name: _____ Date: _____

CONTRACTOR'S CERTIFICATION

"I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification. Further, by my signature, I understand that I am becoming a co-permittee, along with the owner(s) and other contractors and subcontractors signing such certifications, to the general NPDES storm water permit for the storm water discharges associated with industrial activity from the identified site. As a co-permittee, I understand that I, and my company, are legally required under the clean Water Act, to ensure compliance with the terms and conditions for the Storm water Pollution Prevention Plan (SWPPP) developed under the NPDES storm water permit and the terms of the NPDES storm water permit."

Signature:

Company Name:

Responsible For:

PROPOSED SCHEDULE OF WORK ACTIVITIES

Dates Activity

To be Determined and submitted by Contractor

APPENDIX A

Storm Water Pollution Prevention Plan
Inspection and Maintenance Report Form
To be Completed Every 7 Days and Within 24 Hours
of a rainfall Event of 0.25 Inches or More

Sediment Basin:

Depth of Sediment in Basin	Condition of Basin Side Slopes	Any Evidence of Overtopping of the Embankment?	Condition of Outfall from Sediment Basin

Maintenance Required for Sediment Basin:

To Be Performed
By:

On or Before:

Stabilized Construction Entrance:

Does Much Sediment get Tracked on to Road?	Is the Gravel clean or is it filled with Sediment?	Does all Traffic use the Stabilized entrance to leave the site?	Is the Culvert Beneath the entrance working?

Maintenance Required for Stabilized Construction Entrance:

On or Before:

To be Performed by:

Stabilization Measures:

Area	Date Since last Disturbed	Stabilized? (Yes/No)	Stabilized with	Condition

Stabilization Required:

To be preformed by: _____ On or before: _____

Structural Controls Earth Dike:

Stabilized Construction Entrance To:	Stabilized Construction Entrance From:	Is dike stabilized?	Is there evidence of washout or over-topping?

Stabilization Required:

To be preformed by: _____ On or before: _____

I certify under penalty of law that this document and all attachments were prepared under my direction of supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those person directly responsible for gathering the information, the information submitted is, to the best for my knowledge and belief, true, accurated, and complete. I am aware that there are significant penalites for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: _____

Inspector: _____ Date: _____

Inspector's
Qualifications:

Days since last rainfall: _____ Amount of last rainfall: _____

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Drains.
8. Encasement for piping.
9. Manholes.
10. Channel drainage systems.
11. Catch basins.
12. Stormwater inlets.
13. Stormwater detention structures.
14. Pipe outlets.
15. Dry wells.
16. Stormwater disposal systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
 2. Catch basins stormwater inlets and dry wells. Include plans, elevations, sections, details, frames, covers, and grates.
 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:50) and vertical scale of not less than 1 inch equals 5 feet (1:5). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- D. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Construction Manager and/or Owner no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Construction Manager's and/or Owner's written permission.

PART 2 - PRODUCTS

2.1 ABS PIPE AND FITTINGS

- A. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.
 - 1. NPS 3 to NPS 6 (DN 80 to DN 150): SDR 35.
 - 2. NPS 8 to NPS 12 (DN 200 to DN 300): SDR 42.

- B. Gaskets: ASTM F 477, elastomeric seals.

2.2 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
 - 2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
 - 2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.3 PVC PIPE AND FITTINGS

- A. PVC Cellular-Core Piping:
 - 1. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
 - 2. Fittings: ASTM D 3034, [SDR 35] <Insert SDR>, PVC socket-type fittings.
- B. PVC Corrugated Sewer Piping:
 - 1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
 - 3. Gaskets: ASTM F 477, elastomeric seals.
- C. PVC Profile Sewer Piping:
 - 1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D 3034, PVC with bell ends.
 - 3. Gaskets: ASTM F 477, elastomeric seals.
- D. PVC Type PSM Sewer Piping:
 - 1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM D 3034, PVC with bell ends.
 - 3. Gaskets: ASTM F 477, elastomeric seals.
- E. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F 679, T-1 and T-2 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.4 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M).

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets
2. Class III, Wall B for pipes 36" Dia and smaller.
3. Class III, Wall C for pipes 42" Dia. and larger.
4. Class IV, Wall C.
5. Class V, Wall C.

2.5 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.6 CLEANOUTS

A. All cleanouts to be cast iron, unless shown otherwise on plans.

B. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe.

- e. Watts Water Technologies, Inc.
 - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
3. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 4. Top-Loading Classification(s): Light Duty, Medium Duty, Heavy Duty and Extra-Heavy Duty.
 5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- C. Plastic Cleanouts:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Canplas LLC.
 - b. IPS Corporation.
 - c. NDS Inc.
 - d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.
 3. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.7 DRAINS

A. Cast-Iron Area Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe.
 - e. Watts Water Technologies, Inc.
 - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

3. Description: ASME A112.6.3 gray-iron round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
4. Top-Loading Classification(s): Medium and Heavy Duty.

B. Cast-Iron Trench Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe.
 - e. Watts Water Technologies, Inc.
 - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
3. Description: ASME A112.6.3, 6-inch- (150-mm-) wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and quantity of bottom outlets with inside calk or spigot connections, of sizes indicated.
4. Top-Loading Classification(s): Medium and Heavy Duty

C. Steel Trench Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Rockford Sanitary Systems, Inc.
3. Description: Factory fabricated from ASTM A 242/A 242M, welded steel plate, to form rectangular body with uniform bottom downward slope of 2 percent toward outlet, anchor flange, and grate. Include units of total length indicated, bottom outlet of size indicated, outlet strainer, acid-resistant enamel coating on inside and outside surfaces, and grate with openings of total free area at least two times cross-sectional area of outlet.
4. Plate Thicknesses: 1/8 inch (3.2 mm) and 1/4 inch (6.4 mm).
5. Overall Widths: 7-1/2 inches (190 mm) and 12-1/3 inches (313 mm).
 - a. Grate Openings: 3/8 inch (9.5 mm) circular or 3/8-by-3-inch (9.5-by-76-mm) slots.

2.8 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches (1500 mm).
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches (1500 mm).

6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 1 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 4 percent.

- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.10 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

- A. General Requirements for Polymer-Concrete, Channel Drainage Systems: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. ABT, Inc.
 2. ACO USA.
 3. Innovative Plastic, Inc.; a subsidiary of T-H Marine Supplies, Inc.
 4. Mea-Josam Div.; Josam Company.
 5. Poly-Cast.
- D. Sloped-Invert, Polymer-Concrete Systems:
1. Channel Sections:
 - a. Interlocking-joint, precast, modular units with end caps.
 - b. 4-inch (102-mm) inside width and deep, rounded bottom, with built-in invert slope of 0.6 percent and with outlets in quantities, sizes, and locations indicated.
 - c. Extension sections necessary for required depth.
 - d. Frame: Include gray-iron or steel frame for grate.
 2. Grates:
 - a. Manufacturer's designation "Heavy and Medium Duty," with slots or perforations that fit recesses in channels.
 - b. Material: Fiberglass Galvanized steel Gray iron Stainless steel.
 3. Covers: Solid gray iron if indicated.
 4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
- E. Narrow-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:
 - a. Interlocking-joint, precast, modular units with end caps.
 - b. 5-inch (127-mm) inside width and 9-3/4-inch- (248-mm-) deep, rounded bottom, with level invert and with NPS 4 (DN 100) outlets in quantities, sizes, and locations indicated.
2. Grates:
 - a. Slots or perforations that fit recesses in channels.
 - b. Material: Fiberglass Galvanized steel Gray iron Stainless steel.
3. Covers: Solid gray iron if indicated.
4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

F. Wide-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:
 - a. Interlocking-joint, precast, modular units with end caps.
 - b. 8-inch (203-mm) inside width and 13-3/4-inch- (350-mm-) deep, rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.
2. Grates:
 - a. Slots or other openings that fit recesses in channels.
 - b. Material: Fiberglass Gray iron.
3. Covers: Solid gray iron if indicated.
4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

G. Drainage Specialties: Precast, polymer-concrete units.

1. Large Catch Basins:
 - a. 24-by-12-inch (610-by-305-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. Gray-iron slotted grate.
 - c. Frame: Include gray-iron or steel frame for grate.
2. Small Catch Basins:
 - a. 19- to 24-inch by approximately 6-inch (483- to 610-mm by approximately 150-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. Gray-iron slotted grate.
 - c. Frame: Include gray-iron or steel frame for grate.

- 3. Oil Interceptors:
 - a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch- (6.4-mm-) thick, steel-plate covers.
 - b. Steel-plate covers.
 - c. Capacity: 140 gal. (530 L).
 - d. Inlet and Outlet: NPS 4 (DN 100) or NPS 6 (DN 150).
- 4. Sediment Interceptors:
 - a. 27-inch- (686-mm-) square, polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. 24-inch- (610-mm-) square, gray-iron frame and slotted grate.
- H. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
- I. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.11 PLASTIC, CHANNEL DRAINAGE SYSTEMS

- A. General Requirements for Plastic, Channel Drainage Systems:
 - 1. Modular system of plastic channel sections, grates, and appurtenances.
 - 2. Designed so grates fit into frames without rocking or rattling.
 - 3. Number of units required to form total lengths indicated.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. ACO USA.
 - 2. MultiDrain Systems, Inc.
 - 3. NDS Inc.
 - 4. Tuf-Tite Corporation.
 - 5. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.
- D. PE Systems:
 - 1. Channel Sections: Interlocking-joint, PE modular units, 4 inches (102 mm) wide, with end caps. Include rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.
 - 2. Grates: PE, ladder shaped; with stainless-steel screws.
 - 3. Color: Gray unless otherwise indicated.
 - 4. Drainage Specialties: Include the following PE components:

- a. Drains: 4-inch- (102-mm-) diameter, round, slotted top; with NPS 4 (DN 100) bottom outlet.
 - b. Drains: 8-inch- (203-mm-) diameter, round, slotted top; with NPS 6 (DN 150) bottom outlet.
 - c. Drains: 4-inch- (102-mm-) square, slotted top; with NPS 3 (DN 80) bottom outlet.
 - d. Drains: 8-inch- (203-mm-) square, slotted top; with NPS 6 (DN 150) bottom outlet.
 - e. Catch Basins: 12-inch- (305-mm-) square plastic body, with outlets in quantities and sizes indicated. Include PE slotted grate 11-3/4 inches (298 mm) square by 1-1/8 inches (28.6 mm) thick.
- E. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
- F. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.12 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
8. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches (1500 mm).
9. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.

1. Joint Sealants: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.

2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
 4. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches (1500 mm).
 5. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent unless otherwise indicated.
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.13 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to the FDOT Standard Indexes, latest edition.
- B. Gutter Inlets: Made with horizontal gutter opening[, of materials and dimensions according to the FDOT Standard Indexes, latest edition, include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to the FDOT Standard Indexes, latest edition, include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, according to the FDOT Standard Indexes, latest edition.
- E.

2.14 STORMWATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
 - 1. Ballast: Increase thickness of concrete as required to prevent flotation.
 - 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
 - 3. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of structure to finished grade is less than 60 inches (1500 mm).
- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.15 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
 - 2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
 - 3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).
- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

2.16 DRY WELLS

- A. Description: ASTM C 913, precast, reinforced, perforated concrete rings. Include the following:
 - 1. Floor: Cast-in-place concrete.
 - 2. Cover: Liftoff-type concrete cover with cast-in lift rings.

3. Wall Thickness: 4 inches (102 mm) minimum with 1-inch (25-mm) diameter or 1-by-3-inch- (25-by-76-mm-) maximum slotted perforations arranged in rows parallel to axis of ring.
 - a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
 - b. Ring Construction: Designed to be self-aligning.
 4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
- B. Description: Manufactured PE side panels and top cover that assemble into 50-gal. (190-L) storage capacity units.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. NDS Inc.
 3. Side Panels: With knockout ports for piping and seepage holes.
 4. Top Cover: With knockout port for drain.
 5. Filter Fabric: As recommended by unit manufacturer.
 6. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
- C. Description: Constructed-in-place aggregate type. Include the following:
1. Lining: Clay or concrete bricks.
 2. Lining: Concrete blocks or precast concrete rings with notches or weep holes.
 3. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
 4. Cover: Precast, reinforced-concrete slab, designed for structural loading according to ASTM C 890 and made according to ASTM C 913. Include slab dimensions that will extend 12 inches (300 mm) minimum beyond edge of excavation, with bituminous coating over entire surface. Cast cover with opening for manhole in center.
 5. Manhole: 24-inch- (610-mm-) diameter, reinforced-concrete access lid with steel lift rings. Include bituminous coating over entire surface.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 3. Install piping with 36-inch (915-mm) minimum cover.
 - 4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 7. Install corrugated steel piping according to ASTM A 798/A 798M.
 - 8. Install corrugated aluminum piping according to ASTM B 788/B 788M.
 - 9. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 10. Install PE corrugated sewer piping according to ASTM D 2321.
 - 11. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
 - 12. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 13. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 14. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.
 - 15. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.
 - 16. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 17. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install force-main pressure piping according to the following:

1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 2. Install piping with 36-inch (915-mm) minimum cover.
 3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
 4. Install ductile-iron special fittings according to AWWA C600.
 5. Install PVC pressure piping according to AWWA M23, or ASTM D 2774 and ASTM F 1668.
 6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.
- H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
 2. Hubless cast-iron soil pipe and fittings.
 3. Ductile-iron pipe and fittings.
 4. Expansion joints and deflection fittings.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
 5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
 7. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
 8. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
 9. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
 10. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
 11. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
 12. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
 13. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
 14. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
 15. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
 16. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

17. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping according to the following:

1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
4. Join PVC water-service piping according to ASTM D 2855 for solvent-cemented joints.
5. Join dissimilar pipe materials with pressure-type couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches (450 by 450 by 300 mm) deep. Set with tops 1 inch (25 mm) above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification drains in roads.

B. Embed drains in 4-inch (102-mm) minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

- F. Embed trench sections in 4-inch (102-mm) minimum concrete around bottom and sides.

3.6 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.8 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.9 DRY WELL INSTALLATION

- A. Excavate hole to diameter of at least 6 inches (150 mm) greater than outside of dry well. Do not extend excavation into ground-water table.
- B. Install precast, concrete-ring dry wells according to the following:
 - 1. Assemble rings to depth indicated.
 - 2. Extend rings to height where top of cover will be approximately 8 inches (203 mm) below finished grade.
 - 3. Backfill bottom of inside of rings with filtering material to level at least 12 inches (300 mm) above bottom.
 - 4. Extend effluent inlet pipe 12 inches (300 mm) into rings and terminate into side of tee fitting.

5. Backfill around outside of rings with filtering material to top level of rings.
 6. Install cover over top of rings.
- C. Install manufactured, PE dry wells according to manufacturer's written instructions and the following:
1. Assemble and install panels and cover.
 2. Backfill bottom of inside of unit with filtering material to level at least 12 inches (300 mm) above bottom.
 3. Extend effluent inlet pipe 12 inches (300 mm) into unit and terminate into side of tee fitting.
 4. Install filter fabric around outside of unit.
 5. Install filtering material around outside of unit.
- D. Install constructed-in-place dry wells according to the following:
1. Install brick lining material dry and laid flat, with staggered joints for seepage. Build to diameter and depth indicated.
 2. Install block lining material dry, with staggered joints and 20 percent minimum of blocks on side for seepage. Install precast concrete rings with notches or weep holes for seepage. Build to diameter and depth indicated.
 3. Extend lining material to height where top of manhole will be approximately 8 inches (203 mm) below finished grade.
 4. Backfill bottom of inside of lining with filtering material to level at least 12 inches (300 mm) above bottom.
 5. Extend effluent inlet pipe 12 inches (300 mm) into lining and terminate into side of tee fitting.
 6. Backfill around outside of lining with filtering material to top level of lining.
 7. Install manhole over top of dry well. Support cover on undisturbed soil. Do not support cover on lining.

3.10 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.11 CHANNEL DRAINAGE SYSTEM INSTALLATION

- A. Install with top surfaces of components, except piping, flush with finished surface.
- B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- C. Embed channel sections and drainage specialties in 4-inch (102-mm) minimum concrete around bottom and sides.
- D. Fasten grates to channel sections if indicated.

- E. Assemble channel sections with flanged or interlocking joints.
- F. Embed channel sections in 4-inch (102-mm) minimum concrete around bottom and sides.

3.12 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Chamber Systems: Excavate trenches of width and depth, and install system and backfill according to chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.
- B. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, according to piping manufacturer's written instructions.

3.13 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."
- B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- D. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."
- E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Shielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure-type pipe couplings for force-main joints.

3.14 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 1. Close open ends of piping with at least 8-inch- (203-mm-) thick, brick masonry bulkheads.
 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 1. Remove manhole or structure and close open ends of remaining piping.
 2. Remove top of manhole or structure down to at least 36 inches (915 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Section 312000 "Earth Moving."

3.15 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.16 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
 1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
 6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig (1035 kPa).
 - a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
 - b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.17 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

END OF SECTION CIVIL SPECIFICATIONS

ADDITIONAL INFORMATION: ALL SEWER AND WATER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST CITY OF TALLAHASSEE SPECIFICATIONS AND CROSS CONNECTION GUIDE. A COPY OF THE LATEST SPECIFICATIONS ARE AVAILABLE ON LINE AT:
"WWW.TALGOV.COM/COM/YOU/WATER/PDF/SPECIFICATIONS.PDF" OR BY PURCHASE OF A CD FROM THE CITY OF TALLAHASSEE WATER AND SEWER DEPARTMENT. CONTRACTOR SHALL OBTAIN A COPY OF THE SPECIFICATIONS PRIOR TO BIDDING.