TECHNICAL SPECIFICATION

FOR

CITY OF WILTON MANORS

LIFT STATION 5 REPLACEMENT

Bid Submittal

THE OFFICIAL RECORD OF THIS TECHNICAL SPECIAL PROVISION IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G 15-23.003, F.A.C.

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PART 1 - GENERAL

1.01 SCOPE

Work under this contract includes furnishing materials, labor, tools equipment, supervision and incidentals necessary to construct infrastructure improvements.

1.02 GENERAL

A. The provisions of this Section shall amplify the "General Conditions", including updates through the bid date of this project, in specific instances and shall have full force and effect as if contained in those documents.

B. TECHNICAL SPECIFICATIONS consists of this section, Section 01005, described as TECHNICAL PROVISIONS, pages 01005-1 to 01005-7

C. In case of a conflict among the Project Drawings, these TECHNICAL PROVISIONS, and the "General Conditions", the "General Conditions" will govern.

1.03 ITEMS SPECIFIED ON DRAWINGS

A. Items of material, equipment, machinery and the like may be specified on the Drawings and not in the Technical Specifications. The CONTRACTOR in accordance with the General Notes on the Drawings shall provide such items.

1.04 FIELD LAYOUT OF THE WORK AND RECORD DRAWINGS

A. See "General Conditions”.

B. After completion of construction, the CONTRACTOR shall provide four sets of Record Drawings with all the As-Built information; all locations, dimensions and elevations of the constructed facilities, certified, signed and sealed thereon by a Land Surveyor registered in the State of Florida. All elevations shall refer to N.A.V.D. (North American Vertical Datum). The cost of such field layout and recording work shall be the responsibility of the CONTRACTOR.

1.05 SALVAGE

A. Any existing equipment or material, including but not limited to valves, pipes, fittings, couplings, etc., which is removed as a result of construction under this project may be designated as salvage by the CITY, and if so, shall be delivered clean to the CITY at a location directed by the CITY. Any equipment or material not worthy of salvaging shall be disposed of by the CONTRACTOR at a suitable location in accordance with all applicable regulations, ordinances and laws at no additional cost to the CITY.

1.06 POWER

A. The CONTRACTOR shall furnish and pay for all electrical power required for the construction, testing and trial operation, prior to final acceptance by the CITY.

1.07 WATER SUPPLY

A. All water required for testing, flushing, and construction shall be furnished by the CITY and paid for by the CONTRACTOR. The purchase price shall be the prevailing rate as published by the CITY. The quantity of water used shall be determined by reading the meter at the start and at the finish of construction. The CONTRACTOR shall make all arrangements and incur all expense involved in having the CITY furnish and install the necessary water meters. Each water service line shall be provided with a vacuum relief or backflow preventer which shall meet the requirements of ASA A40.6, latest revision, and the local administrative authority.

1.08 MAINTENANCE

A. The CONTRACTOR shall fully cooperate at all times with the CITY in order to maintain the operation of the existing water and/or sewer system with the least amount of interference and interruption possible. The schedule, plans, and work of the CONTRACTOR shall at all times be subject to alteration and revision if necessary for public health and safety considerations. The creation of a public nuisance will not be permitted.

B. It may be necessary to interrupt the operation of the existing water and/or sewer system. In all cases where the CONTRACTOR must cause an interruption, CONTRACTOR shall prepare and submit to the ENGINEER, four (4) working days prior to commencing the work, a complete description of the proposed procedure and a time schedule, which CONTRACTOR will guarantee. At least forty-eight (48) hours prior to the time proposed for starting the work, the ENGINEER will notify the CONTRACTOR whether or not the work will be permitted as proposed.

1. The ENGINEER reserves the right to require the CONTRACTOR to work 24 hours per day in all cases where, in ENGINEER'S opinion, interference with operation of the system may result in dangerous health hazards or offensive conditions.

2. In no case will the CONTRACTOR be permitted to interfere with the existing system until all materials, supplies, equipment, tools and incidentals necessary to complete the work are on the site. Backup equipment on key equipment items shall be required on work necessitating interference with the existing system.

1.09 SITE RESTORATION

A. The CONTRACTOR shall remove all excess material and shall clean up and restore the site to its original condition or better. All damage, as a result of work under this Contract, done to existing structures, pavement, driveways, paved areas, curbs and gutters, sidewalks shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basins, flagstones, rocked, graveled, or stabilized areas of driveways, and including all obstructions not specifically named herein, shall be repaired, or replaced, as determined by the ENGINEER. Site restoration shall be done in a timely manner as the work progresses.

1.10 SANITARY FACILITIES

A. The CONTRACTOR shall provide temporary facilities at the site as directed by the ENGINEER.

1.11 STANDARDS

A. Wherever in these TECHNICAL SPECIFICATIONS or in the drawings name and/or number refer to certain standards or regulations, the applicable publication shall be the latest revision thereof. Reference by abbreviation is made in accordance with the Section 01070, "Abbreviations of Institutions."

1.12 QUALITY OF ITEMS

A. All material furnished for this project shall be new and unused. Any material, which has become excessively weathered or damaged since manufacture, shall not be considered as new. ENGINEER shall be the sole judge as to what constitutes excessive weathering or damage.

1.13 TESTING

A. The CITY may require during shop drawing review that materials and equipment supplied meet given standards and testing to demonstrate conformance to the minimum standards. The cost of these tests shall be the obligation of the CONTRACTOR and no extra charge shall be made to the CITY on account of such testing.

B. The CONTRACTOR will select a recognized, independent testing laboratory to make tests on concrete, reinforcing steel, soils and other materials for the construction phase, which the CITY may decide to test for conformity with the TECHNICAL SPECIFICATIONS. The CONTRACTOR shall supply the necessary samples for this testing without cost to the CITY. The costs for actual testing shall be paid by the CONTRACTOR. The cost of the tests that fail will be charged to the CONTRACTOR by deducting the cost from the Contract price, or will be paid directly to the testing laboratory by the CONTRACTOR.

C. Construction in areas where installation and restoration must satisfy the additional requirements of a local, state or federal authority may require testing to demonstrate conformance. The CONTRACTOR shall ascertain the extent of testing required by regulatory agencies within these areas. The CONTRACTOR is responsible for performing such tests, including but not limited to, tests of compaction, and all costs for these tests shall be the obligation of the CONTRACTOR and no extra charge shall be made to the CITY on account of such testing.

1.14 UTILITY CROSSINGS

A. It is intended that wherever existing utilities must be crossed that the pipe may be deflected up to 75% of the manufacturer's recommended limits, but shall not exceed the allowable limits of the CITY. Adequate cover shall be used to adequately clear the obstruction. However, when this procedure is not feasible in the opinion of the ENGINEER, the ENGINEER may direct the use of fittings to clear a utility crossing as detailed on the Drawings. The cost of such crossing including joint restraints shall be on the basis of the schedule of pay items applied.

B. Deflections and adjustments of the proposed water and/or sewer mains to avoid all other existing utilities shall be verified/determined in the field during construction.

1.15 BASIS OF MEASUREMENT

A. Where mains are to be paid for on a unit price per linear foot basis, the number of linear feet will be determined by measurement along the centerline of the pipe in place, including fittings.

1.16 ADJUSTMENT AND RELOCATION OF EXISTING LINES

A. When the drawings indicate that existing lines must be deflected, the pipe may be deflected up to 75% of the manufacturer's recommended limits but shall not exceed the allowable limits of the CITY. The CONTRACTOR will be so directed by the ENGINEER. If the ENGINEER determines that the use of new pipe and fittings is required for deflection, the CONTRACTOR will be directed to use this method. The price for either method shall be based upon the unit prices bid. This does not apply to connections to existing system (Paragraph 1.17, this Section).

1.17 CONNECTION TO EXISTING SYSTEM

A. The CONTRACTOR shall perform all work necessary to locate, excavate and prepare for connection to the existing mains as shown on the Drawings. The cost of this work and for the actual connection to the existing main shall be based upon the unit prices for installing the pipe and appurtenances and shall not result in any additional cost to the CITY. The cost of sleeves shall be included in the fittings unit price.

B. Additional valves used for the CONTRACTOR's convenience shall not be considered as an extra cost payable by the CITY for the tie-in to the existing system.

C. During all phases of the work, (i.e. installation, testing and restoration), the CONTRACTOR shall ensure at all times the safe operation of the existing water and/or sewage systems. Service to the customers shall be maintained with the least amount of interference and interruption as possible.

1.18 RELOCATIONS

A. The CONTRACTOR shall be responsible for the relocation of structures that are shown on the drawings, including, but not limited to, light poles, signs, fences, piping, conduits and drains that interfere with the proposed positioning of the water/sewer mains. The cost of all such relocations shall be included in the prices bid for the appropriate items.

1.19 UTILITIES

A. Existing utilities are shown on the Drawings insofar as information is reasonably available. However, it will be the responsibility of the CONTRACTOR to preserve all existing utilities whether shown on the Drawings or not. If utility conflicts are encountered by the CONTRACTOR during construction, CONTRACTOR shall give sufficient notice to their CITYs so that they may make the necessary adjustments. Damage to any utility, which in the opinion of the CITY is caused by carelessness on the part of the CONTRACTOR, shall be repaired at the expense of the CONTRACTOR.

1.20 GUARANTEE

A. The CONTRACTOR shall guarantee the equipment, material and labor performed under the Contract against any and all failures in proper use and operation for a period of one (1) year from date of written acceptance by the CITY.

B. The CONTRACTOR shall also obtain warranties from manufacturers for each piece of equipment furnished so that the manufacturer's warranty fully covers the equipment for a period of one (1) year from the date of written acceptance by the CITY.

1.21 PERFORMANCE OF WORK

A. The CONTRACTOR shall provide all personnel and equipment required to complete all work specified herein and on the Drawings. In an emergency situation, if the CITY determines that it must provide staff and/or equipment to assist the CONTRACTOR in the satisfactory performance of the Contract terms and conditions, the CONTRACTOR at the applicable prevailing wage rates shall reimburse the CITY.

B. CONTRACTOR shall provide forty-eight (48) hours advance written notice to the CITY for approval of CONTRACTOR'S intention to work overtime on weekdays or to work on the weekends.

1.22 BARRICADING (SAFETY)

A. The CONTRACTOR shall be responsible for the furnishing and maintaining of all required barricades, either the lighted or the reflector type, to ensure the public's safety during open trench work or for any other potentially unsafe or hazardous construction activities. Barricades shall be located and displayed in conformance with the most stringent regulations required by the governing agencies. All costs for barricading, including any permits, shall be the responsibility of the CONTRACTOR.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01005

PART 1 - GENERAL

1.01 SCOPE

A. The WORK to be performed under this Contract shall consist of furnishing and installing all tools, equipment, materials, supplies, and manufactured articles and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The WORK shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the CITY.

B. The Lift Station Improvements Project Contract Documents is comprised of two volumes and are summarized as follows:

Volume I Front End Documents and Technical Specifications

Volume II General Drawings and Standard Details

C. This Contract include one Bid Alternative summarized as follows:

a. Bid Alternate 1: Raised Intersection Installation

i. The WORK to be under this Bid Alternate shall include all requirements listed in Section 1.01 A.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The work of this Contract comprises the construction of the lift station improvements for City of Wilton Manors. The work will include but not be limited to site preparation, earthwork, lift station improvements, sanitary sewer improvements, bypass pumping, electrical replacement, asphalt restoration, and landscape restoration.

B. The general location of the project site is as follows:

Lift Station #5 is located along the east side of NW 5th Avenue.

1.03 NOTICE TO BIDDERS

A. The successful bidder, in order to be considered responsive, must possess the appropriate licenses.

B. It should also be noted that the successful bidder will, at the time of the pre-work conference, be required to show that each of the CONTRACTOR'S subcontractors must possess the appropriate licenses.

1.04 STANDARD SPECIFICATION

A. All materials and workmanship shall meet the requirements of "The Minimum Standards Applicable to Public Rights-of-Way under Broward County Jurisdiction" (to be referred to as "Minimum Standards") and the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction" and its supplements, and the Florida Department of Transportation "Roadway and Traffic Design Standards".

1. These Special Provisions are supplemental to the above Specifications and Standards.

1.05 SITE INVESTIGATION

A. The CONTRACTOR, by virtue of signing the Contract, acknowledges that CONTRACTOR and all subcontractors have satisfied themselves to the nature and location of the work, the general and local conditions including, but not restricted to: those bearing upon transportation; disposal, handling and storage of materials; access roads to the site; the conformation and conditions of the work area; and the character of equipment and facilities needed preliminary to and during the performance of the work. Failure on the part of the CONTRACTOR to completely or properly evaluate the site conditions shall not be grounds for additional compensation.

B. Soil boring information will be furnished to the CONTRACTOR upon request. The CONTRACTOR, by virtue of signing the Contract, acknowledges that CONTRACTOR and subcontractors have satisfied themselves as to the nature and extent of soil and groundwater conditions on the project site. No additional payment will be made to the CONTRACTOR because of differences between actual conditions and those shown by the boring logs.

1.06 WORK BY OTHERS

A. Concurrent Work by Other Contractors. The CONTRACTOR'S attention is directed to the fact that other contractors may conduct work at the site during the performance of the WORK under this Contract. The CONTRACTOR shall conduct its operations so as to cause little disruption to the other contractors' ability to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts.

B. Interference With Work On Utilities. The CONTRACTOR shall cooperate fully with all utility forces of the CITY or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.07 WORK SEQUENCE

A. The CONTRACTOR shall schedule and perform the work in such a manner as to result in the least possible disruption to the public's use of roadways, driveways, and utilities. Utilities shall include but not be limited to water, sewerage, drainage structures, ditches and canals, gas, electric, television and telephone. Prior to commencing with the WORK, CONTRACTOR shall perform a location investigation of existing underground utilities and facilities in accordance with Section 01530 entitled "Protection of Existing Facilities" and shall have obtained all required permits and permissions. CONTRACTOR shall also deliver

written notice to the CITY, the ENGINEER, and the property occupants (private and public) of all planned disruption to roadway, driveways, temporary displacement of fences, mailboxes, street signs and traffic signs, and utilities 72 hours in advance of disruption.

B. CONTRACTOR shall sequence the work so as to minimize impact on residents. CONTRACTOR shall notify Broward County Traffic Engineering School Coordinator and the Post Office 14 days prior to disruption of roadway.

1.08 WORK SCHEDULE

A. Time is of the essence in completing this project. Because time is of the essence the CONTRACTOR shall commit the necessary resources to this project to complete it in a timely manner. Those resources may include multiple working crews, working over time, etc. Because time is of the essence, the CONTRACTOR'S construction progress will be monitored closely on a weekly basis. The Construction progress will be measured with the construction schedule submitted by the CONTRACTOR. If the ENGINEER determines that the CONTRACTOR does not meet the schedule as specified in Section 01311, the CONTRACTOR will be required to commit those resources necessary to ensure the completion of the project in a timely manner including working over time, adding other work crews, etc. All costs incurred to implement measure to complete the work in timely manner will be borne by the CONTRACTOR at no additional cost to the CITY.

B. SCHEDULE

1. CONTRACTOR shall submit scheduling information for the work as required in Section 01311 "Schedules and Reports".

2. No separate payment shall be made for preparation and/or revision of the schedule.

1.09 COMPUTATION OF CONTRACT TIME

A. It is the CONTRACTOR'S responsibility to provide clear and convincing documentation to the ENGINEER as to the effect additional work will have with respect to additional contract time extension that may be justified. If additional quantities of work can be carried out concurrent with other existing construction activities without disrupting the critical path of the project then no contract time extension will be granted. The CONTRACTOR is obligated to provide documentation to the ENGINEER if additional elements of work affect the critical path of the project. If work set forth in the original scope of the project is deleted, the contract time may be reduced. This contract is a calendar day contract. While the CONTRACTOR may be granted time to suspend work operations for vacations or holidays, contract time will not be suspended. During suspensions, the CONTRACTOR shall be responsible for all maintenance of traffic and liability without additional compensation from the CITY.

1.10 CONTRACTOR USE OF PREMISES

A. The CONTRACTOR'S use of the project site shall be limited to its construction operations. The CONTRACTOR will arrange for storage of materials and a copy of an agreement for use of other property shall be furnished to the ENGINEER.

1.11 PRE-CONSTRUCTION CONFERENCE

A. After the award of Contract, a Pre-construction Work Conference will be held between the CONTRACTOR, the ENGINEER, the CITY, other interested Agencies, representatives of Utility Companies and others affected by the work. The ENGINEER will set the time and place of this conference. The CONTRACTOR shall bring to the conference a copy of the proposed work schedule for the approval by the ENGINEER of the proposed methods and manner of executing the work including sequences of operation and time schedule. The work shall be performed in accordance with such schedule or approved amendments thereto.

1.12 UTILITY LOCATIONS

A. As far as possible, all existing utility lines in the project area have been shown on the plans. However, CITY does not guarantee that all lines are shown, or that said lines are in their true location. It shall be the CONTRACTOR'S responsibility to identify and locate all underground or overhead utility lines or equipment affected by the project. No additional payment will be made to the CONTRACTOR because of discrepancies in actual and plan location of utilities and damages suffered as a result thereof.

B. The CONTRACTOR shall notify each utility company involved at least thirty (30) days prior to the start of construction to arrange for positive underground location, relocation or support of its utility where that utility may be in conflict with or endangered by the proposed construction. The CONTRACTOR shall pay for relocation of water mains or other utilities for the convenience of the CONTRACTOR. The CONTRACTOR shall pay for all charges by utility companies for temporary support of its utilities. All costs of permanent utility relocations to avoid conflict shall be the responsibility of the CONTRACTOR and the utility company involved.

C. The CONTRACTOR shall schedule and coordinate their work in such a manner that they are not delayed by the utility companies relocating or supporting their utilities. No compensation will be paid to the CONTRACTOR for any loss of time or delay.

D. All overhead, surface, and underground structures and/or utilities encountered are to be carefully protected from damage or displacement. All damage to said structures and/or utilities is to be completely repaired within a reasonable time; needless delay will not be tolerated. The CITY reserves the right to remedy any damage by ordering outside parties to make repairs at the expense of the CONTRACTOR. All repairs made by the CONTRACTOR are to be made to the satisfaction of the utility owner and shall be inspected by a representative of the utility owner and the ENGINEER.

E. The CONTRACTOR should be aware of the Sunshine State One Call Center, which has a free locating service for CONTRACTORS and excavators. Within forty-eight hours before excavating, dial toll free 1-800-432-4770, and a locator will be dispatched to the work location. CONTRACTOR shall reasonably notify other utility companies not notified by Sunshine State One Call Center.

F. The permits listed below will be obtained for the project by the CITY prior to beginning construction. The CONTRACTOR is responsible for compliance with any and all permit conditions. In the event that the CITY must obtain permits in addition to those listed below,

the CONTRACTOR shall not have any claim for damages arising from any delay caused by the CITY'S obtaining said additional permits.

1. Florida Department of Environmental Protection
   i. Permit for Constructing a Domestic Wastewater Collection/Transmission System

2. Broward County Resilient Environment Department
   i. Permit to Construct a Wastewater Collection/Transmission System

G. The CONTRACTOR shall obtain a construction permit from Broward County Highway Construction and Engineering Division, dewatering permit from SFWMD and/or Broward County Environmental Protection and Growth Management Department, and other applicable building permits from the CITY,

1.13 LINE AND GRADE

A. The ENGINEER has provided vertical and horizontal control for layout of the work in the form of benchmarks and reference points located adjacent to the work. From these controls provided, the CONTRACTOR shall develop and make all detailed surveys needed for construction and shall establish all working points, lines and elevations necessary to perform the work. A Professional Land Surveyor registered in the State of Florida shall supervise this surveying work.

1.14 PROTECTION AND RESTORATION OF SURVEY MONUMENTS

A. The CONTRACTOR shall carefully protect from disturbance all survey monuments, stakes and bench marks, whether or not established by CONTRACTOR, and shall not remove or destroy any surveying point until it has been properly witnessed by the ENGINEER. All major survey monuments that have been damaged by the CONTRACTOR such as section corners, 1/4 section corners, property corners or block control points shall be replaced at the CONTRACTOR'S expense with markers of a size and type approved by the ENGINEER. The replacement shall be under the supervision of a Florida Registered Land Surveyor where directed by the ENGINEER.

1.15 EQUIPMENT

A. All equipment necessary and required for the proper construction of all facilities shall be on the construction site, in first-class working condition.

1.16 STORAGE SITES

A. The CONTRACTOR shall furnish, at CONTRACTOR’s expense, properly zoned areas suitable for field office, material storage and equipment service and storage. No material may be stored in the public right of way without prior authorization by the agency having jurisdiction. The CONTRACTOR shall keep these areas in a clean and orderly condition so as not to cause a nuisance or sight obstruction to motorists or pedestrians.

1.17 OWNERSHIP OF EXISTING MATERIALS

A. All materials removed or excavated from the job site shall remain the property of CITY until released by the CITY, at which time it shall become the property of the CONTRACTOR, who shall dispose of it in a manner satisfactory to the ENGINEER.

1.18 EXCESS MATERIAL

A. Upon direction of the ENGINEER, all vegetation, debris, concrete or other unsuitable materials shall be disposed of in areas provided by the CONTRACTOR and approved by the ENGINEER. Any excess material desired to be retained by the CITY shall be delivered by the CONTRACTOR to a designated area within a 10-mile radius of the project, at no extra cost to the CITY.

1.19 AUDIO-VISUAL PRECONSTRUCTION RECORD

A. General:

1. The CONTRACTOR shall engage the services of a professional electrographer. A responsible commercial firm known to be skilled and regularly engaged in the business of preconstruction color audio-video tape documentation shall prepare the color audio-video recording. The electrographer shall furnish to the ENGINEER a list of all equipment to be used for the audio-video recording (i.e., manufacturer's name, model number, specifications and other pertinent information). Additional information to be furnished by the electrographer are the names and addresses of two references that the electrographer has performed color audio-video recording for on projects of a similar nature within the last 12 months.

2. Prior to beginning the work, the CONTRACTOR shall have a continuous color audio-video recording taken along the entire length of the project to serve as a record of preconstruction conditions. No construction shall begin prior to review and approval of the recording covering the construction area by the ENGINEER. The ENGINEER shall have the authority to reject all or any portion of the video recording not conforming to the specifications and order that it be redone at no additional charge. The CONTRACTOR shall reschedule unacceptable coverage within five days after being notified. The ENGINEER shall designate those areas, if any, to be omitted from or added to the audio-video coverage.

B. Audio-Video Media:

1. Audio-Video media shall be via digital video files.

2. CONTRACTOR shall provide the ENGINEER and the CITY with the digital video files for the project area.

Equipment:

1. All equipment, accessories, materials and labor to perform this service shall be furnished by the CONTRACTOR.

2. The total audio-video system shall reproduce bright, sharp, clear pictures with accurate colors. The audio portion of the recording shall reproduce the commentary

of the camera operator with proper volume and clarity and be free from distortion and interruptions.

3. When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall not be less than twelve feet. In some instances audio-video coverage may be required in areas not accessible by conventional wheeled vehicles. Such coverage shall be obtained by walking or special conveyance approved by the ENGINEER.

4. The color video camera used in the recording system shall have a luminance signal to noise ratio of 45 dB and a minimum illumination requirement of 25 foot-candles.

D. Recorded Information - Audio

1. Each video file shall begin with the current date, project name and municipality and be followed by the general location, i.e., name of street, house address, viewing side and direction of progress. The audio track shall consist of an original live recording. The recording shall contain the narrative commentary of the electrographer, recorded simultaneously with the electrographer's fixed elevation video record of the zone of influence of construction.

E. Recorded Information - Video

1. All video recordings must, by electronic means, display continuously and simultaneously generated with the actual transparent digital information to include the date and time of recording, and station numbers as shown on the drawings. The date information shall contain the month, day and year. The time information shall contain the hour, minutes and seconds. Additional information shall be displayed periodically. Such information shall include, but not be limited to, project name, contract number, name of street, house address, direction of travel and the viewing side.

2. All video recording shall be done during times of good visibility. No video recording shall be done during precipitation, mist or fog. The video recording shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.

3. The rate of speed of the vehicle used during video recording shall not exceed 10 miles per hour. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.

4. Video coverage shall include all surface features located within the zone influence of construction supported by appropriate audio coverage. Such coverage shall include, but not be limited to, existing driveways, sidewalks, curbs, pavements, ditches, mailboxes, landscaping, culverts, fences, signs and headwalls within the area covered.

F. Payment:

1. Compensation for the audio-video preconstruction record shall be included in the lump sum price bid for Item 1 Mobilization.

1.20 ADJUSTING EXISTING VALVES, METERS, CATCH BASINS, AND MANHOLES

A. It shall be the CONTRACTOR'S responsibility to coordinate and have all adjustments made to existing water meters, valves, and structures encountered during construction, in order to meet all final grades, unless otherwise instructed by the ENGINEER or the respective utility owner. All valves and manholes shall be accessible during all phases of the work for emergency access. Omission of such structures from the Contract Plans does not relieve the CONTRACTOR from making such adjustments as may be deemed necessary. The CONTRACTOR shall take this provision into account when personally investigating the site prior to bidding. No additional payment shall be made for these adjustments.

1.21 CONFLICT STRUCTURES

A. The CONTRACTOR shall abide by the following criteria concerning conflicts between new drainage, water, or sewer construction and existing utilities.

1. The CONTRACTOR shall verify the location of all utilities suspected of being potential conflicts prior to ordering drainage or sewer structures for these locations and inform the ENGINEER as to CONTRACTOR'S findings.

2. The ENGINEER shall have full authority to direct the placement of conflict structures, the relocation of structures shown in the plans, and the addition, deletion, or relocation of any pipe or structure shown in the plans in order to facilitate construction, expedite completion and avoid conflicts with existing utilities.

3. Where an existing utility is to pass through a conflict structure, the CONTRACTOR shall protect the utility from damage by whatever means the utility owner and the ENGINEER deem necessary.

4. In no case shall there be less than 6 inches between any two (2) pipe lines within the structure or between pipelines and the structure.

1.22 ENVIRONMENTAL PROTECTION

A. The CONTRACTOR shall furnish all labor and equipment and perform all work required for the prevention of environmental pollution during and as a result of the work under this contract. For the purpose of this contract, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water, land and involves noise, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants.

B. The CONTRACTOR shall take all steps necessary to protect water quality in the connected waters around the project and shall utilize such additional measures as directed by the ENGINEER. Silt screens adjacent to outfall construction shall not be removed until the

turbidity of the affected waters is equal to or lower than the ambient turbidity of undisturbed segments of the waterway. Any discharge into existing drainage facilities shall require the approval of the owner of the system. This may require an engineered plan to be furnished at no additional cost to the CITY.

1.23 MAINTENANCE AND PROTECTION OF TRAFFIC

A. The CONTRACTOR shall provide all necessary traffic control devices in order to redirect, protect, warn or maintain existing vehicular and pedestrian traffic during the course of construction.

1. CONSTRUCTION PHASING REQUIREMENTS

Following are general requirements for construction phasing to minimize resident disruption yet maximize cost effectiveness of the construction scheduling.

a. The CONTRACTOR shall make every effort to provide access to driveways at the end of the working day. If a driveway is not accessible, the homeowner should have access to a neighboring swale area for temporary parking. When vehicular access to homes is not possible for parking of vehicles, an area for parking shall be provided within one block of the furthest home effected. This condition is to be avoided whenever possible and shall last no longer than five (5) working days. The CONTRACTOR, with the CITY'S approval, shall coordinate the parking area location. The CONTRACTOR shall lease the property from the landowner, and will provide a compacted, graded parking surface acceptable to the ENGINEER.

b. Construction within the right of way of affected roads shall be scheduled so that all improvements are completed at once, and the residents are only disrupted for one time period.

c. All affected residents and property owners shall be notified by the contractor in writing a minimum of two (2) weeks, or earlier if required by the CITY, prior to any disruption to or construction in road right-of-ways adjacent to their homes. The notification shall also indicate any special parking or traffic conditions that will affect residents.

d. All affected residents shall be notified by the contractor a minimum of forty eight (48) hours, or earlier if required by the CITY, prior to a shut off of water supply. Any water supply interruptions shall be rescheduled to be as short as possible and not exceed twelve (12) hours.

e. Access for emergency vehicles shall be maintained at all times to all homes or businesses. Excavation must be back-filled or barricaded at the end of each workday to prevent hazardous conditions. If a trench, excavation or structure is to be left open, it must be covered with a steel plate and barricaded at the end of each workday or when work will be suspended for more than eight (8) hours.

f. Transportation provisions for handicapped or disabled residents shall be made by the CONTRACTOR if construction prevents access to homes.

The CONTRACTOR shall also make provisions with local bus, school bus, garbage collection, mail delivery and other agencies for continuation of service. A traffic maintenance plan indicating proposed street closings, schedules, and alternate routes, which has been approved by the ENGINEER and Broward County Traffic Engineering, should be submitted to all affected agencies for coordination and routing purposes.

h. Materials and equipment shall be stored in a fenced or otherwise enclosed area during non-working hours. Pipe and material shall not be strung out along installation routes for longer than two (2) weeks prior to installation.

B. TRAFFIC CONTROL

1. The CONTRACTOR is required to submit a conceptual Traffic Control Plan at the Pre-Construction Conference. This preliminary plan should identify the phases of construction that the CONTRACTOR plans to proceed with and identify traffic flows during each phase. The ENGINEER will have ten (10) days to notify the CONTRACTOR of any comments. Once the conceptual plan for maintaining traffic has been approved, the CONTRACTOR will be required to submit a detailed plan showing each phase's Maintenance and Protection Plan prior to starting construction of any phase.

2. The "Maintenance of Traffic" plan shall include pedestrian traffic as well as vehicular traffic. A safe walk route for all schools within the vicinity of the construction zone shall be maintained during the arrival and dismissal of school. CONTRACTOR shall not block bus access to schools during school hours.

In the case that a designated crossing of any portion of the designated walk route can not be maintained, then the CONTRACTOR shall notify the "School Safety Coordinator" at Broward County Traffic Engineering Division, (954) 484-9600 a minimum of ten (10) working days prior to ceasing that route so that an alternate route can be established with the School and the Enforcing agency.

It shall be the responsibility of the CONTRACTOR for any necessary Construction, Pavement Marking and Signage or any Pedestrian Signalization and/or Signal Modification to accommodate an alternate safe walk route.

Thirty (30) days prior to the beginning of construction the CONTRACTOR shall notify the "School Safety Coordinator" at Broward County Traffic Engineering Division (954) 484-9600, to set up a pre-work meeting.

3. The CONTRACTOR, at all times, shall conduct the work in such a manner as to insure the least obstruction to traffic as is practical. Convenience of the general public and of the residents adjacent to the work shall be provided for in a satisfactory manner, as determined by the ENGINEER.

4. Sidewalks, gutters, drains, fire hydrants and private drives shall, insofar as practical, be kept in condition for their intended uses. Fire hydrants on or adjacent to the work shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within twenty (20) feet of any such hydrant.

5. Construction materials stored upon the public street shall be placed so as to cause as little obstruction to the general public as is reasonably possible.

6. Streets may be closed only as permitted by the approved Maintenance of Traffic Plan and as directed by the ENGINEER. Whenever the street is not closed, the work must be conducted with the provision for a safe passageway for traffic at all times. The CONTRACTOR shall make all necessary arrangements with the ENGINEER concerning maintenance of traffic and selection of detours required.

7. All existing stop and street name signs will be maintained as long as deemed necessary by the ENGINEER.

8. When permission has been granted to close an existing roadway, the CONTRACTOR shall furnish and erect signs, barricades, lights, flags and other protective devices, which shall conform to the requirements, and be subject to the approval of the ENGINEER. The CONTRACTOR shall furnish and maintain proper protective devices at such location for the entire time of closure as the ENGINEER may direct. Signage shall be affected one week before closure.

9. The CONTRACTOR shall furnish a sufficient number of protective devices to protect and divert the vehicular and pedestrian traffic from working areas closed to traffic, or to protect any new work. Failure to comply with this requirement will result in the ENGINEER shutting down the work until the CONTRACTOR provides the necessary protection.

10. Any time traffic is diverted for a period of time that will exceed one-work day temporary pavement markings will be required. Existing pavement markings that conflict with the new work zone traffic pattern must be obliterated. Painting over existing pavement markings (black out) is not permitted.

11. The CONTRACTOR may be required to reposition existing traffic heads in order to maintain traffic flows at diverted intersections. If this should be necessary the CONTRACTOR must submit a plan for approval showing the course of work and the planned repositioning. The Broward County Traffic Engineering Division must approve the plan prior to implementation. No separate payment for repositioning the existing traffic signal heads will be made. The cost of this work shall be included in the bid item for Maintenance of Traffic.

1.24 MAINTENANCE AND PROTECTION OF EXISTING DRAINAGE SYSTEM

A. It shall be the responsibility of the contractor to maintain positive drainage on the surface and to ensure that the existing underground drainage system continues to function as intended during the construction of the new drainage system. The contractor shall submit a plan to maintain the existing drainage patterns and under ground system for the approval of the CONSULTANT prior to beginning any work on the existing or new drainage systems.

The cost of maintaining positive drainage and preparing the maintenance plan shall be included under Item 3, maintenance of traffic and existing drainage system, of the Schedule of Prices Bid.

1.25 BASIS OF PAYMENT (SEE SECTION 01025)

1.26 APPLICATION FOR PAYMENT FOR STORED MATERIALS

A. Application for payment for stored materials may not be made by the CONTRACTOR

1.27 SPECIAL CONDITIONS FOR CONSTRUCTION BY OTHER AGENCIES

A. It will be the CONTRACTOR'S responsibility to coordinate construction schedules with other contractors so as to minimize disruptions, and inconveniences. The project site shall be safe at all times for construction workers and residents of the Project area.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01010

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Contract Requirements, and Division I - General Requirements shall govern the work under this section.

1.02 ITEMS TO BE PROVIDED UNDER SEPARATE CONTRACTS

A. The following items of work are not included in the Contract (N.I.C. ITEMS) and shall be executed under separate contracts directly by the CITY, other Broward County agencies, other public entities, or other utilities:

- Not applicable

B. All other items indicated on the Drawings as N.I.C. ITEMS, and any items listed in the proposal form as N.I.C. ITEMS.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01012

PART 1 - GENERAL

1.01 SCOPE

A. Payment for various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the work all in accordance with requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment shall be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various appurtenances needed to complete the items of work. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the work, from any discrepancies between the actual quantities of work and those shown in the Contract Documents, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the CITY.

B. Payment for the various items of the Bid Schedule shall constitute full compensation for CONTRACTOR's superintendent at the job site full-time during construction, for furnishing and installing all pipe and structures complete in place including but not limited to bends, tees, outlets, fittings, blind flanges and specials, including connections to existing pipelines shown on the Drawings; including surveying both horizontal and vertical control for construction of the roadways, structures, pipeline and appurtenances; including protecting and replacing if necessary existing monuments, control points, found iron rods, valves; including all earthwork, trench excavation as shown on the Drawings, removal and disposal of waste, unsuitable and excess material, furnishing and installing pipe bedding material, all backfill and compaction of native material, dewatering as required, and removal, preservation and relocation of select existing trees as shown on the Drawings; the restoration of interfering portions of existing service and utility lines that are not included in other bid items and shown on the Drawings, including replacement of utility pipes with ductile iron pipe where the minimum vertical clearances are not met for the utility pipe shown; restraint of pipe shown on the Drawings and grouting of pipe joints; including providing the water for pressure testing, cleaning the pipe and disinfection, and disposal of the water as required when completed; furnishing, installation, and removal of test heads; cleanup and restoration of all improvements incidental to construction for which there are no other bid items, including but not limited to, existing sprinkler systems and landscaping; and all other work not included in other bid items.

C. Payment shall also include providing the necessary equipment and labor power to pothole and verify depths and locations of existing utilities sufficiently ahead of construction to avoid conflicts with the design alignment and grade of structures, water mains, force mains, gravity sewers, culverts, storm drains, exfiltration trenches, etc. Conflicts with utilities shown on the Drawings which result from the CONTRACTOR's negligence to pothole sufficiently ahead of construction (a minimum of two days ahead of construction of the pipeline or as approved by the ENGINEER) shall be resolved by

the CONTRACTOR at no additional cost to the CITY.

D. Payment for all bid items shall constitute full compensation for the complete installation of each bid item including but not limited to excavation, dewatering, backfill and compaction. The work shall include for all bid items to be completed, tested and ready for acceptance by the appropriate government agency.

E. No separate payment for surface restoration shall be made unless specifically shown on the Drawings, called out in the Bid Schedule, or directed by the ENGINEER. All bid items shall include surface restoration.

F. The monetary values stated in the Bid Schedule include all costs and expenses for taxes, escalation, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, and labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Drawings and specified herein. The basis of payment for an item at the monetary value shown in the Bid Schedule shall be in accordance with its description of the item in this Section and as related to the work specified and as shown on the Drawings. Unit prices where used will be applied to the actual quantities furnished and installed in conformance with the Contract Documents.

G. The CONTRACTOR's attention is called to the fact that the quotations for the various items of work are intended to establish a total compensation for completing the work in its entirety. Should the CONTRACTOR feel that the cost of any item of work has not been established by the Bid Schedule, he shall include the cost for that work in the other bid items so that the total cumulative value in his Bid Schedule reflect his total compensation for completing the project in its entirety.

1.02 MEASUREMENT

A. The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service, and accepted by the CITY in accordance with the Contract Documents. A representative of the CONTRACTOR shall witness all field measurements.

1.03 PAYMENT ITEMS

A. All bid items below shall be provided by the CONTRACTOR along with all applicable regulatory permits prior to construction for the full compensation as described below, in full accordance with the Drawings and Specifications.

B. Item No. 1 – Bonds and Insurance: The work included in this item includes the costs of bonds and any required insurance as outlined in the Contract Documents, all of which are part of the CONTRACTOR’s typical overhead expenses. Payment of said bonds and insurance shall be made at the time of payment of the first progress estimate. NOTE: The maximum total amount paid for the CONTRACTOR’s overhead expenses (includes bonds, insurance, administration costs, and other contractor provisions) shall not exceed 3% of his subtotal for all labor, materials, equipment, supplies, other construction provisions, and taxes for this project (excludes permits, allowances, profit, and escalation).

C. Item No. 2 – Mobilization: The work included in this item consists of preparatory work and operations in mobilizing for beginning work, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; the establishment of the temporary provisions per state and local laws and regulations; and any other preconstruction expense (including preconstruction work conference and audio-video preconstruction record) necessary for the start of the work. Payment for this item shall be made at the lump sum price named in the Bid Schedule, in equal monthly amounts over the duration of the original Contract time, and the maximum total amount paid for mobilization shall not exceed five (5) % of the CONTRACTOR's subtotal for labor, materials, equipment, supplies and other construction provisions (excludes taxes, permits, allowances, overhead, profit, and escalation). See Section 01505, "Mobilization" for payment limitations.

D. Item No. 3 – Maintenance of Traffic: See Section 01570 entitled "Traffic Regulations" and all other references to traffic control and maintenance in these Specifications and any regulatory requirements. Payment for this item shall be made at the lump sum price named in the Bid Schedule, in equal monthly amounts over duration of the original Contract time and the maximum total amount paid for maintenance of traffic shall not exceed five (5) % of the CONTRACTOR's subtotal for labor, materials, equipment, supplies and other construction provisions (excludes taxes, permits, allowances, overhead, profit, and escalation).

E. Item No. 4 – Bypass Pumping: The work for this item includes preparing a bypass pumping plans for review and approval by the City, furnishing and installing all temporary piping, fittings, pumps, pipe connections, providing power for pump operations, operating and maintaining bypass pumps at a flow rate acceptable to the City for the duration of all construction activities, removing all items upon completion of construction operations. Payment for this item shall be made at the lump sum price named in the Bid Schedule, in equal monthly amounts over duration of the original Contract time and the maximum total amount paid for bypass pumping operations.

F. Item No. 5 – Indemnification: In recognition of CONTRACTOR's indemnification obligations, the CITY will pay to the CONTRACTOR the specific consideration of ten dollars ($10.00). Payment of said specific consideration shall be made at the time of the payment of the first progress estimate, and the CONTRACTOR shall acknowledge payment of this consideration by letter to the CITY after receipt of the progress payment.

G. Item No. 6 – Permit Fees: The work included in this item consists of regulatory permits which the CONTRACTOR must obtain prior to beginning related construction activities, and this item specifically excludes the permits and approvals listed in Paragraph 1.12.F. of Section 01010. Payment for this item shall be made at the actual cost of permit fees and any required testing services specifically defined within the permit requirements. CONTRACTOR must provide copies of any receipts and/or invoices to justify these actual costs for reimbursement under this item. CONTRACTOR is responsible for any coordination with regulatory agencies to obtain these permits.

H. Item No. 7 – FPL Allowance: The work included in this item is related to work to be completed by FPL for the new electrical service, which includes, but is not limited to, the relocation of certain existing utility facilities and the removal and disposal of any existing

utility facilities. Payment for this item shall be made at the actual costs specifically defined by FPL. CONTRACTOR must provide copies of any receipts and/or invoices to justify these actual costs for reimbursement under this item. CONTRACTOR is responsible for any coordination with FPL for the completion of this work.

I. Item No. 8 – Construction Contingency Allowance: The work included in this item is related to project work not identified or reasonably anticipated through the Contract Documents, which includes, but is not limited to, the relocation of certain existing utility structures and the removal and disposal of any existing utility infrastructure encountered that are deemed unnecessary by the governing utility company. This is an allowance, and any work to be completed under this item must be specifically approved in writing by the City prior to completing the work, including the mutually agreed upon cost of said work.

J. Items No. 9-15 – Demolition: The work included in this item consists of all demolition activities at the existing lift station site as indicated on the Drawings. All other demolition activities related to construction of the proposed lift station project as shown on the Drawings shall be included in the appropriate, corresponding bid items in this Section. This work shall also include all excavation, dewatering, surveying, noise abatement, trench stabilization in accordance with the State of Florida Trench Safety Act, asphalt and concrete removal, backfilling, grading, compacting, density testing, tree removal and/or replacement, removal of any piping and other items or activities necessary for complete and acceptable work.

K. Item No. 16 – Asphalt Pavement Removal: Measurement for payment to remove and dispose of existing pavement will be based upon the actual number of square yards (SY) of full depth pavement removed, including all layers in accordance with the Contract Documents. Payment for removal and disposal of existing pavement shall be made at the unit price per square yard (SY), which price shall constitute full compensation for sawcutting (as necessary), removal and disposal of all asphalt layers (surface course and binder course), underlying limerock or aggregate base, aprons, collars, miscellaneous concrete, reflective pavement markers, abandoned valves and valve boxes, and removal and salvage of brass valve tabs. Thickness of existing pavement and base may vary; removal will be paid at the square yard unit price with no additional compensation for thickness.

L. Item No. 17 – Mill Asphalt Payment: Measurement for payment for mill of existing asphalt pavement will be based on the number of square yards of such pavement actually milled, as detailed in the drawings, all in accordance with the requirements of the Contract Documents. Payment for milling existing asphalt pavement will be made at the unit price per square yard (SY) which price shall constitute full compensation for milling, removal and disposal of asphalt, removal of reflective pavement markers, tack coat and restoration. Milling of State/County roads will be at a minimum depth of 1 inch.

M. Item No. 18 – Sanitary Sewer MAS: Measurement for payment to furnish and install sanitary sewer Maintenance Access Structures (MAS) will be based upon the actual quantity, each (EA), of such MAS constructed and installed, all in accordance with the requirement of the Contract Documents. MAS depth shall be measured from the rim elevation to the lowest invert elevation of the structure, the bottom slab is NOT

counted in the depth of the structure. Payment for furnishing and installing sanitary sewer MAS will be made at the unit price, each (EA), named in the Bid Schedule which price shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, bypass pumping (with all equipment and materials necessary), any form and amount of shoring, utility pole protection, backfill and compaction, rock bedding for structure, epoxy coating (and/or anti-microbial agent), grade rings, boots, testing, and construction of the reinforced concrete structure. As-builts for newly installed sewer MAS must be provided before compensation for said sewer MAS will be approved.

N. Item No. 19 – Core Existing Sanitary Sewer MAS: Measurement for coring and connecting into an existing maintenance access structure will be based upon the actual number of cores and connections performed, all in accordance with the requirements of the Contract Documents. Payment for coring and connecting to existing maintenance structure will be made at the unit price, each (EA), named in the Bid Schedule which price shall include coring existing structure (cutting will not be allowed), attaching new pipe with coupler and all applicable fittings including but not limited to all labor incurred, plugging of existing main when necessary, excavation, any form and amount of shoring, utility pole protection, trench protection and trench safety, backfill, dewatering, bypass pumping (with all equipment and materials necessary) all connections, all mortar and restoration work.

O. Items No. 20 – Gravity Pipe: The work included in this item consists of providing and installing PVC gravity pipe as indicated on the Drawings. This work shall also include, but not be limited to all demolition, excavation, dewatering, surveying, noise abatement, bedding, pipe laying, pipe markers, corrosion protection, thrust restraint, line stops, trench stabilization in accordance with the State of Florida Trench Safety Act, backfilling, grading, compacting, density testing, pressure testing, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Contractor is responsible for cleaning the existing gravity sewer pipe prior to commencement of work. Payment will be on a linear foot (LF) basis per item as installed and accepted by the CITY.

P. Items No. 21-23 – Wet Well and Vault Structures: The work included in this item consists of providing and installing precast or cast-in-place reinforced concrete structures of the size, grade and depth and associated access hatches, as well as the concrete top slab as indicated on the Drawings. This work shall also include, but not be limited to, all demolition, excavation, dewatering, surveying, noise abatement, bedding, pipe penetrations, custom-sized lockable hold-open aluminum access hatches, PVC drain with P-trap (wet well and valve vault), trench stabilization in accordance with the State of Florida Trench Safety Act, backfilling, grading, compacting, density testing, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment for these items shall be made at the unit price, each (EA) named in the Bid Schedule which price shall constitute full compensation, as installed and accepted by the CITY.

Q. Items No. 24-25 – Submersible Pumps, Piping, and Appurtenances: The work included in this item consists of installing the submersible pumps along with all associated intake and discharge piping within the lift station structure as indicated on the Drawings along with all fittings, valves, wall pipe, and appurtenances. This work shall also include, but

not be limited to, all demolition, dewatering, surveying, noise abatement, pipe supports, corrosion protection, thrust restraint, pump base elbows, anchoring, stainless steel guide rails, stainless steel cables, power cables, pump testing, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment for this item shall be made at the percentage complete based on the lump sum (LS) price provided in the Bid Schedule which shall constitute full compensation, as installed and accepted by the CITY.

R. Items No. 26-28 – Plug and Check Valves: The work included in this item consists of providing and installing plug and check valves together with their corresponding concrete vault /valve box, as indicated on the Drawings. This work shall also include, but not be limited to, all excavation, dewatering, surveying, bedding, pipe markers, pipe supports, corrosion protection, thrust restraint, pump base elbows, anchoring, trench stabilization in accordance with the State of Florida Trench Safety Act, backfilling, grading, compacting, density testing, pressure testing, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment for furnishing and installing valves will be made at the unit price each (EA), named in the Bid Schedule which price shall constitute full compensation for the completed installation of the valve, including valve box and extension, 2” brass ID disk.

S. Items No. 29-37 – Lift Station Components: See Section 02603 entitled "Pump Station and Force Main" and all other references to piping and controls in these Specifications and any regulatory requirements. This work shall also include, but not be limited to, all lift station components defined within the Drawings along with all pump bypass assemblies, dewatering, surveying, noise abatement, pipe penetrations, air bubbler system (wet well), level transmitter (wet well), exhaust fans, drop bowl, level sensor, cranes, remove and relocation of water meter & backflow preventer, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment for these items will be made at the unit price each (EA), named in the Bid Schedule which shall constitute full compensation, as installed and accepted by the CITY.

T. Item No. 38 – Force Main Fittings: The work included in this item consists of furnishing and installing force main fittings, including but not limited to crosses, tees, bends and elbows of all angles and radius, concentric and eccentric reducers, offsets, wyes, true wyes, sleeves, plugs, caps, restraining glands and gaskets, base sends, reducing flanges, mega lugs, fillers and connecting pieces, furnished all in accordance with the Contract Documents. Payment for furnishing and installing force main fittings complete and in place shall be at the lump sum (LS) priced stated in the bid schedule, and shall include furnishing, storing, transporting, and installing the fittings

U. Items No. 39-40 – Force Main Pipe: The work included in this item consists of providing and installing DIP force main as indicated on the Contract Documents. This work shall also include, but not be limited to all demolition, excavation, dewatering, surveying, noise abatement, bedding, pipe laying, pipe markers, corrosion protection, thrust restraint, line stops, trench stabilization in accordance with the State of Florida Trench Safety Act, backfilling, grading, compacting, density testing, pressure testing, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment will be on a linear foot (LF) basis per

item as installed and accepted by the CITY

V. Item No. 41 – Force Main Connection: The work included in this item consists of providing and connecting the 6-inch diameter ductile iron pipe to the existing 6-inch diameter force main as indicated on the Contract Documents. The work also includes providing and installing required force main fittings, valves, wall pipe, and appurtenances. This work shall also include all demolition, excavation, dewatering, surveying, noise abatement, bedding, pipe laying, pipe markers, pipe supports, corrosion protection, thrust restraint, line stops, trench stabilization in accordance with the State of Florida Trench Safety Act, backfilling, grading, compacting, density testing, pressure testing, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment for this item shall be made at the percentage complete based on the lump sum (LS) price provided in the Bid Schedule which shall constitute full compensation, as installed and accepted by the CITY.

W. Items No. 42-51 – Electrical: The work included in this item consists of providing and installing the equipment, materials, supplies, labor, etc. necessary to supply adequate electrical power to all electrical devices and facilities for this project, including but not limited to the gas monitoring system, electrical components, pumps, pressure instruments, level transmitters, alarms, ventilation, and motor-operated louvers, valves or other appurtenances, all as shown on the Contract Documents and in full accordance with Division 16 and other applicable Sections of these Specifications. The contractor shall provide and install decorative wrapping approved by the CITY to fully conceal the control panel. This work shall also include, but not be limited to, all demolition of existing equipment at the existing lift station (to be reused as directed by the CITY), noise abatement, shop drawings, record drawings with GPS data, and other items or activities necessary for a complete and acceptable installation. Payment for these items shall be made at the percentage complete based on the lump sum (LS) price provided in the Bid Schedule which shall constitute full compensation, as installed and accepted by the CITY. FPL new service costs shall be paid by the owner and will include, but not limited to FPL allowance and utility charges.

X. Item No. 52 – Subgrade: Measurement for payment for stabilization of subgrade will be based upon the number of square yards of such materials actually stabilized, all in accordance with the requirements of the Contract Documents. Payment for stabilization of subgrade will be made at the unit price per square yard, which price shall constitute full compensation for handling, cleaning, positioning and compacting of said bedding to a Limerock Bearing Ratio (LBR) of 40, importing fill material as needed and disposal of excess waste or unsuitable material. Existing limerock removed can be blended to be used for subgrade compaction if the CONTRACTOR elects to do so. If contractor elects to reuse limerock, stockpiling and blending of limerock shall be done at no cost to the City.

Y. Item No. 53 – Limerock Base: Measurement for payment for furnishing and placing limerock base material will be based upon the number of square yards of such materials actually compacted in place, all in accordance with the requirements of the Contract Documents. Payment for furnishing and placing of limerock base material will be made at the unit price per square yard, which price shall constitute full compensation for applying prime coat and furnishing all such material Limerock Bearing Ratio (LBR) of

100, in place, including all transportation, handling, cleaning, positioning and compacting of said bedding and disposal of waste or unsuitable material.

Z. Item No. 54 – 55 – Asphalt Pavement: Measurement for payment of asphalt concrete pavement will be based upon the number of square yards of such asphalt concrete pavement actually constructed for areas with newly compacted subgrades and limerock bases, as detailed in the drawings, all in accordance with the requirements of the Contract Documents. Payment for placement of asphalt concrete pavement, will be made at the unit price per square yard for such placement named in the Bid Schedule which price will constitute full compensation for applying a tack coat, and furnishing, placing and compacting all asphalt surface, complete in place to the cross section and thicknesses shown on the Drawings; including replacing brass valve tabs, adjusting valve box and MAS rim elevations, saw cutting of all pavement, temporary striping and all cleanup of the area disturbed by this construction. Type and thickness of asphalt shall be in accordance with roadway jurisdiction requirements.

AA. Item No. 56 – Sod Restoration: The work included in this item consists of providing and installing sod as indicated on the drawings. Measurement for furnish and install sod (to match existing type) will be based upon the number of square yards (SY) of sod actually installed, all in accordance with the requirements of the Contract Documents. Payment for sod will be made at the unit price per square yard (SY) of sod named in the Bid Schedule.

BB. Item No. 57 - Specialty Driveways: Measurement for payment for restoration of specialty driveway aprons will be based upon the number of square yards (SY) of such driveways aprons actually constructed to repair open cuts made to install pipeline as detailed in the drawing, all in accordance with the requirements of the Contract Documents. Specialty driveways are considered to be pavers, stamped, Chattahoochee, etc. Payment for specialty driveway apron restoration will be made at the unit price per square yard (SY) for such driveways aprons constructed as named in the Bid Schedule which price will constitute full compensation for furnishing and installing all materials necessary to restore driveway to conditions equal or better than pre-construction conditions and shall include the removal of existing material, all earthwork and grading, subgrade compaction, disposal of excess material and the appurtenant items for which separate payment is not specifically included in the Bid Schedule.

CC. Item No. 58 – Concrete Slab: The work included in this item consists of furnishing and installing an 8-inch-thick reinforced concrete slab at the lift station, complete and in place, as indicated on the Drawings. This shall include but is not limited to all labor, materials, and equipment necessary to provide complete and acceptable concrete slab in accordance with the Contract Documents. Payment shall be made at the unit price per square foot (SF) of concrete slab furnished and installed, measured in place and accepted by the CITY.

DD. Item No. 59 – Water Service with Hose Bib: The work included in this item consists of furnishing and installing a new water service with a hose bib. Measurement for payment will be based upon the actual number, each, of water services with hose bibs furnished and installed, all in accordance with the requirements of the Contract Documents.

Payment for the furnishing and installation of a water service with hose bib shall constitute full compensation for furnishing all labor, materials, equipment, and incidentals necessary to complete the work in accordance with the Contract Documents, including: tapping the existing water main; furnishing and installing the saddle, corporation stop, ball valve, dual check valve (when required), service piping, fittings, and appurtenances; furnishing and installing the water meter box and meter; furnishing and installing the hose bib at the location shown on the Contract Documents; providing water service encasement (when necessary); performing all clearing and grubbing, excavation, trenching, trench protection and safety, backfilling, compaction, and open trench work; and providing temporary restoration of landscape, decorative features, and walkways.

EE. Item No. 60 – Water Service: The work included in this item consists of furnishing and installing new water services and relocating existing water meters. Measurement for payment will be based upon the actual number, each, of water services furnished and installed and the actual number of existing water meters relocated, all in accordance with the requirements of the Contract Documents. Payment for the installation of a new water service and relocation of an existing water meter shall constitute full compensation for relocating existing water meters to fit inside of single water meter boxes, installation of existing water meters as shown in Contract Documents, relocation of water service line behind the water meter in private property, water service encasement (when necessary), water meter box, tapping the existing water main and furnishing and installing the saddle, corporation stops, ball valve, dual check valve (when required), fittings, and appurtenances to complete the connection, including open trench, all clearing and grubbing, excavation, trench protection and safety, and temporary restoration of landscape, decoration, and walkways.

FF. Item No. 61 – Water Main Offset: This work included in this item consists of the offset for an existing water main. Payment for these items shall be made at the percentage complete provided in the Bid Schedule which shall constitute full compensation, as installed and accepted by the CITY for the complete installation including, but not limited to, the excavation, backfilling, compaction and material costs for all fitting and associate pipe, removal and relocation of pipe, valves, cut and connection to existing water main, attaching new piping with coupler all applicable fittings and adjustments of pipe ends, excavation, trench protection and trench safety, backfill and compaction, dewatering, restoration and all related materials.

GG. Item No. 62 – Sewer Lateral: The work included in this item consists of furnishing and installing sanitary sewer laterals and will be based upon the actual number, each (EA), of sanitary sewer laterals installed, all in accordance with requirements of the Contract Documents. Payment for furnishing and installing sanitary sewer laterals will be made at the unit price, each (EA), named in the Bid Schedule which price shall constitute full compensation for the complete installation of the sanitary sewer laterals at required size including main line wye (which may include PVC, DIP, or C900 material), clean out(s), material adaptor bends and fittings to property line, cleanout box with pea rock, concrete collars around cleanout box (when required), excavation, dewatering, bypass pumping (with all equipment and materials necessary), any form and amount of shoring, utility pole protection, backfill and compaction. The CONTRACTOR is responsible for the restoration of any disturbed surface features including, but not limited fencing, driveways, walkways, mailboxes, decorations, irrigation and landscaping inside and outside of the public right-of-

way.

HH. Item No. 63-64 – Pavement Markings: This work included in this item consists of furnishing and placing pavement markings. Measurement for payment will be based upon the number of linear feet (LF) of such markings actually constructed as determined by measurement along the centerline of the pavement markings in place, all in accordance with the requirements of the Contract Documents. Payment for furnishing and placing pavement markings will be made at the unit price per linear foot (LF) of pavement markings named in the Bid Schedule, which price shall constitute payment for all colors, widths and types.

II. Item No. 65 - Street Sign: Measurement for payment to remove and relocate signs will be based upon actual quantity, each (EA), of such sign post relocated, all in accordance with the requirements of the Contract Documents. Payment for removing and relocating signs will be made at the unit price, each (EA), named in the Bid Schedule which price shall constitute full compensation for the completed removal, temporary relocation and re-installation of signs and post (regardless of the number of times CONTRACTOR chooses to remove and re-install sign), and final installation of the sign and post including all restoration. Removal and relocation of existing signs are based upon the relocation of the sign post regardless of the number of signs on each post. Final Sign installation shall be installed per BCTED approval. Signs damaged by the CONTRACTOR will be replaced by the CONTRACTOR at no cost to the City.

JJ. Item No. 66 – Stamped Concrete Raised Intersection: Measurement for payment of stamped concrete raised intersection will be based upon the actual quantity, each (EA), of stamped concrete raised intersections furnished and installed, as detailed on the Drawings and in accordance with the requirements of the Contract Documents. Payment for furnishing and installing stamped concrete raised intersections will be made at the unit price, each (EA), named in the Bid Schedule, which price shall constitute full compensation for furnishing all labor, materials, equipment, and incidentals necessary for a complete installation, including preparation of the subgrade and base, formwork, reinforcement where required, furnishing, placing, finishing, stamping, coloring, curing and sealing of concrete, joints, saw cutting, adjustments to existing utility structures and appurtenances, cleanup, and all other work necessary to construct the raised intersection complete in place to the lines, grades, elevations, patterns, dimensions, and thicknesses shown on the Drawings. Concrete materials, finishes, colors, patterns, and installation shall be in accordance with the requirements of the applicable roadway jurisdiction.

KK. Item No. 67 – Pavement Markings: This work included in this item consists of furnishing and placing pavement markings. Measurement for payment will be based upon the number of linear feet (LF) of such markings actually constructed as determined by measurement along the centerline of the pavement markings in place, all in accordance with the requirements of the Contract Documents. Payment for furnishing and placing pavement markings will be made at the unit price per linear foot (LF) of pavement markings named in the Bid Table, which price shall constitute payment for all colors, widths and types.

END OF SECTION 01025

PART 1 - GENERAL

1.01 REQUIREMENTS

A. Coordinate work of trades and schedule elements of alterations and renovation work by procedure and methods to expedite completion of the work.

B. In addition to demolition specified in Section 02050 and that specifically shown, cut, move or remove items necessary to provide access or to allow alterations and new work to proceed. Include such items as:

1. Repair or removal of hazardous or unsanitary conditions.

2. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit and wiring.

3. Removal of unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals and deteriorated concrete, shall be removed from the site expeditiously.

4. Cleaning of surfaces, and removal of surface finished as needed to install new work and finishes.

5. Protection as required for existing trees to remain.

6. For purposes of all existing underground utilities work, coordinate as required by use of special telephone number shown on engineering drawings.

7. Site storage for all existing benches, signals, light poles, fire hydrants, manhole covers and grates to be relocated.

C. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a professional transition to adjacent new items of construction.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 ALTERATIONS, CUTTING AND PROTECTION

A. Assign the work of moving, removal, cutting, patching and protection to trades qualified to perform the work in a manner to cause least damage to each type of work, and provide means of returning surfaces to appearance of new work.

B. Perform cutting and removal work to remove minimum necessary, and in a manner to avoid damage to adjacent work.

1. Cut finish surfaces such as paving, masonry, tile, plaster or metals, by methods to

terminate surfaces in a straight line at a natural point of division.

C. Perform cutting and patching as specified in Section 01045.

D. Protect existing finishes, equipment, and adjacent work which is scheduled to remain, from damage.

1. Protect existing and new work from weather and extremes of temperature.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. General Requirements that work be complete:

1. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work.

(a) Generally Contract Documents will not define products or standards of working conduct present in existing construction; CONTRACTOR shall determine products in inspection and any necessary testing by use of the existing as a sample of comparison.

2. Presence of a product, finish, or type of construction, requires that patching, extending or matching shall be performed as necessary to make work complete and consistent to existing identical standards of quality.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. Patch and extend existing work using skilled mechanics who are capable of matching existing quality. Quality of patched or extended work shall be not less than that specified for new work.

3.02 DAMAGED SURFACES

A. Patch and replace any portion of an existing finished surface which is found to be damaged, lifted, discolored, or shows other imperfections, with matching material.

1. Provide adequate support of substrate prior to patching the finish.

2. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.

3. When existing surface finish cannot be matched, refinish entire surface to nearest intersections.

3.03 TRANSITION FROM EXISTING TO NEW WORK

A. When new work abuts or is finished flush with existing work, make a smooth transition. Patched work shall match existing adjacent work in texture and appearance so that the patch of transition is invisible at a distance of five feet.

1. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

3.04 CLEANING

A. Perform periodic and final cleaning as specified in Section 01710.

1. Clean CITY occupied areas daily.

2. Clean spillage, overspray, and heavy collection of dust in CITY occupied areas immediately.

B. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.

C. At completion of alterations work in each area, provide final cleaning and return space to a condition suitable for use by CITY.

3.05 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work in this section. Payment for work shall be included in all other work.

END OF SECTION 01031

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. CONTRACTOR shall be responsible for all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:

1. Make its several parts fit together properly.

2. Uncover portions of the work to provide for installation of ill-timed work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of Contract Documents.

5. Remove samples of installed work as specified for testing.

6. Provide routine penetrations of nonstructural surfaces for installation of piping and electrical conduit.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 SUBMITTALS

A. Submit a written request to ENGINEER well in advance of executing any cutting or alteration, which affects:

1. Work of the CITY or any separate CONTRACTOR.

2. Structural value of integrity of any element of the project.

3. Integrity of effectiveness of weather-exposed or moisture-resistant elements or systems.

4. Efficiency, operational life, maintenance or safety of operational elements.

5. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of the project.

2. Description of the affected work.

3. The necessity for cutting, alteration or excavation.

4. Effect on work of CITY or any separate CONTRACTOR, or on structural or weatherproof integrity of project.

5. Description of proposed work:

   a. Scope of cutting, patching, alteration, or excavation.
   b. Trades who will execute the work.
   c. Products proposed to be used.
   d. Extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

8. Written permission of any separate CONTRACTOR whose work will be affected.

C. Should conditions of work or the schedule indicate a change of products from original installation, CONTRACTOR shall submit request for substitution as specified in Section 01600, paragraph 1.08.

D. Submit written notice to ENGINEER designating the date and time the work will be uncovered.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product involved.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering the work, inspect conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions affecting installation of products, or performance of work.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of project from damage.

C. Provide protection from elements for that portion of the project, which may be exposed by cutting and patching, work, and maintain excavations free from water.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods, which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods, which will prevent settlement or damage to other work.

C. Employ original Installer or Fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified product, functions, tolerances and finishes.

E. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish entire unit.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the unit price bid of any item requiring cutting and patching, including pavement restoration.

END OF SECTION 01045

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. CONTRACTOR shall provide and pay for field Engineering and Survey services, including AutoCAD capabilities, required for the project except as noted below in paragraph 1.04.

B. ENGINEER will identify existing control points and property line corner stakes indicated on the drawings, as required.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Qualified Engineer or registered Land Surveyor, acceptable to ENGINEER and CITY.

1.04 SURVEY REFERENCE POINTS

A. CONTRACTOR will provide basic horizontal and vertical control points for the construction project including:

1. Permanent coordinate reference points with horizontal and vertical control, located and staked as shown on the plans.

B. Locate and protect control points prior to starting site construction work and preserve all permanent reference points during construction.

1. Make no changes or relocations without prior written notice to CITY's Representative.

2. Report to CITY's Representative when any reference point is lost, destroyed, or requires relocation because of necessary changes in grades or locations.

3. CONTRACTOR's surveyor shall replace project control points which may be lost or destroyed at contractor’s expense.

a. Establish replacements based on original survey control.

1.05 PROJECT SURVEY REQUIREMENTS

A. CONTRACTOR's surveyor shall establish a minimum of two permanent benchmarks on site, referenced to data established by survey control points.

B. CONTRACTOR shall establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:

1. Stakes for grading and fill placement.

2. Controlling lines and levels as required.

C. From time to time, verify layouts by same methods.

1.06 RECORDS

A. Maintain a complete, accurate log and AutoCAD electronic drawing of all control and survey work as it progresses.

B. On completion of construction work, prepare a certified survey showing all dimensions, locations and elevations of project.

1.07 SUBMITTALS

A. Submit name and address of Surveyor and Professional Engineer to CITY's Representative at preconstruction conference.

B. Submit serial number of AutoCAD software to CITY's Representative at preconstruction conference.

C. Submit documentation to verify accuracy of field engineering work on a monthly basis.

D. Submit certificate signed by Registered Engineer or Surveyor certifying that elevation and locations of work are in conformance, or non-conformance, with Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

END OF SECTION 01050

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. CONTRACTOR shall comply with all building codes appropriate to the project, including those of:

1. National Electric Code
2. Unified Building Code

B. CONTRACTOR shall comply with these codes, laws, regulations, rules, directives of all agencies, boards, districts, and governmental bodies having jurisdiction.

D. Any and all engineering permits have been obtained from the Agencies listed below by the CITY. The CONTRACTOR is responsible for compliance with any and all permit conditions. In the event that the CITY must obtain permits in addition to those listed below, the CONTRACTOR shall not have any claim for damages arising from any delay caused by the CITY'S obtaining said additional permits.

1. Florida Department of Environmental Protection
   i. Permit for Constructing a Domestic Wastewater Collection/Transmission System

2. Broward County Resilient Environment Department
   i. Permit to Construct a Wastewater Collection/Transmission System

3. Florida Department of Transportation
   i. Utility Permit

E. The CONTRACTOR shall obtain:

1. South Florida Water Management District – Dewatering Permit (if necessary)

2. City of Wilton Manors – Building Permit

3. EPA NPDES Notice of Intent

4. Broward County Highway Construction and Engineering Division - Permit (as necessary)

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 MEASUREMENT AND PAYMENT

A. CONTRACTOR shall be reimbursed for permit fees as described in Section 01025.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01060

PART 1 GENERAL

1.01 GENERAL

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations, which may appear in these Specifications, shall have the meanings indicated herein.

1.02 ABBREVIATIONS

AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBC	Basic Building Code, Building Officials and Code Administrators International
BCEED	Broward County Environmental Engineering Division
BCEPGM	Broward County Environmental Protection and Growth Management Department
BCWWS	Broward County Water and Wastewater Services

BCPHU	Broward County Public Health Unit
BCTED	Broward County Traffic Engineering Division
BCWRMD	Broward County Water Resource Management Division
BHMA	Builders Hardware Manufacturer's Association
CBM	Certified Ballast Manufacturers
CEMA	Conveyors Equipment Manufacturer's Association
CGA	Compressed Gas Association
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DIPRA	Ductile Iron Pipe Research Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
EPA	Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FM	Factory Mutual System
FPL	Florida Power & Light
FS	Federal Specifications
HI	Hydronics Institute
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MPTA	Mechanical Power Transmission Association
MSS	Manufacturers Standardization Society
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PPI	Plastics Pipe Institute

RCRA	Resource Conservation and Recovery Act
RIS	Redwood Inspection Service
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SB	Southern Bell
SFWMD	South Florida Water Management District
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Society of the Plastics Industry, Inc.
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WEF	Water Environment Federation
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01070

PART 1 GENERAL

1.01 GENERAL

A. Titles of Sections and Paragraphs: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.

B. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C. Specialists, Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.

B. References herein to "Building Code" shall mean "Unified Building Code". Reference to "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing

any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

D. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.

E. Applicable Standard Specifications: References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction, 1991 Edition.

F. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

G. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

H. References to "Minimum Standards" shall mean Broward County Engineering Division, Department of Public Works-Minimum Standards and Broward County Office of Environmental Services, Department of Public Works-Minimum Design and Construction Standards.

1.03 REGULATIONS RELATED TO HAZARDOUS MATERIALS

A. The CONTRACTOR is responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.

B. Where no specific regulations exist, all chemical, hazardous, and petroleum product piping and storage in underground locations must be installed with double containment piping and tanks, or in separate concrete trenches and vaults, or with an approved lining which cannot be penetrated by the chemicals, unless waived in writing by the CITY.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01090

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Submit Applications for Payment to CITY and ENGINEER in accordance with the schedule established by Conditions of the Contract and Agreement between CITY and CONTRACTOR.

1.02 RELATED REQUIREMENTS

A. Contract Between CITY and CONTRACTOR: Progress Payments, Retainage and Final Payment.

B. All applicable sections of the Specifications.

1.03 FORMAT AND DATE REQUIRED

A. Submit itemized applications typed on AIA Document G702, Application and Certificate for Payment, and continuation sheet G702A or equivalent.

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.

2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.

3. Execute certification with signature of a responsible officer of Contract firm.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of work, with item number and scheduled dollar value for each item.

2. Fill in dollar value in each column for each scheduled line item when work has been performed.

    a. Round off values to nearest dollar, or as specified for Schedule of Values.

3. List each Change Order executed prior to date of submission, at the end of the continuation sheets.

    a. List by Change Order Number, and description, as for an original component item of work.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the CITY or the CITY's Representative requires substantiating data, CONTRACTOR shall submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

B. Submit one copy of data and cover letter for each copy of application.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700 Contract Closeout.

1.07 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to CITY's Representative at the times stipulated in the Agreement.

B. Number: Two copies of each Application.

1.08 “RED LINE” AS-BUILT INFORMATION

A. Submit with each progress payment application “red-line” as-built information current to the date of the submittal date with verification by the CITY's Representative.

1.09 OTHER PROVISIONS

A. The CONTRACTOR'S Land Surveyor will measure all "As-built" quantities for payment. In the event of disputes as to quantity, the ENGINEER shall make the final determination; no additional compensation will be made for surveying services. A Florida Licensed Registered Land Surveyor shall supervise this work.

B. The CONTRACTOR shall not be permitted to invoice for quantities of work beyond those contained in the contract and all previously approved change orders. Invoice for partial payment shall not be accepted by ENGINEER as complete without the following:

1. Certificate of payment to subcontractors.

2. Updated Construction Schedule: Five hard copies and one electronic copy.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01152

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. CITY's Representative shall schedule and administer a preconstruction meeting, progress meetings at a minimum of every two weeks on a day established by the CITY's Representative and specially called meetings throughout progress of the work.

1. Prepare agenda for meetings.

2. Distribute written notice of each meeting five (5) days in advance of meeting date.

3. Make physical arrangements for meetings.

4. Preside at meetings.

5. Record the minutes; include significant proceedings and decisions.

6. Reproduce and distribute copies of minutes within three days after each meeting.

    a. To participants in the meeting
    b. To parties affected by decisions made at the meeting
    c. Furnish three copies of minutes to CITY's Representative

B. Representative of CONTRACTOR, subcontractor and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. ENGINEER shall attend all meetings.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 PRE-CONSTRUCTION MEETING

A. Schedule after date of Notice to Proceed.

B. Location: A central site, convenient for all parties, designated by CITY's Representative.

C. Attendance:

1. The CONTRACTOR and its superintendent.

2. ENGINEER and ENGINEER'S professional consultants.

3. Resident Project Representative.

4. Representatives of the CITY.

5. Major subcontractors.

6. Major Suppliers.

7. Governmental representatives as appropriate.

8. Others as requested by CONTRACTOR, CITY or ENGINEER.

D. Suggested Agenda:

1. Distribution and discussion of:

   a. List of major subcontractors and suppliers.
   b. Projected Construction Schedules.
   c. Shop drawings and other submittals.
   d. Traffic maintenance plan.
   e. Community Public Relations.

2. Critical work sequencing.

3. Procurement of major equipment and materials requiring a long lead time.

4. Project Coordination

   a. Designation of responsible personnel.

5. Procedures and processing of:

   a. Field decisions.
   b. Proposal requests.
   c. Submittals.
   d. Change Orders.
   e. Applications for Payment

6. Adequacy of distribution of Contract Documents.

7. Procedures for maintaining Record Documents.

8. Use of premises:

   a. Office, work and storage areas.
   b. CITY's requirements.

9. Construction facilities, controls and construction aids.

10. Temporary utilities.

11. Safety procedures.

12. Security procedures.

13. Housekeeping procedures.

1.04 PROGRESS MEETINGS

A. Schedule regular biweekly meetings on a day established by the CITY's Representative as required.

B. Hold called meetings as required by progress of the work.

C. Location of the meetings: Project field office of CITY's Representative.

D. Attendance

1. CITY's Representative and CITY's professional consultants as needed.

2. ENGINEER.

3. Subcontractors as active on the site.

4. Suppliers as appropriate to the agenda.

5. Governmental representatives as appropriate.

6. Others, as requested by CONTRACTOR, CITY or ENGINEER.

E. Suggested Agenda:

1. Review, approval of minutes of previous meeting.

2. Review of work progress since previous meeting.

3. Field observations, problems, and conflicts.

4. Problems, which impeded Construction Schedule.

5. Review of off-site fabrication, delivery schedules.

6. Corrective measures and procedures to regain projected schedule.

7. Revisions to Construction Schedule.

8. Progress, schedule, during succeeding work period.

9. Coordination of schedules.

10. Community Public Relations.

11. Review submittal schedules; expedite as required.

12. Maintenance of quality standards.

13. Pending changes and substitutions.

14. Review proposed changes for:

    a. Effect on Construction Schedule and on completion date.
    b. Effect on other contracts of the Project.

15. Other business.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The Work under this Contract shall be planned, scheduled, executed, reported and accomplished using the Critical Path Method (hereinafter referred to as CPM), in calendar days, unless otherwise specifically provided in the Contract Documents.

B. The primary objectives of the CPM scheduling requirements are: (1) to insure adequate planning and execution of the Work by CONTRACTOR; (2) to assist CITY and CONSULTANT in evaluating progress of the Work; (3) to provide for optimum coordination by CONTRACTOR of their trades, Subcontractors and Suppliers, and of their Work with the work or services provided by any separate Contractors; (4) to permit the timely prediction or detection of events or occurrences which may affect the timely prosecution of the Work; and (5) to provide a mechanism or tool for use by the CITY, CONSULTANT and CONTRACTOR in determining and monitoring any actions of the CONTRACTOR which may be required in order to comply with the requirements of the Contract Documents relating to the completion of the various portions of the Work by the Specific Dates specified in the Contract Documents.

C. CONTRACTOR is responsible for determining the sequence of activities, the time estimates of the detailed construction activities and the means, methods, techniques and procedures to be employed. The construction Schedule shall represent the CONTRACTOR's best judgment of how they will prosecute the Work in compliance with the Contract requirements. CONTRACTOR shall ensure that the Construction Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions and the Contract Documents may require.

D. CONTRACTOR shall consult with their principal Subcontractors and Suppliers relating to the preparation of their construction plan and Construction Schedule. Principal Subcontractors shall receive copies of those portions of CONTRACTOR's Construction Schedule, which relate to their work and shall be continually advised of any updates or revisions to the Construction Schedule as the Work progresses. When CONTRACTOR submits their Construction Schedule to the CITY or makes any proposed updates or revisions to such Schedule, CITY and CONSULTANT that CONTRACTOR has consulted with and has the concurrence of their principal Subcontractors and Suppliers will assume it. CONTRACTOR shall be solely responsible for ensuring that all Subcontractors and Suppliers comply with the requirements of the Construction Schedule for their portions of the Work.

E. CONTRACTOR will provide the basic data relating to activities, durations and sequences of construction and shall develop and deliver to the CITY and CONSULTANT the draft of the Construction Schedule. This data shall reflect the CONTRACTOR's actual construction plan for the Project and shall fully comply with all requirements of the Contract Documents.

F. When there are separate Contractors working concurrently on the Project whose work must interface or be coordinated with the Work of CONTRACTOR, CONTRACTOR shall coordinate their activities with the activities of the separate Contractors and shall, prior to the submission of their Construction Schedule to the CITY and CONSULTANT, obtain

written approval of their Construction Schedule by the separate Contractors. If CONTRACTOR is unable to obtain such written approval by the separate Contractors after their best efforts to do so, or if a conflict occurs that cannot be resolved by mutual agreement between CONTRACTOR and any separate CONTRACTOR, the CITY shall make a determination of the schedule, which shall be binding upon CONTRACTOR and the separate Contractors.

G. The CONTRACTOR shall be responsible for providing the services required for the preparation of the CONTRACTOR's initial Construction Schedule, in accordance with the requirements of this Contract.

H. To carry out the intent of this Section, CONTRACTOR agrees that the orientation session, shall not be grounds for any claim by CONTRACTOR or any of their Subcontractors or Sub-Subcontractors of alleged interference, lack of cooperation, delay disruption, negligence or hindrance by CITY or CONSULTANT, and CONTRACTOR covenants not to sue therefore.

I. It is understood and agreed that the Construction Schedule is to represent CONTRACTOR's best plan and estimate for the Work; however, CONTRACTOR acknowledges that the Construction Schedule may have to be revised from time-to-time as progress proceeds. CONTRACTOR further acknowledges and agrees that the CITY does not guarantee that: (1) CONTRACTOR can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish" or "late finish" dates shown in the schedule, or as same may be updated or revised; (2) CONTRACTOR can proceed at all times in the sequence established by the utilization of only the resources and labor they initially plans for the performance of the work; (3) CONTRACTOR's Construction Schedule will not have to be modified in order to obtain the agreement of any separate Contractors to the schedule; or (4) CONTRACTOR's Construction Schedule will not have to be modified or changed by direction of the CITY. Any changes, modifications or adjustments made by CONTRACTOR to the Construction Schedule shall be in full compliance with all requirements of the Contract Documents.

J. The CONTRACTOR acknowledges and agrees that their Construction Schedule must be flexible in order to accommodate and allow for their coordination with the operations of the CITY and the work of separate contractors relating to the Project. The CITY and CONSULTANT will review the CONTRACTOR's Construction Schedule for compatibility with CITY operations and the work of separate contractors. CONTRACTOR agrees to hold meetings with the CITY, CONSULTANT and separate contractors to resolve any conflicts between CONTRACTOR's Construction Schedule and the operations of the CITY or work of separate contractors. CONTRACTOR agrees to fully cooperate with CITY and separate contractors to resolve such conflicts and to revise their Construction Schedule as reasonable required.

K. In order to maintain the orderly progress of the work performed on the Project, the CITY shall have the right to determine, in their sole discretion, the priority between the Work performed by CONTRACTOR and the work of any separate contractors or CITY's operations; this decision shall be final and binding upon CONTRACTOR and shall not be a cause for extra compensation or an extension of time, except where an extension of time is granted because of a delay for which CONTRACTOR is otherwise entitled to an extension under the Contract Documents. Provided, however, that this right shall not be exercised by

the CITY unless: (1) the determination is necessary, in the opinion of the CITY, because of Project conditions; and (2) CONTRACTOR and any separate contractors cannot otherwise agree upon such priority of schedule construed as relieving the CONTRACTOR of their obligation to cooperate with any separate contractors on the Project.

L. If CONTRACTOR's Construction Schedule indicates that CITY or a separate CONTRACTOR is to complete an activity or perform certain preceding work by a particular date, or within a certain duration, CITY or any separate contractor shall not be bound to said date or duration unless CITY expressly and specifically agrees in writing to same. The review and approval or acceptance by CITY of the Construction Schedule or any other schedule or plan of construction of CONTRACTOR, does not constitute an agreement by CITY of any start or finish date in the schedule or specific durations or sequences for activities of the CITY or any separate contractor; provided, however, that nothing herein shall be construed as modifying or changing, or excusing the performance of CONTRACTOR of required portions of the Work by the Specific Dates as set forth in the Contract Documents.

M. The Specific Dates set forth in the Contract Documents represent only the major items of Work and may include interface dates with the operations of the CITY, the work of separate contractors or others. Specific Dates are Contract requirements and are of the essence to this Contract and to the coordination of the Work by CONTRACTOR. Specific Dates represent the latest allowable start or completion time for those portions of the Work to which each Specific Date relates. The Specific Dates are not intended to be a complete listing of all Work under this Contract or of all interfaces with work performed by other separate contractors, the CITY or others. CONTRACTOR shall determine the time requirements for all such interfaces and shall be responsible for planning, scheduling and coordinating the Work in order to complete in accordance with those requirements.

N. It is understood and agreed that should the CITY and CONSULTANT provide CONTRACTOR, at CONTRACTOR's request, with any services, advice or counsel relating to the scheduling or coordination of the Work or any other matter that: (1) CITY and CONSULTANT shall not be liable to CONTRACTOR for any errors, omissions, negligence or deficiencies which may in any way occur because of same; (2) such services, advice or counsel are provided solely as aids in the development by CONTRACTOR of a representation of CONTRACTOR's actual construction plan and schedule in accordance with the requirements of the Contact Documents, and CITY and CONSULTANT shall not be liable to CONTRACTOR should CONTRACTOR rely on such services, advice or counsel to their detriment; (3) such services, advice or counsel shall not relieve CONTRACTOR of any responsibility under the Contract for all construction means, methods, techniques, coordinating all portions of the Work; and (4) any services provided by the CITY and CONSULTANT or the lack or alleged untimeliness thereof will not in any way take the place of or relieve the CONTRACTOR of full responsibility for compliance with all requirements of the Contract Documents, including, but not limited to the obligation to complete the Work within the Specific Dates set forth in Contract Documents.

O. Approval or acceptance by the CITY of the CONTRACTOR's Construction Schedule, or any revisions or updates thereto, is advisory only and shall not relieve the CONTRACTOR of the responsibility for accomplishing each portion of the Work within each and every applicable Specific Date. Omissions and errors in the approved or accepted Construction Schedule, or

any revisions or updates shall not excuse performance, which is not in compliance with the Contract. Approval by the CITY in no way makes the CITY an insurer of the reliability, accuracy or feasibility of the Construction Schedule nor liable for time or cost overruns flowing from such omissions or errors. It is understood and agreed that CONTRACTOR cannot rely upon any informal or constructive acquiescence or approval of the Construction Schedule by CITY has any right or power to agree to any schedule commitment or obligation on the part of CITY except as set forth expressly in the Contract Documents.

P. Should CONTRACTOR intend or plan to complete the Work, or any portion thereof, earlier than any applicable Specific Date or the Contract Time, CONTRACTOR shall give timely and reasonable notice of this fact to CITY and CONSULTANT. CITY shall have the sole discretion to agree to or reject such early completion plan by CONTRACTOR. CITY shall have no duty or obligation to agree to, or to cooperate with CONTRACTOR regarding any early completion plan or proposal by CONTRACTOR and shall not be liable for any damages of CONTRACTOR because of the rejection by CITY of said plan.

Q. Unless otherwise specifically provided in the Contract Documents, CONTRACTOR acknowledges that CITY has contemplated in CITY's planning and approval of the schedule, and in CITY's budgeting for professional services, that the Work will be performed on a 5-day work week basis, utilizing a single 8-hour shift per day. CITY shall have the sole discretion of approving or rejecting a variance in the workweek, number of shifts, or shift length. Unless otherwise agreed by CITY, CONTRACTOR shall bear the cost of, and pay the CITY, for additional staff and supervisory personnel, including but not limited to the services of CONSULTANT necessary to support any variance in the contemplated work week, number of shifts or shift length.

1.02 POST AWARD ACTIVITIES

A. Upon receipt by CONTRACTOR of the Notice to Proceed, and until the Construction Schedule is approved by the CITY, CONTRACTOR shall proceed with CONTRACTOR's Work in accordance with the Provisional Preliminary Network of CONTRACTOR which was included as part of the CONTRACTOR's bid.

B. Orientation Session: CONTRACTOR shall, upon notification from the CITY, attend an orientation session relating to the Schedules and Reports requirements for this Project. This orientation meeting is designed to assist the CONTRACTOR in planning the Work and in developing the Construction Schedule. This session will normally be held within three (3) days after the date of the Notice to Proceed or the Notice of Award of Contract by CITY (whichever occurs first) and will be conducted by the CITY. CONTRACTOR shall arrange for CONTRACTOR's project manager and Superintendent, major Subcontractors and Suppliers, and any scheduling engineers that CONTRACTOR may employ to attend the orientation session.

C. Among other things, the CITY and CONSULTANT will review: the objectives of the Schedules and Reports requirements; the procedures and requirements for the preparation of the Construction Schedule and Schedule of Values by CONTRACTOR; how the requirements of the Contact Documents will be monitored and enforced by the CITY; long-lead items and time requirements for work by Subcontractors will be identified. It is understood and agreed that the CONSULTANT has no authority to waive any requirements of the Contract Documents at this orientation meeting, and all requirements of the Contract

Documents remain applicable to CONTRACTOR's work whether or not discussed at this session.

Should CONTRACTOR or CONTRACTOR's principal Subcontractors and Suppliers fail or refuse to attend this orientation session, CITY shall have the right to terminate CONTRACTOR for default pursuant to the provisions of the General Contracts.

1.03 DRAFT OF CONSTRUCTION SCHEDULE

A. Within fifteen (15) days of the orientation session, (even though CONTRACTOR may not have completed subcontractor negotiations and executed subcontracts) the CONTRACTOR, in consultation with the CITY and CONSULTANT, shall complete a draft of CONTRACTOR's time-scaled network graphic and work schedule.

1. Except for procurement requirements, CONTRACTOR shall differentiate activities of the Schedule so that no single activity shown has a duration longer than fourteen (14) calendar days, unless the CITY, in CITY's sole discretion, shall approve a longer duration for certain activities.

2. The Construction Schedule shall represent the CONTRACTOR's best judgment and intended plan for completion of the Work in compliance with Specific Dates listed in the Contract Documents and the Contract Time. The Construction Schedule shall take into account all foreseeable activities to be accomplished by any separate contractors, and interface dates with utility CITYs, the CITY's operations and others. The Construction Schedule shall anticipate all necessary labor and resources to accomplish the activities within the durations set forth in the Construction Schedule.

B. CITY shall have seven (7) days to approve the draft schedule information and shall have the right to require the CONTRACTOR to modify any CONTRACTOR data or any portion of the CONTRACTOR's Construction Schedule, Schedule of Values or Recovery Schedule, as herein required, with CONTRACTOR bearing the expense thereof, which the CITY reasonably determines to be: (1) impracticable; (2) based upon erroneous calculations or estimates; (3) unreasonable; (4) required in order to ensure proper coordination by CONTRACTOR of the work of their Subcontractors and with the work or services being provided by any separate Contractors; (5) necessary to avoid undue interference with the CITY's operations or those of any utility CITYs or adjoining property owners; (6) necessary to ensure completion of the Work by the Specific Dates set forth in the Contract Documents; (7) required in order for CONTRACTOR to comply with the requirements of the Contract Documents or (8) not in accordance with the CONTRACTOR's actual operations.

C. The CITY and CONSULTANT will be available during normal working hours to consult with the CONTRACTOR should questions arise while the CONTRACTOR assembles the information required for the Construction Schedule. The CITY will pay for the reasonable costs for the CONSULTANT's time for this consultation.

1.04 CONSTRUCTION SCHEDULE

A. Within ten (10) days after approval of the Construction Schedule draft by the CITY, based on the data submitted by the CONTRACTOR, the CONTRACTOR will provide a final draft

time-scaled graphic network of activities and computer listing of all activities included in the Construction Schedule. The graphic representation and computer printouts shall be carefully reviewed by the CITY and CONSULTANT and discussed at a meeting with the CONTRACTOR for the purpose of finalizing the schedule. Any additions and/or deletions to these documents that are desired by the CITY will be brought to the attention of the CONTRACTOR within three (3) days. The CONTRACTOR shall, if consistent with the requirements of the Contract Documents, incorporate the CITY's revisions and shall deliver the completed Construction Schedule and computer reports to the CITY and CONSULTANT for review and acceptance within seven (7) days.

B. CONTRACTOR shall submit as a part of the data submitted to the CITY and CONSULTANT a narrative report indicating anticipated allocation by CONTRACTOR of the following resources and work shifts for each activity which they proposes to be utilized on the Project:

1. Labor resources

2. Equipment resources

3. Whether CONTRACTOR proposes the Work to be performed on single, double or triple shifts, and whether it is to be done on a 5-, 6- or 7-day workweek basis. If the CONTRACTOR chooses any work schedule other than the 8-hour day, 5-day workweek, and approved by the CITY, any overtime costs shall be borne by the CONTRACTOR.

1.05 SCHEDULE OF VALUES

A. Within ten (10) days after completion of the Construction Schedule the CONTRACTOR shall submit to the CITY and CONSULTANT a Schedule of Values for review by the CITY and CONSULTANT, allocating a dollar value for the activities on the Construction Schedule. The dollar value for the activity shall be the cost of the work of the activity including labor, materials, and pro rata contribution of General Conditions requirements, overhead and profit. The sum of all activity costs shall equal the total Contract Sum. The CONTRACTOR shall revise the Schedule of Values as necessary to gain the approval of the CONSULTANT and the CITY.

B. The activity cost for the Schedule of Values shall be coded with a cost code corresponding to the trade, subcontractor or Supplier performing the work so that subtotals for each division of the Work can be prepared.

C. The Schedule of Values shall, in the best judgment of the CONTRACTOR, represent a fair, reasonable and equitable dollar (cost) allocation for each activity on the Construction Schedule.

D. The CONTRACTOR will provide, within seven (7) days after approval of the Schedule of Values, a computer listing of all cost-loaded activities for CITY and CONSULTANT's review.

1.06 CONSTRUCTION SCHEDULE CONTENT

A. The Construction Schedule shall consist of a time-scaled, detailed network graphic representation of all activities that are part of the CONTRACTOR's construction plan and an accompanying computerized mathematical analysis of these activities. The graphic network shall include, but not be limited to, the following information:

1. Project Name

2. Activities of completed work ready for use by next trade, owner, etc.

3. Activities relating to different areas of responsibility, such as subcontracted work, which is distinctly separate from that being done by the CONTRACTOR directly

4. Different categories of work as distinguished by craft or crew requirements

5. Different categories of work as distinguished by equipment requirements

6. Different categories of work as distinguished by materials

7. Distinct and identifiable subdivisions of work such as structural slabs, beams, columns

8. Locations of work within the Project that necessitates different times or crews to perform

9. Outage schedules for existing utility services that will be interrupted during the performance of the Work

10. Acquisition and installation of equipment and materials, supplies and/or installed by the CITY or separate contractors

11. Material to be sorted on site

12. Specific Dates

B. For all major equipment and materials to be fabricated or supplied for the Project, the Construction Schedule shall show a sequence of activities including:

1. Preparation of Shop Drawings and sample submissions

2. A reasonable time for review of Shop Drawings and samples or such time as specified in the Contract Documents

3. Shop fabrication, delivery, and storage

4. Erection or installation

5. Testing of equipment and materials

C. The Construction Schedule shall include late completion dates for the Work that is no later

than the required Specific Dates. The time-scaled graphic network shall be drawn based upon the early start dates of activities shown on the graphic.

D. All activity durations shall be given in calendar days.

1.07 UPDATING OF CONSTRUCTION SCHEDULE/PROGRESS REPORTS

A. On or about the dates specified, CONTRACTOR shall arrange for CONTRACTOR's project manager and superintendent to meet at Project Site with the CITY and CONSULTANT to review CONTRACTOR's report of actual progress prepared by CONTRACTOR. Said report shall set forth up-to-date and accurate progress data, shall be based upon CONTRACTOR's best judgment and shall be prepared by CONTRACTOR in consultation with all principal Subcontractors and suppliers.

B. The progress report of CONTRACTOR shall show the activities or portions of activities, completed during the reporting period, the actual start and finish dates for these activities, remaining durations and/or estimated completion dates for activities currently in progress.

C. The CONTRACTOR will produce a computerized update work sheet for approval by the CITY as a part of this process.

D. CONTRACTOR shall submit a narrative report with the updated progress analysis which shall include, but not be limited to a description of problem areas, current and anticipated delaying factors and their impact, explanations of corrective actions taken or planned, any newly planned activities or changes in sequence, and proposed logic for a Recovery Schedule, if required, as further described herein. The report shall also include:

1. A narrative describing actual work accomplished during the reporting period

2. A list of major construction equipment used on the Work during the reporting period and any construction equipment idle during the reporting period

3. The total number of personnel by craft actually engaged in the Work during the reporting period, with such total stated separately as to office, supervisory, and field personnel

4. A labor and equipment forecast for the succeeding thirty (30) days, stating the total number of personnel by craft, and separately stating such total as to office, supervisory and field personnel

5. A list of CONTRACTOR supplied materials and equipment, indicating current availability and anticipated job site delivery dates

6. Changes or additions to CONTRACTOR's supervisory personnel since the preceding progress report

E. The CONTRACTOR will provide initial computer reports and monthly reports thereafter, in accordance with the following:

1. Schedule Reports: Initial and subsequent Schedule Reports will contain the following minimum information for each activity:

    a. Activity number, description and estimated duration in days
    b. Early and late finish dates
    c. Percentage of each activity competed as of each report
    d. Remaining float/days behind schedule
    e. Responsibility for activity. Actual start and finish dates shall be indicated for each activity, as appropriate. Dummies and completed activities will be omitted from remaining Float and Late Start Sorts.

2. Cost Reports: Initial and subsequent Cost Reports will include the following information for each activity, sorted by trade activity:

    a. Activity number and description
    b. Percentage of value of Work in place against total value
    c. Total cost of each activity
    d. Value of Work in place since last report
    e. Value of Work in place to date
    f. Value of uncompleted Work

3. As part of the updating process, the CONTRACTOR'S computer will calculate, based upon progress data provided by CONTRACTOR and agreed to by the CITY, the value of work done for each activity based on percentage complete for each activity less the amount previously paid for past percentages completed. Summation of all values of each activity less the appropriate percent of retainage shall be the amount payable to the CONTRACTOR, provided that CONTRACTOR has complied with all requirements of the Contract Documents.

F. CONTRACTOR shall be solely responsible for expediting the delivery of all materials and equipment to be furnished by CONTRACTOR so that the progress of construction shall be maintained according to the currently approved Construction Schedule for the Work. CONTRACTOR shall notify the CITY and CONSULTANT in writing, and in a timely and reasonable manner, whenever CONTRACTOR determines or anticipates that the delivery date of any material or equipment to be furnished by CONTRACTOR will be later than the delivery date indicated by the Construction Schedule, or required consistent with the completion requirements of this Contract, subject to schedule updates as herein provided.

G. CONTRACTOR shall ensure that the critical path runs through on-site activities and that off-site activities do not control the critical path of the Construction Schedule.

1.08 INITIAL PROGRESS PAYMENT

A. The completed Construction Schedule, including the Schedule of Values, will be required for each Application for Payment. However, one initial provisional progress payment may be payable in the sole discretion of CITY if CITY determines the CONTRACTOR is complying with these Schedules and Reports provisions during the development of the Construction Schedule and Schedule of Values as required herein and represented to be true by the CONSULTANT. However, no more than one Application for Payment will be approved until

all of the requirements of these Schedules and Reports provisions have been met.

1.09 RECOVERY SCHEDULE

A. Should the updated Construction Schedule show at any time during CONTRACTOR's performance, in the sole opinion of the CITY, that the CONTRACTOR is fourteen (14) or more days behind schedule for any Specific Date, or should CONTRACTOR be required to undertake actions under Paragraph 40 of the General Conditions hereof, the CONTRACTOR shall prepare a Recovery Schedule at no additional cost to the CITY (unless the CITY is solely responsible for the event or occurrence which has caused the schedule slippage) explaining and displaying how CONTRACTOR intends to reschedule the Work in order to regain compliance with the Construction Schedule during the immediate subsequent pay period.

B. If the CONTRACTOR believes that all of the time can be recovered during the subsequent pay period the CONTRACTOR will be permitted to prepare a Recovery Schedule as set forth below. However, if the CONTRACTOR believes it will take more than thirty (30) days to recover all of the lost time, CONTRACTOR shall prepare and submit a request for revision to the Construction Schedule and comply with all of the requirements for a Schedule Revision.

1. The CONTRACTOR shall prepare and submit to the CITY and CONSULTANT a one-month maximum duration Recovery Schedule, incorporating best available information from Subcontractors and others, which will permit return to Construction Schedule at the earliest possible time. The CONTRACTOR shall prepare a Recovery Schedule to same level of detail as the Construction Schedule for a maximum duration of one month. This Recovery Schedule shall be prepared in coordination with other separate contractors on the Project.

2. Within two (2) days after submission of Recovery Schedule to the CITY and CONSULTANT, CONTRACTOR shall participate in a conference with the CITY and CONSULTANT to review and evaluate the Recovery Schedule. Within two (2) days of conference, the CONTRACTOR shall submit the revisions necessitated by the review for the CITY and CONSULTANT's review and approval. The CONTRACTOR shall use the approved Recovery Schedule as their plan for returning to the Construction Schedule.

3. CONTRACTOR shall confer continuously with the CITY and CONSULTANT to assess the effectiveness of the Recovery Schedule. As a result of this conference, the CITY will direct the CONTRACTOR as follows:

a. If the CITY determines the CONTRACTOR is still behind the schedule the CITY will direct the CONTRACTOR to prepare a Schedule Revision and comply with all of the requirements of a Schedule Revision as stated herein and the other requirements of the Contract Documents; provided, however, that nothing herein shall limit in any way the rights and remedies of the CITY as provided elsewhere in the Contract Documents.

1. If the CITY determines the CONTRACTOR has successfully complied

with provisions of the Recovery Schedule, the CITY will direct the CONTRACTOR to return to the use of the approved Construction Schedule.

1.10 SCHEDULE REVISIONS

A. Should CONTRACTOR desire to or otherwise be required under the Contract Documents to make modifications or changes in CONTRACTOR's method of operation, the sequence of Work or the durations of the activities in the Construction Schedule, CONTRACTOR shall do so in accordance with the requirements of the Contract Documents. The CITY must approve revisions to the approved Construction Schedule in writing.

B. CONTRACTOR shall submit requests for revisions to the Construction Schedule to the CITY and CONSULTANT, together with written rationale for revisions and description of logic for rescheduling work and maintaining the Specific Dates listed in the Contract Documents. Proposed revisions acceptable to the CITY will be incorporated into next update of Construction Schedule. CONTRACTOR shall pay the CITY for costs incurred by the CITY for the revisions.

C. If there are separate contractors on the Project, prior to the submission by the CONTRACTOR of their proposed schedule revisions, CONTRACTOR shall meet with and gain written approval of the separate contractors to make the revisions which shall be evidenced by the signatures of said separate contractors on the proposed schedule revisions. If accepted by the CITY the revisions shall be binding upon CONTRACTOR and all separate contractors on the Project.

D. In submitting any proposed schedule revisions to the CITY and CONSULTANT, CONTRACTOR shall submit therewith the following certification:

"The undersigned CONTRACTOR certifies that the proposed schedule revision to the Construction Schedule which comprised of the graphic network of activities displayed on the sheets dated _____ and of the computerized mathematical reports dated _____ is CONTRACTOR's schedule revision to the Construction Schedule as required by the Contract Documents; and that said schedule revision is a true and accurate representation of CONTRACTOR's plan to complete the Work, including all Change Orders that are in the CONTRACTOR's possession as of the foregoing date, and fully complies with the requirements of the Contract Documents. The CONTRACTOR further certifies that CONTRACTOR will prosecute the Work in accordance with this schedule revision, subject to any change therein which is implemented in accordance with the Contract Documents; and CONTRACTOR further certifies that CONTRACTOR has met and coordinated with and obtained the approval of said schedule revision by all separate contractors, as evidenced by CONTRACTOR's signature thereon; and CONTRACTOR further certifies they have fully complied with all of the requirements of the Contract Documents relating to coordination of said Schedule with separate contractors."

1.11 FLOAT TIME

A. Float or slack time associated with one chain of activities is defined as amount of time between earliest start date and latest start date or between earliest finish date and latest

finish date for such activities, as calculated as part of the Construction Schedule. Float or slack time shown on the Construction Schedule is not for exclusive use or benefit of either the CITY, CONSULTANT or the CONTRACTOR and is available for use by either of them according to whichever first needs the use or benefit of the float to facilitate the effective use of available resources and to minimize the impact of project problems, delays or Changes in the Work which may arise during performance. CONTRACTOR specifically agrees that the CITY or CONSULTANT may use float time in conjunction with their review activities or to resolve for any modification of the Specific Dates or an extension of the Contract Time or a claim for additional compensation as a result of any Project problem.

B. Float time shown on the Construction Schedule shall not be used arbitrarily by CONTRACTOR in a manner, which, in the opinion of the CITY and CONSULTANT, unnecessarily delays separate contractors from proceeding with their work in a way which is detrimental to the interests of the CITY. Any conflict between contractors, or schedules or available and/or necessary work of Contractors, which may result in a delay on that Contractor performing work on this Project, shall be referred to the CITY for resolution. If CONTRACTOR refuses to perform Work which is available and necessary to be performed in order to not delay any separate contractors and the CITY has provided resolution to any conflicts, the CITY may, regardless of the float shown on the Construction Schedule to be available for the path of activities which encompasses said Work, terminate the CONTRACTOR for default pursuant to the General Conditions of this Contract.

1.12 CONTRACTOR'S ORGANIZATION

A. CONTRACTOR shall maintain as part of their organization, or hire a subcontractor with, a competent staff of sufficient size who are knowledgeable in the use, application and implementation of CPM as required by the Contract Documents. It shall be the responsibility of this staff to prepare input information for the Construction Schedule, monitor progress, provide input for updating and revising logic diagrams when necessary and otherwise assist the CONTRACTOR in fulfilling their obligations hereunder.

1.13 DEFAULT

A. Failure of the CONTRACTOR to substantially comply with the requirements of this Section shall constitute a default by CONTRACTOR of CONTRACTOR’s obligations under this Contract sufficient for termination of CONTRACTOR under the General Conditions of this Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All work required in connection with Schedules and Reports shall be included in the bid price for all other work.

END OF SECTION 01311

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Submit Shop Drawings, Product Data and Samples required by the Contract Documents.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

C. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that reviewed Shop Drawings, Product Data and Samples will be needed.

1.03 SHOP DRAWINGS

A. Drawings shall be presented in readable and thorough condition.

1. Drawing size shall be in standard sizes 8½" X 11" through 24" X 36" as appropriate for detail.

2. Details shall be identified by reference to CITY Project Number, sheet, detail, specification section, equipment numbers, I. D. numbers and schedule numbers shown on Contract Drawings.

1.04 PRODUCT DATA

A. Preparation

1. Clearly mark each copy to identify pertinent products or models.

2. Show performance characteristics and capacities.

3. Show dimensions and clearances required.

4. Show wiring or piping diagrams and controls.

B. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information, which is not applicable to the work.

2. Supplement standard information to provide information specifically applicable to the work.

1.05 SAMPLES

A. Office samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product with integrally related parts and attachment devices.

2. Full range of color, texture and pattern.

1.06 CONTRACTOR RESPONSIBILITIES

A. Review Shop Drawings, Product Data and Samples prior to submission.

B. Determine and verify:

1. Field measurements

2. Field construction criteria

3. Catalog numbers and similar data

4. Conformance with specifications

C. Coordinate each submittal with requirements of the work and of the Contract Documents.

D. Notify the CITY's Representative in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.

E. Begin no fabrication or work, which requires submittals until return of submittals with CITY's Representative or ENGINEER's approval.

1.07 SUBMISSION REQUIREMENTS

A. CONTRACTOR shall furnish the shop drawing submittals to the ENGINEER for review. The term "Shop Drawing" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.

B. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER. In any case, every separate item submitted for shop drawing approval will be uniquely numbered, between the submittal and transmittal for proper tracking.

C. Except as may otherwise be indicated herein, the ENGINEER will return each submittal to the CONTRACTOR with its comments noted thereon, within fifteen (15) calendar days following their receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The CITY reserves the right to withhold monies due the contractor to cover additional costs of the ENGINEER's review beyond the second

submittal. The ENGINEER's maximum review period for each submittal, including all resubmittals, will be 15 days per submittal. In other words, for a submittal that required two resubmittals before it is complete, the maximum review period for that submittal could be 45 days.

D. If a copy of a submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN", formal revision and resubmission of said submittal will not be required.

E. If a copy of a submittal is returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal will not be required.

F. If a submittal is returned to the CONTRACTOR marked "REVISE AND RESUBMIT" or "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER.

G. If a submittal is returned to the CONTRACTOR marked "REJECTED-RESUBMIT", the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the ENGINEER.

H. Fabrication of an item shall be commenced only after the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either 'NO EXCEPTIONS TAKEN" or 'MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.

I. All CONTRACTOR shop drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the ENGINEER of any CONTRACTOR submittals will be made for any items, which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.

J. The ENGINEER's review of CONTRACTOR shop drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

K. Submittals shall contain:

1. The date of submission and the dates of any previous submissions

2. The Project title and Project number

3. Contract identification

4. The names of:

   a. CONTRACTOR
   b. Supplier
   c. Manufacturer

5. Identification of the product, with the specification section number

6. Field dimensions, clearly identified as such

7. Relation to adjacent or critical features of the work or materials

8. Applicable standards, such as ASTM or Federal Specification numbers

9. Identification of deviations from Contract Documents

10. Identification of revisions on resubmittals

11. An 8" x 3" blank space for CONTRACTOR and CITY's Representative ENGINEER's stamps

12. CONTRACTOR's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

1.08 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in the submittals required by CITY's Representative and resubmit until approved.

B. Shop Drawings and Product Data:

   1. Revise initial drawings or data and resubmit as specified for the initial submittal.

   2. Indicate any changes which have been made other than those requested by the CITY's Representative.

C. Samples: Submit new samples as required for initial submittal.

1.09 DISTRIBUTION

A. Distribute reproduction of Shop Drawings and copies of Product Data, which carry the CITY's Representative or ENGINEER's stamp of approval to:

   1. Job site file

   2. Record Documents file

   3. Other affected CONTRACTORs

4. Subcontractors

5. Supplier or Fabricator

B. Distribute samples which carry the CITY's Representative or ENGINEER's stamp of approval as directed by the CITY's Representative or ENGINEER.

1.10 CITY'S REPRESENTATIVE OR ENGINEER DUTIES

A. Review submittals with reasonable promptness and in accord with schedule.

B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or approval of submittal.

B. Return submittals to CONTRACTOR for distribution, or for resubmission.

1.11 LIQUIDATED DAMAGES

A. The CONTRACTOR further agrees to pay $250 per day as liquidated damages, for failure to begin within ten (10) days of CITY's issuance of the "Notice to Proceed" or failure to achieve Substantial Completion within 180 calendar days from Commencement Date or failure to achieve Final Completion within 240 calendar days from Commencement Date, as indicated in the written "Notice to Proceed". The CITY shall have the right to deduct said liquidated damages from any amount due, or that may become due the CONTRACTOR, or to collect such liquidated damages from the CONTRACTOR or their Surety.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

END OF SECTION 01340

PART 1 - GENERAL

1.01 GENERAL

A. Employ competent photographer to take construction record photographs periodically, monthly at a minimum, during course of the work.

1.02 RELATED REQUIREMENTS

A. Section 01010: Summary of Work.

B. Section 01720: Project Record Documents.

1.03 PHOTOGRAPHY REQUIRED

A. Provide photographs taken on cutoff date for each scheduled application for Payment.

B. Provide photographs taken at each major stage of construction.

C. Provide photographs taken of change order work.

1.04 COSTS OF PHOTOGRAPHY

A. CONTRACTOR shall pay costs for specified photography.

1. Parties requiring additional photography or prints will pay photographer directly.

1.05 DIGITAL PHOTOGRAPHY

A. At CITY and ENGINEER’s discretion, digital photography may be used for all construction photographs except aerial progress photographs.

PART 2 PRODUCTS

2.01 PRINTS

A. Color:
1. Paper: Single weight, color print paper
2. Finish: Smooth surface, glossy
3. Size: 8-inch x 10-inch

B. Identify each print on back, listing:
1. Name of Project
2. Specific Location
3. Date and time of exposure
4. Name and address of photographer
5. Photographer's numbered identification of exposure

PART 3 - EXECUTION

3.01 TECHNIQUE

A. Factual presentation.

B. Correct exposure and focus
   1. High resolution and sharpness
   2. Maximum depth-of-field
   3. Minimum distortion

3.02 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate condition of construction and state of progress.

B. Photographs shall include aerial photographs showing the entire construction area.

3.03 DELIVERY OF PRINTS

A. Deliver prints to the ENGINEER to accompany each Application for Payment.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

END OF SECTION 01380

PART 1 - GENERAL

1.01 DEFINITION

A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.02 INSPECTION AT PLACE OF MANUFACTURE

A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.

B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.03 SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the CITY reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will insure the CITY that the quality of the work is in full accord with the Contract Documents.

B. Any waiver by the CITY of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the ENGINEER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER to require the removal or correction and reconstruction of any such work in accordance with the General Conditions.

1.04 INSPECTION AND TESTING LABORATORY SERVICE

A. Inspection and testing laboratory service shall comply with the following:

1. The CONTRACTOR will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

2. The CONTRACTOR or independent firm will perform inspections, testings, and other services specified in individual specification sections and as required by the ENGINEER.

3. Reports will be submitted to the ENGINEER in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

4. The CONTRACTOR shall cooperate with the CITY or independent firm and furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

5. The CONTRACTOR shall notify ENGINEER 48 hours prior to the expected time for operations requiring inspection and laboratory testing services.

6. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the ENGINEER. The CONTRACTOR shall bear all costs from such retesting at no additional cost to the CITY.

7. For samples and tests required for CONTRACTOR'S use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR'S use shall be included in the Contract Price.

8. CONTRACTOR shall bear all costs should materials for testing are not ready for testing at time specified by CONTRACTOR for test.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspection: The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation, and reject damaged and defective items.

B. Measurements: The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.

C. Manufacturer's Instructions: Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

END OF SECTION 01400

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. All required testing services under the contract Documents shall be provided by the CONTRACTOR:

1. CONTRACTOR shall cooperate with the laboratory to facilitate the execution of its required services.

2. Employment of the laboratory by the CONTRACTOR for specific testing shall in no way relieve the CONTRACTOR's obligations to perform the work of the Contract as specified.

3. The CONTRACTOR shall pay for testing. The cost of any retesting necessitated by failure of materials or methods shall be deducted from the CONTRACTOR's monthly payment request.

4. The following tests will be coordinated by the CONTRACTOR, as necessary.

   a. Density
   b. Proctor
   c. LBR
   d. Carbonate Content
   e. Gradation
   f. Plastic Index and Liquid Limit
   g. Organic Content
   h. Concrete Compressive Strength and Slump
   i. Asphalt Extraction
   j. Bacteriological testing

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

1.03 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E-329.

C. Authorized to operate in the state in which the project is located.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of Natural Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:

a. National Bureau of Standards
b. Accepted values of natural physical constants

1.04 LABORATORY DUTIES

A. Cooperate with CITY's Representative and CONTRACTOR; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specified standards.

2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify CITY's Representative and CONTRACTOR of observed irregularities of deficiencies of work or products.

D. Promptly submit written report of each test and inspection; one copy each to CITY's Representative, CITY, CONTRACTOR, and one copy to Record Document File. Each report shall include:

1. Date issued

2. Project title, number and Parcel number

3. Testing laboratory name, address and telephone number

4. Name and signature of laboratory inspector

5. Date and time of sampling or inspection

6. Record of temperature and weather conditions

7. Date of test

8. Identification of fill product and specification section

9. Location of sample or test in the project

10. Type of inspection or test

11. Results of tests and compliance with Contract Documents

12. Interpretation of test results, when requested by CITY's Representative

E. Perform additional tests as required by the CITY's Representative.

1.05 LIMITATION OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract documents.

2. Approve or accept any portion of the work.

3. Perform any duties of the CONTRACTOR.

1.06 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to work.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes, which require control by the Testing Laboratory.

D. Furnish copies of Products test reports as required.

E. Furnish incidental labor and facilities:

1. To provide access to work to be tested

2. To obtain and handle samples at the project site or at the source of the product to be tested

3. To facilitate inspections and tests

4. For storage of test samples

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse CITY for laboratory personnel and travel expenses incurred due to CONTRACTOR's negligence.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall

be included in the price for all other work.

END OF SECTION 01410

PART 1 GENERAL

1.01 GENERAL

A. Mobilization shall include the obtaining of all permits; moving onto the site of all equipment; temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:

1. Moving on to the site of all CONTRACTOR's equipment required for first month operations.

2. Installing temporary construction power, wiring, and lighting facilities.

3. Developing construction water supply.

4. Providing field office trailers for the CONTRACTOR, complete with all specified furnishings and utility services including telephones, telephone appurtenances, and copying machine.

5. Providing all on-site communication facilities, including telephones and radio pagers.

6. Providing on-site sanitary facilities and potable water facilities.

7. Arranging for and erection of CONTRACTOR's work, site access, and storage.

8. Obtaining all required permits.

9. Having all OSHA required notices and establishment of safety programs.

10. Having the CONTRACTOR's superintendent at the job site full time.

11. Submitting initial submittals.

12. Audio-Visual preconstruction record as described in Section 01010.

13. Project identification and signs.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 PAYMENT FOR MOBILIZATION

A. The CONTRACTOR's attention is directed to the condition that no payment for mobilization, or any part thereof will be approved for payment under the Contract until all mobilization items listed in Paragraph 1.01.A. above have been completed as specified.

END OF SECTION 01505

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Types: The types of utility services required for general temporary use at the project site include the following:

Water service (potable for certain uses)
Storm sewer
Sanitary sewer
Electric power service
Telephone service
Gas service

B. It shall be the CONTRACTOR's responsibility to provide equipment that is adequate for the performance of the WORK under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safety and efficiently performing the required WORK, and shall be subject to inspection and approval by the CITY's representative at any time within the duration of the Contract. All work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

1.02 JOB CONDITIONS

A. Scheduled Uses: The CONTRACTOR shall, in conjunction with establishment of job progress schedule, establish a schedule for implementation and termination of service for each temporary utility or facility; at earliest feasible time, and when acceptable to CITY and ENGINEER change over from use of temporary utility service to permanent service.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSTALLATION OF POWER DISTRIBUTION SYSTEM

A. Power: The CONTRACTOR shall provide all necessary power required for its operations under the Contract and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.

3.02 INSTALLATION OF LIGHTING

A. Construction Lighting: All WORK conducted at night or under conditions of deficient daylight shall be suitable lighted to ensure proper WORK and to afford adequate facilities for inspection and safe working conditions.

3.03 WATER SUPPLY

A. General: The CITY will furnish reasonable quantities of water required by the CONTRACTOR in performance of the WORK under the Contract; however, the CONTRACTOR shall provide all facilities necessary to convey the water from the CITY-designated source to the points of use in accordance with the requirements of the Contract

Document. The CONTRACTOR shall pay all permit and water charges.

B. Potable Water: All drinking water on the site during construction shall be furnished by the CONTRACTOR and shall be bottled water or water furnished in acceptable metal dispensers. Notices shall be posted conspicuously throughout the site warning the CONTRACTOR's personnel that piped water may be contaminated.

C. Water Connections: The CONTRACTOR shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency. The CONTRACTOR shall pay all permit and water charges.

D. Removal of Water Connections: Before final acceptance of the WORK on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the ENGINEER and to the agency owning the affected utility.

3.04 INSTALLATION OF SANITARY FACILITIES

A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of CONTRACTOR's employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.

B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wasted from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all laws and regulations pertaining thereto.

3.05 INSTALLATION OF FIRE PROTECTION

A. Fire Protection: The construction of the WORK shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction.

3.06 INSTALLATION OF COMMUNICATIONS

A. Telephone Services: The CONTRACTOR shall provide and maintain at all time during the progress of the WORK not less than one telephone in good working order, at its own field construction office, at or near the site of the WORK included in the Contract.

3.07 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the lump sum price for Item 1 - Mobilization.

END OF SECTION 01510

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Furnish, install and maintain required construction aids, remove on completion of work.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate execution of the work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

1. Refer to respective sections for particular requirements for each trade.

2. Provide protective coverings for finished surfaces.

B. Maintain facilities and equipment in first-class condition.

PART 3 - EXECUTION

3.01 PREPARATION

A. Consult with CITY's Representative, review site conditions and factors which affect construction procedures and construction aids including adjacent properties and public facilities which may be affected by execution of the work.

3.02 GENERAL

A. Comply with applicable requirements specified in sections of Division 2 through 4 (as applicable).

B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of CITY and other Contractors employer at the site.

3.03 REMOVAL

A. Completely remove temporary materials, equipment and services:

1. When construction needs can be met by use of permanent construction.

2. At completion of project.

B. Clean, repair damage caused by installation or by use of temporary facilities.

1. Remove foundations and underground installations for construction aids.

2. Grade areas of site affected by temporary installations to required elevations and slopes, and clean the area.

C. Restore permanent facilities used for temporary purposes to specified condition.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

END OF SECTION 01520

PART 1 - GENERAL

1.01 GENERAL

A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.

B. The CONTRACTOR shall verify the exact locations and depths of all utilities shown and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's work. When such exploratory excavations show the utility location as shown to be in error, the CONTRACTOR shall so notify the ENGINEER.

C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

1.02 RIGHTS-OF-WAY

A. The CONTRACTOR shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the ENGINEER that the CITY has secured authority from the proper party. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support or otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same. When two or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the CITY shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the CITY to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK in the General Conditions of the Contract.

1.03 PROTECTION OF STREET OR ROADWAY MARKERS

A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. All survey markers or points disturbed by the CONTRACTOR shall be accurately restored after all street or roadway resurfacing has been completed.

1.04 RESTORATION OF PAVEMENT

A. General: All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement CITY. All pavements which are subject to partial removal shall be neatly saw cut in straight lines.

B. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

C. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

D. Restoration of Sidewalks or Driveways: Wherever sidewalks or driveways within the public right of way or on private properties have been removed for purposes of construction or damaged during construction, the CONTRACTOR shall place suitable temporary sidewalks or driveways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or driveways until the final restoration thereof has been made. The CONTRACTOR shall restore all private properties within thirty (30) days after a complaint is received by the CITY to the original condition.

E. Restoration of Stamped Concrete or Paver Driveways: Wherever stamped concrete or paver driveways have been removed for purposes of construction or damaged during construction within the public right of way, the CONTRACTOR shall replace the entire portion within the right of way up to the expansion joint at the property line. The new driveway area shall match the material, texture, color, and pattern of the existing driveway. The CONTRACTOR shall restore all private properties within thirty (30) days after a complaint is received by the CITY to the original condition.

1.05 EXISTING UTILITIES AND IMPROVEMENTS

A. General: The CONTRACTOR shall protect all Underground Utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.

B. Utilities to be Moved: In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the CITY to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER and the CITY of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

D. CITY's Right of Access: The right is reserved to the CITY and to the CITYs of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.

E. Underground Utilities Indicated: Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR.

F. Underground Utilities Not Indicated: In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in the General Conditions.

G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of the General Conditions.

H. Approval of Repairs: All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement CITY and the ENGINEER before being concealed by backfill or other work.

I. Maintaining in Service: All oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the ENGINEER are made with the

owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

J. Existing Water Services: CONTRACTOR shall protect and provide temporary support for existing water services. Any water service damaged by the CONTRACTOR, shall be replaced at the CONTRACTOR's expense, with a new water service complete with new water main tap.

1.06 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

A. General: The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or CITY. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the CITY. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.

B. Trimming: Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.

C. Replacement: The CONTRACTOR shall immediately notify the jurisdictional agency and/or the CITY if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the CITY, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at CONTRACTOR’s own expense. The tree shall be of a like size and variety as the tree damaged, or, if of a smaller size, the CONTRACTOR shall pay to the CITY of said tree a compensatory payment acceptable to the tree CITY, subject to the approval of the jurisdictional agency or CITY. The size of the trees shall be not less than 1-inch diameter nor less than 6 feet in height.

1.07 NOTIFICATION BY THE CONTRACTOR

A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way the CONTRACTOR shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire. The CONTRACTOR shall also notify the Sunshine State One Call Center 1-800-432-4770 at least 2 days, but no more than 14 days, prior to such excavation.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 FENCING

A. Materials to CONTRACTOR's option, minimum fence height = 6 feet.

2.03 BARRIERS

A. Materials to CONTRACTOR's option, as appropriate to serve required purpose.

PART 3 - EXECUTION

3.01 GENERAL

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.

B. Maintain barriers during entire construction period.

C. Relocate barriers as required by progress of construction.

3.02 TREE AND PLANT PROTECTION

A. Preserve and protect existing trees and plants adjacent to work areas.

B. Consult with CITY's Representative and remove agreed-on roots and branches which interfere with work.

1. Employ qualified tree surgeon to remove branches, and to treat cuts.

C. Protect root zones of trees and plants.

1. Do not allow vehicular traffic and parking.

2. Do not store materials or products.

3. Prevent dumping of refuse or chemically injurious materials or liquids.

4. Prevent puddling or continuous running water.

D. Carefully supervise all work to prevent damage.

E. Replace trees and plants which are damaged or destroyed due to work operations under this contract.

3.03 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by CITY's Representative.

B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

END OF SECTION 01530

PART 1 - GENERAL

1.01 HIGHWAY LIMITATIONS:

A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.02 TEMPORARY CROSSINGS:

A. General: Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.

B. Temporary Bridges: Wherever necessary, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

C. Street Use: Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

D. Traffic Control: For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of

Broward County and the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations," published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1).

The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of the Florida Department of Transportation.

The CONTRACTOR shall submit 3 copies of a traffic control plan to the ENGINEER for approval a minimum of 2 weeks prior to construction. The ENGINEER reserves the right to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes shall supersede these plans and be done solely at the CONTRACTOR's expense.

The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.

E. Temporary Driveway Closure: The CONTRACTOR shall notify the CITY or occupant (if not CITY-occupied) of the closure of the driveways to be closed more than one eight-hour work day at least 3 working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the CITY/occupant how long the work will take and when closure is to start. Total closure time shall not exceed 5 days.

1.03 CONTRACTOR'S WORK AND STORAGE AREA:

A. The CONTRACTOR shall designate and arrange for the use of a portion of the property, adjacent to the WORK for its exclusive use during the term of the Contract as a storage and shop area for its construction operations relative to this Contract.

B. The CONTRACTOR shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the WORK.

C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.

1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

2. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.

3. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.

4. The CONTRACTOR shall obtain and submit to the ENGINEER a single EPA number for wastes generated at the site.

5. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.

6. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of Item 1 - Mobilization and of all other work.

END OF SECTION 01550

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and maintain methods, equipment, and temporary construction, as necessary, to provide controls over environmental conditions at the construction site and related area under CONTRACTOR's control; remove physical evidence of temporary facilities at completion of work.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 NOISE CONTROL

A. Provide all necessary requirements for noise control during the construction period.

1. Noise procedures shall conform to all applicable OSHA requirements and local ordinances having jurisdiction on the work.

2. Noise levels during night time hours shall not exceed 50 db measured at the property line of a residence.

1.04 DUST CONTROL

A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from dispersing into the atmosphere 24 hours per day and 7 days per week.

1.05 WATER CONTROL

A. Provide methods to control surface water to prevent damage to the project, the site, or adjoining properties.

1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.

B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface and water.

C. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas.

1.06 PEST CONTROL

A. Provide pest control as necessary to prevent infestation of construction or storage area.

1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

2. Should the use of pesticides be considered necessary, submit an informational copy of the proposed program to CITY with a copy to ENGINEER. Clearly indicate:

    a. The area or areas to be treated.
    b. The pesticide to be used, with a copy of the manufacturer's printed instructions.
    c. The pollution preventative measures to be employed.

B. The use of any pesticide shall be in full accordance with the manufacturer's printed instructions and recommendations.

1.07 RODENT CONTROL

A. Provide rodent control as necessary to prevent infestation of construction or storage area.

1. Employ methods and use materials, which will not adversely affect conditions at the site or on adjoining properties

2. Should the use of rodenticide be considered necessary, submit an informational copy of the proposed program to CITY with a copy to CITY's Representative. Clearly indicate:

    a. the area or areas to be treated.
    b. the rodenticide to be used, with a copy of the manufacturer's printed instructions.
    c. the pollution preventative measures to be employed.

B. The use of any rodenticide shall be in full accordance with the manufacturer's printed instructions and recommendations.

1.08 DEBRIS CONTROL

A. Maintain all areas under CONTRACTOR's control free of extraneous debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking area, or along access roads and haul routes.

1. Provide containers for deposit of debris as specified in Section 01710 - Cleaning.

2. Prohibit overloading of trucks to prevent spillage on access and haul routes.

    a. Provide periodic inspection of traffic areas to enforce requirements.

C. Schedule periodic collections and disposal of debris as specified in Section 01710 - Cleaning.

1. Provide additional collections and disposal of debris whenever the periodic schedule is inadequate to prevent accumulation.

1.09 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

B. Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soils or liquids.

1. Excavate and dispose of any contaminated earth off-site and replace with suitable compacted fill and topsoil.

C. Take special measures to prevent harmful substances from entering public waters.

1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants.

1. Prevent toxic concentrations of chemicals.

2. Prevent harmful dispersal of pollutants into the atmosphere.

1.10 EROSION CONTROL

A. Plan and execute construction and earthwork, by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas to prevent erosion and sedimentation.

1. Hold the areas of bare soil exposed at one time to a minimum.

2. Provide temporary control measures such as berms, dikes and drains.

3. Provide silt screens as required preventing surface water contamination.

B. Construct fills and waste areas by selective placement to eliminate surface silts or clays, which will erode.

C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

D. All erosion control procedures must comply with the National Pollutant Discharge Elimination System (NPDES). The CONTRACTOR shall develop and implement a Stormwater Pollution Prevention Plan as outlined by NPDES.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

END OF SECTION 01560

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide, operate and maintain equipment, services and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, on-site access roads, and parking areas.

B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or specified conditions.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate traffic control and directional signals or signs required to direct and maintain an orderly flow of traffic in all areas under CONTRACTOR's control or affected by CONTRACTOR's operations.

1.04 FLAGPERSON

A. Provide qualified and suitably equipped flagperson when construction operations encroach on traffic lanes, as required for regulation of traffic.

1.05 FLARES AND LIGHTS

A. Provide flares and lights during periods of low visibility:

1. To clearly delineate traffic lanes and to guide traffic

2. For use of flagperson in directing traffic

B. Provide illumination of critical traffic and parking areas.

1. Maintain free vehicular access to and through parking areas.

2. Prohibit parking on or adjacent to access roads, or in non-designated areas.

1.06 HAUL ROUTES

A. Consult with CITY and governing authorities, establish public thoroughfares which will be used as haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow, to minimize interference with normal public traffic.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement and payment for work under the section, it shall be included in the lump sum price bid for Item 4 - Maintenance of Traffic.

END OF SECTION 01570

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Material and equipment incorporated into the work:

1. Conform to applicable specifications and standards.

2. Comply with size, make, type and quality specified, or as specifically approved in writing by the CITY's Representative.

3. Manufactured and fabricated products:

a. Design, fabricate and assemble in accord with the best engineering and shop practices.

b. Manufacture like parts of duplicate units to standard sizes and gauges to be interchangeable.

c. Two or more items of the same kind shall be identical, by the same manufacturer.

d. Products shall be suitable for service conditions.

e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to CITY's Representative. Maintain one set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with CITY's Representative for further instructions.

2. Do not proceed with work without clear instructions.

C. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site. Products shall be delivered to the job site on an "as needed" basis.

1. Deliver products in undamaged condition, in manufacturers' original containers or packaging, with identifying labels intact with legible markings.

2. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

3. Pipe and materials shall not be strung out along installation routes for longer than two (2) weeks prior to installation.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

C. Coordinate deliveries to avoid conflict with Work and conditions at site:

1. Work of other contractors, or CITY

2. Limitations of storage space

3. Availability of equipment and personnel for handling products

4. CITY's use of premises

D. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.

E. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

F. Immediately on delivery, inspect shipment to assure:

1. Product complies with requirements of Contract Documents and reviewed submittals

2. Quantities are correct.

3. Containers and packages are intact, labels are legible.

4. Products are properly protected and undamaged.

G. Provide equipment and personnel necessary to handle products, including those provided by CITY, by methods to prevent soiling or damage to products or packaging.

H. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.

I. Handle products by methods to prevent bending or overstressing.

J. Lift heavy components only at designated lifting points.

1.05 STORAGE

A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather-tight enclosures.

2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

3. Store unpacked products on shelves, in bins or in neat piles, accessible for inspection.

B. Exterior Storage

1. Provide substantial platforms, blocking or skids to support fabricating products above ground, prevent soiling or staining.

a. Cover products, subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation.

2. Store loose granular materials on solid surface such as paved areas, or provide plywood or sheet materials to prevent mixing with foreign matter.

a. Provide surface drainage to prevent flow or ponding of rainwater.
b. Prevent mixing of refuse or chemically injurious materials or liquids.

1.06 MAINTENANCE OF STORAGE

A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:

1. State of storage facilities is adequate to provide required conditions.

2. Required environmental conditions are maintained on continuing basis.

3. Surfaces of products exposed to elements are not adversely affected.

a. Any weathering of products, coatings and finishes is not acceptable under requirements of Contract Documents.

B. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.

1.07 PROTECTION AFTER INSTALLATION

A. Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion of work.

B. Control traffic to prevent damage to equipment and surfaces.

C. Provide coverings to protect finished surfaces from damage.

1. Cover projections, wall corners, and jambs, sills and soffits of openings, in areas used for traffic and for passage of products in subsequent work.

2. Protect finished floors and stairs from dirt and damage.

a. In areas subject to foot traffic, secure heavy paper, sheet goods, or other materials in place.
b. For movement of heavy products, lay planking or similar materials in place.
c. Cover wall and floor surfaces in the vicinity of construction personnel activities and all finished surfaces used by construction personnel.

D. Waterproofed surfaces

1. Prohibit use of surfaces for traffic of any kind, and for storage of any products.

2. When some activity must take place in order to carry out the Contract, obtain recommendations of installer for protection of surface.

a. Install recommended protection; remove on completion of that activity.
b. Restrict use of adjacent unprotected areas.

E. Lawns and landscaping

1. Prohibit traffic of any kind across planted lawn and landscaped areas.

F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

1.08 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Limitations on substitutions.

1. During bidding period, Instructions to Bidders govern times for submitting requests for substitutions under requirements specified in this section.

2. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request, when requested directly by Subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.

3. Substitute products shall not be ordered or installed without written acceptance.

4. Only one (1) request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

B. Products List

1. Within 15 days after Contract Date submit to ENGINEER a complete list of major products proposed to be used, with the name of the manufacturer and the installing Subcontractor.

C. Contractors Options

1. For products specified only by reference standard, select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named or approved equal, which complies with the Specifications.

3. For products specified by naming one or more products or manufacturers and "or approved equal," CONTRACTOR must submit a request as for substitutions for any product or manufacturer not specifically named.

D. Substitutions

1. For a period of 15 days after Contract Date, ENGINEER will consider written request from CONTRACTOR for substitution of products.

2. Identify product by specification Section and Article Numbers. Provide manufacturer's name and address, trade name of product, and model of catalog number. List fabricators and suppliers as appropriate.

3. List similar projects using product, dates of installation, and names of ENGINEER and CITY.

4. List availability of maintenance services and replacement materials.

5. Submit a separate request for each product, supported with complete data, with drawings and samples as appropriate, including:

a. Comparison of the qualities and performance of the proposed substitution with that specified.

b. Changes required in other elements of the work because of the substitution.

c. Effect on the construction schedule.
d. Cost data comparing the proposed substitution with the product specified.
e. Any required license fees or royalties.
f. Availability of maintenance services, and source of replacement materials.

6. The burden of proof as to the type, function, and quality of any such substitute material or equipment shall be upon the CONTRACTOR.

7. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitute material or equipment and the ENGINEER's decision shall be final.

8. The ENGINEER may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed substitute.

9. The CITY may require the CONTRACTOR to furnish at the CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

10. Acceptance by the ENGINEER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute item.

11. The CONTRACTOR shall be responsible for resultant changes and all additional costs which the accepted substitution requires in the CONTRACTOR work, the work of its Subcontractors and of other Contractors, and shall effect such changes without cost to the CITY.

E. Contractors Representation:

1. A request for a substitution constitutes a representation that CONTRACTOR:

a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
b. Will provide the same guarantees or bonds for the substitution as for the product specified.
c. Will coordinate the installation of an accepted substitution into the work, and make such other changes as may be required to make the work complete in all respects.
d. Waives all claims for additional costs, under CONTRACTOR’S responsibility, which may subsequently become apparent.

F. Submittal Procedures

1. Submit three (3) copies of request for substitution.

2. ENGINEER will review requests for substitutions with reasonable promptness, and notify CONTRACTOR, in writing, of the decision to accept or reject the requested substitution.
3. During the bidding period, ENGINEER will record acceptable substitutions in Addenda.

4. After award of Contract, ENGINEER will notify CONTRACTOR, in writing, of decision to accept or reject requested substitutions in Addenda.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01600

PART 1 - GENERAL

1.01 GENERAL

A. Equipment testing and startup are requisite to satisfactory completion of the contract and, therefore, shall be completed within the contract time.

1.02 EQUIPMENT TESTING

A. The CONTRACTOR shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules (excluding manually-operated valves smaller than 24 inches in size, injectors, tanks, batch-type disc meters, and rotameters, and any other minor items of equipment specifically exempted by the ENGINEER in writing), who shall visit the site of the WORK and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the CONTRACTOR shall arrange to have the manufacturer's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the ENGINEER.

B. The CONTRACTOR shall require that each manufacturer's representative furnish to the ENGINEER a written report addressed to the CITY certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been operated satisfactorily under full-load conditions.

C. The CONTRACTOR shall be responsible for scheduling all operations testing. The CONTRACTOR is advised that the ENGINEER and the CITY's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the CITY's operating personnel in correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the CITY at least 2 weeks in advance and shall be provided while the respective manufacturer's equipment is fully operational. Qualified persons who have been made familiar in advance with the equipment and systems in the plant shall give on-site instruction. Prior to scheduling any operations testing, the CONTRACTOR shall have previously furnished the CITY's Manuals required.

D. The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of each equipment test.

E. The CONTRACTOR shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price for all other work.

END OF SECTION 01660

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the work.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.03 SUBSTANTIAL COMPLETION

A. When CONTRACTOR considers the work is substantially complete, CONTRACTOR shall submit to CITY's Representative:

1. A written notice that the work, or designated portion thereof is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, CITY's Representative and ENGINEER will make an inspection to determine the status of completion.

C. Should CITY's Representative determine that the work is not substantially complete:

1. CITY's Representative will promptly notify the CONTRACTOR in writing, giving the reasons therefore.

2. CONTRACTOR shall remedy the deficiencies in the work and send a second written notice of substantial completion to the CITY's Representative.

3. CITY's Representative and ENGINEER will reinspect the work.

D. When CITY's Representative and ENGINEER concur that the work is substantially complete, CITY's Representative will:

1. Prepare a Certificate of Substantial Completion accompanied by CONTRACTOR's list of items to be completed or corrected, as verified and amended by the CITY's Representative.

a. Submit the Certificate to the CITY and the CONTRACTOR for their written acceptance of the responsibilities assigned to them in the Certificate.

1.04 FINAL INSPECTION

A. When CONTRACTOR considers the work is complete, CONTRACTOR shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the CITY's Representative and are operational.

5. Work is completed and ready for final inspection.

B. CITY's Representative and ENGINEER will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should CITY's Representative and ENGINEER consider that the work is incomplete and defective:

1. CITY's Representative will promptly notify the CONTRACTOR, in writing, listing the incomplete or defective work.

2. CONTRACTOR shall take immediate steps to remedy the stated deficiencies and send a second written certification to CITY's Representative that the work is complete.

3. CITY's Representative and ENGINEER will reinspect the work.

C. When the CITY's Representative finds that the work is acceptable under the Contract Documents, CITY's Representative shall request the CONTRACTOR to make closeout submittals.

1.05 REINSPECTION FEES

A. Should CITY's Representative perform re-inspections due to failure of the work to comply with the claims of status of completion made by the CONTRACTOR:

1. CITY will compensate CITY's Representative and ENGINEER for such additional services.

2. CITY will deduct the amount of such compensation from the final payment to the CONTRACTOR.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS TO CITY'S REPRESENTATIVE

A. Evidence of compliance with requirements of governing authorities.

1. Certificate of Occupancy.

2. Certificates of Inspection.

a. Mechanical
b. Electrical
c. Other, as may be required.

B. Project Record Documents: To requirements of Section 01720.

C. Guarantees and Bonds: To requirements of Section 01740.

D. Evidence of Payment and Release of Liens: To requirements of General and Supplementary General Conditions.

F. Certificate of Insurance for Products and Completed Operations.

1.07 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to CITY's Representative.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

a. Previous Change Orders
b. Allowances
c. Unit Prices
d. Deductions for uncorrected work
e. Penalties and Bonuses
f. Deductions for liquidated damages
g. Deductions for reinspection payments
h. Other adjustments

3. Total Contract Sum, as required

4. Previous payments

5. Sum remaining due

C. CITY's Representative will prepare a final Change Order, reflecting approved adjustments to the Contract Sum, which were not previously made by Change Orders.

1.08 FINAL APPLICATION FOR PAYMENT

A. CONTRACTOR shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01700

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by the General Conditions.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications

B. Conditions of the Contract

1.03 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulation of waste material, rubbish and windblown debris, resulting from Construction Work.

B. Provide on-site containers for the collection of waste materials, debris and rubbish.

C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

D. The CITY's Representative reserves the right to direct the CONTRACTOR to remove waste materials

E. Mechanical Sweeping: CONTRACTOR shall maintain on site a mechanical sweeping device for removing debris from existing, temporary and permanent pavement.

3.02 DUST CONTROL

A. Perform operations so that dust and other contaminants resulting from Construction Work operations will not cause any damages or maintenance problems to adjacent properties.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.03 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

C. Polish glossy surfaces to a clear shine.

D. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

E. Prior to final completion, or CITY occupancy, CONTRACTOR shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify the entire work is clean.

F. All storage and staging areas shall be cleaned and returned to prior conditions or better as per requirements of this section.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

END OF SECTION 01710

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain at the site of the CITY a record copy of:

1. Drawings (AutoCAD or approved equal)
2. Specifications
3. Addenda
4. Change Orders and other modifications to the Contract
5. Approved Shop Drawings, Product Data and Samples
6. Field Test Records

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications

B. Conditions of the Contract

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in CONTRACTOR's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI format.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by CITY's Representative.

1.04 MARKING DEVICES

A. Provide felt tip-marking pens for recording information in the color code designated by CITY's Representative.

1.05 RECORDING

A. Label each document, "PROJECT RECORD" in neat large printed letters, or by rubber stamp.

B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction: (in AutoCAD format or approved equal)

1. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

2. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

3. Field changes of dimension and detail.

4. Changes made by Field Order or by Change Order.

5. Details not on original Contract Drawings.

D. Specifications and Addenda; Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each produce and item of equipment actually installed.

2. Changes made by field order or by Change Order.

1.06 AS-BUILT PLANS (RECORD DRAWINGS)

A. The CONTRACTOR shall maintain a full size (24"X36") field drawings and electronically in AutoCAD format (or approved equal) to reflect the "as-built" items of work as the work progresses. Upon completion of the work, the CONTRACTOR shall prepare a record set of "as-built" drawings on full-size, reproducible material. One set of full size design drawings on reproducible material will be furnished to the CONTRACTOR by the design ENGINEER at the current square foot price. No separate payment will be made for those "as-built" drawings.

B. The cost of maintaining record changes, and preparation of the Record Drawings shall be included in the unit prices bid for the affected items. Upon completion of the work, the CONTRACTOR shall furnish the ENGINEER the reproducible "as-built" Drawings. The completed Record drawings shall be delivered to the ENGINEER at least 48 hours prior to final inspection of the work. The Final Inspection will not be conducted unless the Record Drawings are in the possession of the ENGINEER.

C. The completed (or final) record drawings shall be certified by a Professional Land Surveyor registered in the State of Florida. This certification shall consist of the surveyor's embossed seal bearing registration number, the surveyor's signature and date on each sheet of the drawing set. In addition, the key sheet, cover sheet or first sheet of the plans set shall list the business address and telephone number of the surveyor.

D. Representative items of work that should be shown on the record drawings as verified, changed or added are shown below:

1. Plans:

a. Structure types, location with grade of rim and flow-line elevations.
b. Sewer type, length, size and elevations.
c. Utility type, length, size and elevation in conflict structures.
d. All manholes, valves and hydrants within right-of-way.
e. Spot (critical) elevations at plateaued intersections.
f. Sewer laterals shall be stationed between manholes.

2. Pavement Marking and Signing Plans: Sign location where installed if different from plans.

3. Water and Sewer Plans: Location (horizontal and vertical) of all pipelines, structures, fittings, valves and appurtenances.

E. The CONTRACTOR shall submit one set of progress record drawings with each application for payment. This drawing shall accurately depict the work completed and for which payment is being requested.

1.07 SUBMITTAL

A. At Contract closeout, deliver Record Documents, including electronic file drawing in AutoCAD format (or approved equal), to CITY's Representative for presentation to the CITY.

B. A four complete sets of "As-Built" Drawings shall be prepared in electronic (AutoCAD or approved equal) and hardcopy formats and delivered to the CITY's Representative for the CITY. Work shall be performed by a registered land surveyor and shall include, but not be limited to the following:

1. Valve boxes, splice boxes, pull boxes, all underground utilities-waterlines, electrical runs, irrigation system, storm drainage pipe and structures, finished necessary grades, benches, curbs, fences walls signs, light fixtures and other items as necessary.

C. Accompany submittal with transmittal letter in duplicate, containing:

1. Date

2. Project title and number

3. CONTRACTOR's name and address

4. Title and number of each Record Document

5. Signature of CONTRACTOR or CONTRACTOR'S authorized representative

1.08 "RED LINE" AS-BUILT INFORMATION

A. Submit with each progress payment application “red-line” “As-Built” Drawings current to the date of the submittal date with verification by the CITY's Representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

END OF SECTION 01720

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compile specified guarantees and bonds.

B. Compile specified services and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to CITY's Representative for review and transmittal to CITY.

1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications

B. Conditions of the Contract

1.03 SUBMITTAL REQUIREMENTS

A. Assemble guarantees, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and Subcontractors.

B. Number of original signed copies required: Three each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product or work item

2. Firm, with name of principal, address and telephone number

3. Scope

4. Date of beginning warranty, bond or service and maintenance contract

5. Duration of warranty, bond or service maintenance contract

6. Provide information for CITY's personnel:

   a. Proper procedure in case of failure
   b. Instances, which might affect the validity of warranty or bond

7. CONTRACTOR, name of responsible principal, address and telephone number.

1.04 FORM OF SUBMITTALS

A. Prepare in triplicate packets.

B. Format:

1. Size 8-1/2 in. x 11 in., punch sheets for standard 3-ring binder. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "GUARANTEES AND BONDS". List:

a. Title of Project
b. Name of CONTRACTOR

C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.05 TIME OF SUBMITTALS

A. Make submittals within ten days after Date of Substantial Completion, prior to final request for payment.

B. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of guarantee period.

1.06 SUBMITTALS REQUIRED

A. Submit guarantees, bonds, and service and maintenance contracts for periods other than one year as specified in respective specific sections of the Specifications, (if applicable).

B. The General CONTRACTOR shall submit on the entire Project the one-year guarantee as per AIA, Document A-201 General Conditions, (except for certain portions of the work, where longer periods of time are specified in the specific applicable sections of the Specifications).

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

END OF SECTION 01740

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the subsurface investigation work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. The subsurface investigation for conditions of the project site is the sole responsibility of the CONTRACTOR. In preparing the Bid, the CONTRACTOR shall complete all subsurface or surface investigations necessary to provide proper background and knowledge to determine the nature and extent of work required.

C. CITY or CITY's Representative provides no subsurface information and makes no warranties or guarantees concerning the nature of materials to be encountered on the site.

1.03 RELATED WORK

A. Section 02110 - Clearing

B. Section 02200 - Earthwork

C. Section 02601 – Subterranean Structures

D. Section 02713 - Water Distribution System

E. All applicable sections under Divisions 1, 2, 3, and 4.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

END OF SECTION 02010

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the site demolition work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Contractor shall demolish all electrical conduit, wire, panels, j-boxes, pull boxes, lighting fixtures and switches, control panels, ATS switches, disconnects, metercans, step down transformer, RTU antenna along with all support hardware, hangers, and bolts.

C. The Contractor shall demolish all electrical equipment within the existing underground can station and within the existing wetwell.

D. The Contractor shall remove the former FPL underground service conductors and demolish the former underground raceways.

E. Contractor shall remove the existing DFS RTU equipment and turn over to the CITY.

F. All demolition, removal, and proper disposal of equipment, including hauling fees shall be paid for by the Contractor.

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. All applicable Sections under Divisions 1, 2, 3, and 4

1.04 QUALITY ASSURANCE

A. CONTRACTOR Qualifications: Minimum of five years experience in demolition of comparable nature.

B. Requirements of All Applicable Regulatory Agencies:

1. All applicable Building Codes and other Public Agencies having jurisdiction upon the work.

1.05 SUBMITTALS

A. Permits and notices authorizing building demolition

B. Certificates of severance of utility services

C. Permit for transport and disposal of debris

D. Demolition procedures and operational sequence for review and acceptance by ENGINEER

1.06 JOB CONDITIONS

A. Existing Conditions

1. The demolition work shall be done as indicated on the construction plans.

2. Remove all demolition debris from the site the same day the work is performed. Leave no deposits of demolished material on site overnight.

3. Structural demolition, excavation, backfill and compaction as indicated in drawings.

B. Protection:

1. Erect barriers, fences, guardrails, enclosures, and shoring to protect personnel, structures, and utilities remaining intact.

2. Protect designated trees and plants from damages.

3. Use all means necessary to protect existing objects and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary, to the approval of the ENGINEER at no additional cost to the CITY.

C. Maintaining Traffic:

1. Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct streets and sidewalks without written approval from the ENGINEER.

3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

D. Dust Control:

1. Use all means necessary for preventing dust from demolition operations from being a nuisance to adjacent property CITYs. Methods used for dust control are subject to approval by the ENGINEER prior to use.

E. Burning:

1. On-site burning will not be permitted.

1.07 GENERAL ITEMS

A. Scope of work shall comprise the following: Provide all labor, materials, necessary equipment and services to complete the demolition and clearing work, as indicated on the contract plans, and as specified herein.

B. The CONTRACTOR shall provide references to the CITY to demonstrate a minimum of five years experience in demolition of a comparable nature. Current occupational licenses held by CONTRACTOR shall be submitted to CITY.

C. The CONTRACTOR shall be responsible for adherence to all applicable codes of all regulatory agencies having jurisdiction upon the works.

1.08 PRE-DEMOLITION MEETING

A. A meeting shall be held with the CITY or CITY's representative at the jobsite to describe intended demolition and cleaning procedures and schedules. This shall include identifying access routes for bringing necessary equipment in, removing debris from site, and designation of any trees, drives or other items to remain.

1.09 EXISTING CONDITIONS

A. The CONTRACTOR shall become thoroughly familiar with the site, and of existing utilities and their connections, and note all conditions, which may influence the work.

B. By submitting a bid, the CONTRACTOR affirms that CONTRACTOR has carefully examined the site and all conditions affecting work. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

C. The CITY shall be responsible for removal of all hazardous materials such as asbestos, chemicals, etc., from the site prior to CONTRACTOR mobilizing on site. The CITY shall be notified immediately should the CONTRACTOR discover any further hazardous materials during demolition.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall verify that structures to be demolished are discontinued in use and ready for removal.

B. Contractor shall not commence work until all conditions and requirements of all applicable public agencies are complied with.

3.02 PREPARATION

A. Arrange for and verify termination of utility services to include removing meters and capping lines.

B. Notification: Notify the CITY at least three full working days prior to commencing the

work of this Section

3.03 CLARIFICATION

A. The drawings do not purport to show all objects existing on the site.

B. Before commencing the work of this Section, verify with the CITY all objects to be removed and all objects to be preserved.

3.04 SCHEDULING

A. Schedule all work in a careful manner with all necessary consideration for the public and the CITY.

B. Avoid interference with the use of, and passage to and from, adjacent facilities.

3.05 DISCONNECTION OF UTILITIES

A. Before starting site operations, disconnect or arrange for the disconnection of all affected utility service.

1. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Disconnect and stub off. Notify affected utility company in advance and obtain approval before starting this work.

2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

3. Place markers to indicate location of disconnected services.

4. On-site drainage structures and drain fields shall be removed in their entirety by methods approved by the CITY's representative.

3.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. Utility Services: Maintain existing offsite utilities, keep in service, and protect against damage during demolition operations.

B. Prevent movement or settlement of adjacent structures. Provide and place bracing or shoring and be responsible for safety and support of structures. Assume liability for such movement, settlement, damage, or injury.

C. Cease operations and notify CITY immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.

D. Prevent movement, settlement, damage, or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the CITY.

E. Ensure safe passage of persons around areas of demolition.

3.07 MAINTAINING TRAFFIC

A. Do not interfere with use of adjacent buildings and facilities. Maintain free and safe passage to and from. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed travel ways if required by governing authorities.

3.08 POLLUTION CONTROLS

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations as directed by the CITY or their representative or governing authorities. Return adjacent areas to condition existing prior to start of work.

3.09 INSPECTION AND PREPARATION

A. Verify that structures to be demolished are discontinued in use and ready for removal.

B. Do not commence work until all conditions and requirements of all applicable public agencies are complied with.

C. Arrange for and verify termination of utility services to include removing meters and capping lines.

D. The drawings do not purport to show all objects existing on the site; at the pre-demolition meeting before commencement of the work, verify with the CITY all objects to be removed and all objects to be preserved.

3.10 DEMOLITION

A. Pull out any existing utility lines designated for abandonment, irrigation, electrical lines, pull boxes and splice boxes, manholes, and catch basins to be removed and all other objects designated to be removed or interfering with the work. Contact the utility company or agency involved for their requirements for performing this work. All removed equipment and materials shall be removed from the work area the same day as removed.

B. Remove all debris from the site and leave the site in a neat, orderly condition to the full acceptance of the ENGINEER, or the CITY. No debris shall be left on the site overnight.

C. Clear and Grub and dispose of all trees, shrubs and other organic matter not otherwise addressed on tree removal and relocation plans and specifications.

3.11 DEMOLITION OF SITE STRUCTURES

A. Demolish all site structure items designated to be removed or which are required to be removed to perform the work. This item does not include buildings.

3.12 REMOVAL OF DEBRIS AND DISPOSAL OF MATERIAL

A. Material resulting from demolition and not scheduled for salvaging shall become the property of the CONTRACTOR and shall be removed from site and legally disposed of off-site. Disposal shall be timely, performed as promptly as possible and not left until the final cleanup. Material shall not be left on the job site for more than 60 days.

B. Remove from site contaminated, vermin infested, or dangerous materials encountered and disposed of by safe means so as not to endanger health of workers and public.

C. Burning of removed materials from demolished structures will not be permitted on-site.

3.13 COMPLETION OF WORK

A. Leave the site in a neat, orderly condition to the full acceptance of the CITY.

B. Dirt remaining after demolition shall be graded level and compacted, in preparation for filling operations to follow demolition. Trenches shall be filled in layers of 12" maximum thickness and compacted in accordance with the technical specifications applicable to backfilling of trenches.

3.14 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the lump sum price bid for items associated with the demolition.

END OF SECTION 02050

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the clearing work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Under this section, the CONTRACTOR shall do all clearing, grubbing, root-raking, and necessary clean-up operations in connection with the construction of the work and its related site work.

C. The work shall consist of the removal and disposal of trees, stumps, roots, limbs, brush, fences, asphalt, etc. from all project areas as designated on the drawings as specified herein, and as directed by the ENGINEER on the site.

D. The CONTRACTOR shall remove all refuse, asphalt pavement, concrete pavement, glass, metal, stone, plaster, lumber, paper materials, and any and all trash found in clearing and adjacent areas as directed by the ENGINEER.

E. The CONTRACTOR shall furnish all services, labor, transportation, materials, and equipment necessary for the performance of these operations. All clearing and cleanup operations shall be accomplished to the complete satisfaction of the ENGINEER.

F. The CONTRACTOR shall strip all existing topsoil and stockpile it on-site in locations approved by the CITY's Representative. All topsoil material shall be stockpiled within a haul distance of 3,000 feet.

1.03 RELATED WORK

A. Section 02010 - Subsurface Investigation

B. Section 02200 - Earthwork

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 TREE REMOVAL AND TREE PRESERVATION

A. No trees shall be removed if located outside of the right-of-way and dedicated easement.

B. Within the rights-of-way and easements, no trees with a trunk diameter of 3" or greater at 4-1/2" above grade shall be removed without the approval of the ENGINEER with the

exception of Australian Pines, Meleleuca or Florida Holly. Trees shall be evaluated on an individual basis in accordance with following:

a. Type and size of tree

b. Proximity to proposed and/or existing utility lines and/or exfiltration trench

c. Change in adjacent grades for swale excavation

d. Proximity to proposed sidewalk

e. Proximity to proposed edge of roadway

f. Living condition of the tree

C. If trees are determined to remain, biobarrier shall be installed in accordance with the plans.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment for this item will be made per square yard and will include grading of swales per Section 02210.

END OF SECTION 02110

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the dewatering work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02221 - Excavation and Backfilling for Utilities

C. Section 02601 - Subterranean Structures

D. Section 02610 - Piping, General Section

PART 2 - PRODUCTS

2.01 EQUIPMENT

Dewatering, where required, may include the use of temporary reservoirs and diking, well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment must be maintained on the job site and operate within any local noise ordinance limits. All safety requirements, fencing, etc. shall be installed and maintained by the CONTRACTOR.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The CONTRACTOR shall provide all equipment necessary for dewatering. It shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations, Water entering the excavation from surface runoff shall be collected in shallow

ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with pea rock at no additional cost to the CITY.

F. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

G. The CONTRACTOR shall prevent flotation by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand-packed and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

I. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using a silt box or another approved method to remove sand and fine-sized soil particles before disposal into any drainage system. The ENGINEER prior to being used shall approve dewatering disposal points. Storm drains used by the CONTRACTOR for dewatering shall be cleaned by a jet vac, or other method approved by the ENGINEER after dewatering is complete.

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

K. Dewatering of trenches and other excavations shall be considered, as incidental to the construction of the WORK and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.

L. The CONTRACTOR shall submit a dewatering plan to the ENGINEER for review. The CONTRACTOR is advised that the Broward County Environmental Protection and Growth Management Department (BCEPGM) and/or SFWMD may require that a dewatering plan, prepared by a State of Florida licensed Professional Engineer or Registered Professional Geologist, be submitted and approved prior to issuance of a dewatering permit.

M. The CONTRACTOR is advised that the Broward County Environmental Protection and Growth Management Department may have identified contaminated sites within 1/4-mile

radius of the project site. The CONTRACTOR will responsible for providing any testing and monitoring of the dewatering operations, and to institute dewatering methods and controls, as required by Broward County EPGM.

3.02 QUALITY CONTROL

A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.

C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement, which may develop. The responsibility for conducting the dewatering operation in a manner, which will protect adjacent structures and facilities, rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

3.03 CONTRACTOR SUBMITTALS

Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the ENGINEER and regulatory agencies.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section. It shall be included in the appropriate unit price bid.

END OF SECTION 02140

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Earthwork, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Including but not necessarily limited to the following:

1. Excavation, including demucking
2. Backfilling
3. Filling
4. Grading, general site and building pads
5. Compaction

C. There shall be no classification of excavation for measurement of payment regardless of materials encountered.

D. The work of this Section includes all earthwork required for construction of the WORK. Such earthwork shall include, but not be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing necessary to safely support the sides of all excavation; all pumping, ditching, draining, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to makeup deficiencies for fills; and all other incidental earthwork, all in accordance with the requirement of the Contract Documents.

1.03 RELATED WORK

A. Section 02050 - Demolition

B. Section 02210 - Site Grading

C. All applicable sections of Division 1, 2, 3, and 4

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ASTM D 422	Method for Particle-Size Analysis of Soils.
ASTM D 698	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.
ASTM D 1556	Test Method for Density of Soil in Place by the Sand Cone Method.
ASTM D 1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop.
ASTM D 1633	Test Method for Compressive Strength of Molded Soil-Cement Cylinders.
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
ASTM D 2487	Classification of Soils for Engineering Purposes.
ASTM D 2901	Test Method for Cement Content of Freshly-Mixed Soil-Cement.
ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 4253	Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
ASTM D 4254	Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.

1.05 SUBSOIL INFORMATION

A. There are no representations of any type made as to subsurface conditions.

1.06 SITE INSPECTION

A. CONTRACTOR shall visit the site and acquaint with all existing conditions. CONTRACTOR shall investigate the site and subsurface conditions with no cost to the CITY if CONTRACTOR chooses to. Such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the CITY's Representative and ENGINEER.

1.07 TOPOGRAPHIC INFORMATION

A. The existing grades shown on the drawings are approximate only and no representation is made as to their accuracy or consistency. The CONTRACTOR shall verify all existing

grades to the extent necessary to ensure completion of the job to the proposed grades indicated on the drawings.

1.08 DISPOSAL OF SURPLUS OR UNSUITABLE MATERIAL

A. Unsuitable material encountered during the course of construction shall be removed from the construction site at the expense of the CONTRACTOR. Unsuitable material shall not be stockpiled on-site. All suitable material shall be stockpiled on-site at areas designated by the ENGINEER or hauled to an acceptable storage area within a 10 mile radius from the construction site.

1.09 BENCH MARKS AND MONUMENTS

A. CONTRACTOR shall employ a registered surveyor to lay out lines and grades as indicated. A surveyor registered in the State of Florida shall establish benchmarks. Benchmarks shall be permanent and easily accessible and maintained and replaced if disturbed or destroyed. All benchmarks shall be NGVD.

1.10 UTILITIES

A. Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed in accordance with Section 02050 "Demolition".

B. Locate all existing active utility lines traversing the site and determine the requirements for their protection. Preserve in operating condition all active utilities adjacent to or traversing the site and/or designated to remain.

C. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or replace as indicated, specified or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record the location of all utilities.

1.11 QUALITY ASSURANCE

A. A SOILS ENGINEER may be retained by the CITY to observe performance of work in connection with excavating, filling, grading, and compaction. The CONTRACTOR shall re-adjust all work performed that does not meet technical or design requirements but make no deviations from the Contract documents without specific and written acceptance of the ENGINEER.

B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 2922, or by such other means acceptable to the ENGINEER.

C. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance.

Subsequent testing to show compliance shall be by a testing laboratory selected by the CITY and shall be at the CONTRACTOR's expense.

D. Particle size analysis of soils and aggregates will be performed using ASTM D 422.

E. Determination of sand equivalent value will be performed using ASTM D 2419.

F. Unified Soil Classification System: References in these specifications to soil classification types and standards are set forth in ASTM D 2487. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.

G. Requirements of all applicable building codes and other public agencies having jurisdiction upon the work.

PART 2 - PRODUCTS

2.01 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. General: Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.

B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

C. Suitable Materials: Soils not classified as unsuitable as defined in Paragraph entitled, "Unsuitable Material" herein, are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the specified limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

D. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project the CONTRACTOR shall provide the imported materials at no additional expense to the CITY, unless a unit price item is included for imported materials in the bidding schedule.

E. The following types of suitable materials are designated and defined as follows:

1. Type A (one inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1-inch sieve and a sand equivalent value not less than 50.

2. Type B (one half inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1/2-inch sieve and a sand equivalent value not less than 50.

3. Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a number 4 sieve, and a sand equivalent value not less than 30.

4. Type D (coarse rock backfill): Crushed rock or gravel with 100 percent passing a 1-inch sieve and not more than 10 percent passing a Number 4 sieve.

5. Type E (pea gravel backfill): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a Number 4 sieve.

6. Type F (coarse drainrock): Crushed rock or gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1-1/2-inch	90-100
1-inch	20-55
3/4-inch	0-15
No. 200	0-3

7. Type G (aggregate base): Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements.

	Percentage Passing	
Sieve Size	1-1/2 inch Max.	3/4-inch Max.
2-inch	100	-
1-1/2 inch	90-100	-
1-inch	-	100
3/4-inch	50-85	90-100
No. 4	25-45	35-55
No. 30	10-25	10-30
No. 200	2-9	2-9

8. Type H (graded drainrock): Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements.

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90-100
3/8-inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

The drainrock shall have a sand equivalent value not less than 75. The finish-graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The CONTRACTOR shall use, at its option, one of the asphalt types listed below:

	Type 1	Type 2	Type 3
Designation	SC-70	SC-250	RS-1
Spray Temperature (°F)	135-175	165-200	70-120
Coverage (gal/ sq yd)	0.50	0.50	0.50

If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

9. Type I: Any other suitable material as defined herein.

10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633.

11. Type K (topsoil): Stockpiled topsoil materials, which have been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris as specified.

12. Type L (Class I crushed stone): Manufactured angular, granular crushed stone, rock, or slag, with 100 percent passing a 1-inch sieve and less than 5 percent passing a Number 4 sieve.

13. Type M (aggregate subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and shall meet the following gradation requirements.

Sieve Size	Percentage Passing
3-inch	100
2-1/2 inch	87-100
No. 4	35-95
No. 200	0-29

14. Type N (trench plug): Low permeable fill material, a nondispersible clay material having a minimum plasticity index of 10.

2.02 UNSUITABLE MATERIAL

A. Unsuitable soils for fill material shall include soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, CH, MH or OL.

B. In addition, any soil, which cannot be compacted sufficiently to achieve the percentage of maximum density specified for the intended use, shall be classed as unsuitable material.

2.03 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacture, the ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the most stringent requirement, as determined by the ENGINEER.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of Type I material, as defined herein, or any mixture of Type I and Type A through Type H materials.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" herein, shall consist of the following materials for each pipe material listed below. Where pipelines are installed on grades exceeding 4 percent, and where backfill materials are graded such that there is less than 10 percent passing a Number 4 sieve, trench plugs of Type J or N material shall be provided at maximum intervals of 200 feet or as shown on the Drawings.

    a. Mortar coated pipe, concrete pipe, and uncoated ductile iron pipe shall be provided Type A, B, C, D, E, or L pipe zone backfill material.
    b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, and other non-mortar coated pipe shall be backfilled with Type C pipe zone backfill material.
    c. Plastic pipe and vitrified clay pipe shall be backfilled with Type L pipe zone backfill material.

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Type I backfill material or any of Types A through H backfill materials or any mixture thereof, except that Type K material may be used for trench zone backfill in agricultural areas unless otherwise shown or specified.

4. Final backfill material for pipelines under paved area, as defined under "Pipe and Utility Trench Backfill" shall be Type G backfill material. Final backfill under areas not paved shall be the same material as that used for trench backfill, except that Type K material shall be used for final backfill in agricultural areas unless otherwise shown or specified.

5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

6. Aggregate base materials under pavements shall be Type G material constructed to the thickness shown or specified. Where specified or shown, aggregate subbase shall be Type M Material.

7. Backfill around structures shall be Type I material, or Types A through Type H materials, or any mixture thereof.

8. Backfill materials beneath structures shall be as follows:

   a. Drainrock materials under hydraulic structures or other water retaining structure with underdrain systems shall be Type H material.
   b. Under concrete hydraulic structures or other water retaining structures without underdrain systems, Types G or H materials shall be used.
   c. Under structures where groundwater must be removed to allow placement of concrete, Type F material shall be used.
   d. Under all other structures, Type D, E, G, or H material shall be used.

9. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a 6-inch top filter layer of Type E material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet. Filter fabric shall be Mirafi 140 N, Mirafi 700X, or equal.

10. The top 6 inches of fill on reservoir roofs, embankment fills around hydraulic structures, and all other embankment fills shall consist of Type K material, topsoil.

2.04 EMBANKMENT

A. The maximum sizes of rock, which will be permitted in the completed fill areas, are as follows:

Depth Below Finish Grade	Maximum Allowable Diameter
Top 4 inches	1 inch
4 inches to 12 inches	3-1/2 inches
12 inches to 2 feet	6 inches
2 feet to 4 feet	12 inches
4 feet to 8 feet	24 inches
Below 8 feet	36 inches

B. Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a suitable and enduring roadbed, and material designated as undesirable shall be removed from the site. Where embankments are constructed adjacent to bridge end bents or abutments, rock larger than 3-1/2 inches in diameter shall not be placed within three feet of the location of any abutment.

C. Fill material containing debris, sod, and biodegradable materials shall not be used as fill in construction areas.

D. Fill material required for the building pads and for pavement subgrade shall be granular fill, free of organic material.

E. Fill material required for pervious and sodded areas shall have a maximum organic component of 10%. CONTRACTOR shall provide, at CONTRACTOR'S cost, organic content test results for approval by the ENGINEER.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

A. Protection: Use all means necessary to protect existing objects and vegetation. In the event of damage, immediately make all repairs, and replacements necessary to the acceptance of the CITY's Representative and ENGINEER at no cost to the CITY.

3.02 BACKFILL, FILLING & GRADING

A. Grades:

1. Cut, backfill, fill and grade to proper grade levels indicated. The proposed grades shown on the drawings are for establishing a finished grade over the site.

B. Filling:

1. Fill material shall be placed in horizontal layers and spread to obtain a uniform thickness.

2. After compaction, layers of fill are not to exceed twelve (12) inches for cohesive soils or eight (8) inches for noncohesive soils.

3.03 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measure for the removal or exclusion of water, including taking care of storm water, groundwater, and wastewater reaching the site of the work from any source so as to prevent damage to the work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

B. Excavation Beneath Structures and Embankments: Except where otherwise specified for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top [6 inches] of native material and where such subgrade is sloped, the native material shall be benched. When such over excavation is shown, the CONTRACTOR shall perform both over-excavation and subsequent backfill to the required grade. When such over-excavation is not shown but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been

completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain density as specified in Paragraph 3.14.I.

C. Excavation Beneath Paved Areas: Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain density as specified in Paragraph 3.14.I. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

D. Notification of ENGINEER: The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.04 PIPELINE AND UTILITY TRENCH EXCAVATION

A. General: Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 24 inches for mechanical compaction methods and 18 inches for water consolidation methods. The maximum width at the top of the pipe shall be equal to the outside diameter of the pipe plus 36 inches for pipe diameters 18 inches and larger and to the outside diameter of the pipe plus 24 inches for pipe diameters less than 18 inches, or as shown on the Drawings.

B. Trench Bottom: Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. Excavations for pipe bells and welding shall be made as required.

C. Open Trench: The maximum amount of open trench permitted in any one location shall be 300 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.

D. Trench Over-Excavation: Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.

E. Over-Excavation: When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR when the over-excavation ordered by the ENGINEER is less than 6 inches below the limits shown. When the over-excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6-inch distance. Said additional payment will be made under separate unit price bid items for over-excavation and bedding if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.

F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

3.05 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. The CONTRACTOR at its own expense shall perform such work.

3.06 EXCAVATION IN LAWN AREAS

A. Where excavation occurs in lawn areas, the sod shall be carefully removed, kept damp, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling and testing of the pipeline, the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

3.07 EXCAVATION IN VICINITY OF TREES

A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed and approved by the ENGINEER.

3.08 ROCK EXCAVATION

A. Rock is defined as follows:

1. Rock shall be classified as material having a blow count in excess of 30 blows per foot from a Standard Penetration Test (ASTM D-1586) and exceeding 1000 psi from an Unconfined Compression Strength Test (ASTM D-2938); and,

2. General Excavation - Any material that cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less

than 71,000 lbs. (Caterpillar D9N or equivalent), and occupying an original volume of at least 2 cubic yards or more; and,

3. Trench Excavation - Any material that cannot be excavated with a backhoe having a break out force rated at not less than 44,000 lbs. (Caterpillar 235D or equivalent), and occupying an original volume of at least 2 cubic yards.

B. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of rock as described in Paragraph 3.09(A).

C. Said rock excavation shall be performed by the CONTRACTOR; provided, that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made under a separate bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price.

D. Explosives and Blasting: Blasting will not be permitted, except by express permission of the ENGINEER on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If blasting is utilized at the site of the WORK, the CONTRACTOR shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the CONTRACTOR shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the CITY. The CONTRACTOR shall have a fully qualified and experienced blasting foreman in charge of all blasting operations.

E. The CONTRACTOR will be held responsible for all and shall make good any damage caused by blasting or resulting from its possession or use of explosives on the WORK.

F. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

3.09 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER.

3.10 DISPOSAL OF UNSUITABLE EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all unsuitable excavated material. This shall include muck, tree roots, rocks, garbage, debris, or any other material designated as unsuitable by Paragraph 2 of this Section. Disposal shall be at a site selected by the CONTRACTOR that is designated as an approved disposal site for the unsuitable material.

3.11 BACKFILL - GENERAL

A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

3.12 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.

B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.

C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.

D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.13 COMPACTION - GENERAL

A. Compact each layer of fill in designated areas with approved equipment to achieve a maximum density at optimum moisture, AASHTO T 180 - latest edition.

1. Building Pads: compaction shall be to 98% of maximum density, unless otherwise shown on the drawings or specifications. Building pads shall be within plus or minus one-tenth (0.1) of a foot of the elevations shown on the plans.

2. Refer to Sections 02513 Asphaltic Concrete Paving and 02515 Portland Cement Concrete Paving for compaction requirements in the affected areas.

3. Under landscaped area, compaction shall be to density as specified in Paragraph 3.14.I., unless otherwise shown on the Drawings.

B. No backfill shall be placed against any masonry or other exposed building surface until permission has been given by the CITY's Representative, and in no case until the masonry has been in place seven days.

C. Heavy construction equipment will not be permitted within ten (10) feet of any masonry or other exposed building surface.

D. Compaction in limited areas shall be obtained by the use of mechanical tampers or approved hand tampers. When hand tampers are used, the materials shall be deposited in layers not more than four inches thick. The hand tampers used shall be suitable for this purpose and shall have a face area of not more than 100 square inches. Special precautions shall be taken to prevent any wedging action against masonry, or other exposed building surfaces.

3.14 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of Types, A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Each layer of Type D, E, F, and J backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.

C. Type L material requires mechanical spreading and placement to fill voids but does not require mechanical compaction or vibration.

D. Fill on reservoir and structure roofs shall be deposited at least 30 days after the concrete roof slab has been placed. Equipment weighing more than 10,000 pounds when loaded shall not be used on a roof. A roller weighing not more than 8,000 pounds shall be used to compact fill on a roof.

E. Flooding, ponding, or jetting shall not be used for fill on roofs, backfill around structures, backfill around reservoir walls, for final backfill materials, or aggregate base materials.

F. Pipe zone backfill materials that are granular may be compacted by a combination of flooding and vibration using concrete vibrators or by jetting, when acceptable to the ENGINEER.

G. Pipeline trench zone backfill materials, containing 5 percent or less of material passing a No. 200 sieve, may be compacted using flooding and jetting or vibration if the CONTRACTOR uses effective procedures that yield the specified compaction test results. Flooding and jetting shall not be done in such a manner that the pipe or nearby utilities are damaged, in areas of poorly draining or expansive soils, or where the use of the procedure is prohibited by any agency having jurisdiction over the street or right-of-way. Approved jet pipes or immersible vibrators shall be used so that each backfill layer is saturated and consolidated to its full depth before the next layer is placed. Jet pipes shall be kept at least 6 inches away from the pipe where the backfills being consolidated and 2 feet away from other pipes or utilities.

H. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the fill at that time. Hand operated power compaction

equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

I. Compaction Requirements: The following compaction test requirements shall be in accordance with AASHTO T-180. Where agency or utility company requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density
Pipe zone backfill portion above bedding for flexible pipe.	98
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe, including trench plugs.	98
Pipe zone backfill portion above bedding for rigid pipe.	98
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for rigid pipe.	98
Final backfill, beneath paved areas or structures	98
Final backfill, not beneath paved areas or structures	95
Trench zone backfill, not beneath paved areas or structures, including trench plugs	95
Embankments	98
Embankments, beneath paved areas or structures	98
Backfill beneath structures, hydraulic structures	98
Backfill around structures	98

Location or Use of Fill	Percentage of Maximum Density
Topsoil (Type K material)	80
Aggregate base or subbase Type G or M material)	98

J. Trench Backfill Requirements: the pipe has been structurally designed based upon the trench configuration specified herein.

K. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.

L. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the CITY. "Improved" backfill shall mean sand-cement backfill or other equivalent materials acceptable to the ENGINEER.

M. If the allowable deflection specified for the pipe is exceeded, the CONTRACTOR shall expose and reground or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the CITY.

3.15 PIPE AND UTILITY TRENCH BACKFILL

A. Pipe zone Backfill: The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the springline as shown.

B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.

1. The pipe bears on firm, undisturbed native soil, which contains only particles that will pass a one-inch sieve.

2. The trench excavation is not through rock or stones.

3. The trench subgrade soils are classified as suitable fill and backfill materials per Paragraph 2.01.

4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.

C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.

D. The pipe zone shall be backfilled with the specified backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.

E. Trench Zone Backfill: After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.

F. Final Backfill: Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, of if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.16 EMBANKMENT CONSTRUCTION

A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted as specified in Paragraph 3.14.I. Embankment fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.

B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and recompacted as the embankment fill is brought up in layers. Material thus cut shall be recompacted along with the new fill material at the CONTRACTOR's expense. Hillside of fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

3.17 CORRECTION OF GRADE

A. Bring to required grade levels areas where settlement, erosion or other grade changes occur.

3.18 MAINTENANCE AND PROTECTION OF WORK

A. While construction is in progress adequate drainage for the roadbed shall be maintained at all times.

The CONTRACTOR shall maintain all earthwork construction throughout the life of the contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. CONTRACTOR shall repair at CONTRACTOR'S expense, except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work.

All channels excavated as a part of the contract work shall be maintained against natural shoaling or other encroachments to the lines, grades, and cross sections shown on the plans, until final acceptance of the project.

3.19 AS-BUILT SURVEY

A. At the completion of the work and prior to final inspection of the area, the CONTRACTOR shall provide the ENGINEER with an as-built topographic survey made by a registered Surveyor, of the State of Florida.

B. The surveyor is to certify on the survey whether or not the as-built conditions conform to the elevations shown on the Drawings to within plus or minus two-hundredth (0.02) of a foot.

3.20 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the unit price per square yard bid for compaction of subgrade when constructing new roads and shall be included in the cost of all other work called out in the bid schedule requiring earth work.

END OF SECTION 02200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work covered by this section shall include all labor, equipment, services and materials necessary for bringing the entire site to elevations shown in the plans. The work included in this section shall include all necessary excavations for streets, ditches and swales. It shall include the construction of embankments and fills by the loading, movement, deposition and compaction of suitable fill materials resulting from above listed excavations. It shall include stockpiling of any excess material to an on-site location as specified by the CITY.

B. It shall include rough grading within the roadways and parking lots to the elevations or cross-section details shown on the drawings.

C. It shall include the erection and maintenance of any barricades that are required for accident prevention and property protection.

D. It shall include removal and legal disposal of muck, rock boulders or any foreign material interfering with construction.

1.03 RELATED WORK

A. Section 02110 - Clearing

B. Section 02200 - Earthwork

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall be familiar with all work to be performed as specified and shown on the Drawings. CONTRACTOR shall ascertain where all excavation will be required and shall be solely responsible for all excavating to complete the Contract.

3.02 PAYMENT

A. No extra payment will be allowed for type or classification of material in excavation.

3.03 MATCHING EXISTING GRADES

A. Where existing roadbed surfaces are not at the elevation required prior to subgrade compaction, the CONTRACTOR shall perform any such excavation, filling, earthmoving and grading as may be necessary to attain the proper compacted subgrade elevation before

proceeding with base course construction.

3.04 UNSUITABLE MATERIAL

A. All muck, large rocks and boulders encountered during the work under this Contract shall be removed and legally disposed of in a manner approved by the CITY's Representative.

3.05 EXCAVATION

A. All excavation shall be unclassified regardless of material encountered.

B. The CONTRACTOR shall make probings or sounding for subsurface rock to ascertain its location and depth.

C. It shall be the CONTRACTOR's responsibility to be familiar with soil conditions on the site. Borings, in addition to those provided by others, if any, shall be acquired by the CONTRACTOR, at the CONTRACTOR's expense.

D. Any wet excavated materials shall be drained before hauling or moving.

3.06 EMBANKMENT (FILL)

A. Embankment shall be constructed from suitable materials resulting from roadway or site excavation or approved materials furnished from off-site borrow areas.

B. Embankments shall be placed in successive layers of not more than eight inches in thickness, measured loose, for the full width of the embankment.

C. Each layer of the material used in the formation of roadbed embankments shall be compacted at optimum moisture content to a density as specified in Section 02200, Paragraph 3.14.I.

D. The existing material on the site may vary as to stability. The CONTRACTOR shall be familiar with the soil characteristics by site inspection borings, probings, etc., prior to bidding, as to the subsurface character of the material.

E. All unstable soil shall be removed and shall be replaced by material approved by the ENGINEER.

3.07 GRADING

A. The material excavated shall be transported and spread over the entire work site and shall be graded so that the finished grade shall be within $\pm$0.1 feet of the grades indicated by the grade stakes and control point elevations shown on the plans and by the cross-sections. Due to the minimal slope of the roadways, swale grades shall be within $\pm$0.05 feet of the grades indicated on the plans.

B. The disposal of large rocks in excess of 8", within roadways and parking areas is prohibited. Where allowable, the disposal of large rocks by burial in areas designated by the ENGINEER shall have a minimum 30 inches of cover below finished grade elevation.

3.08 FINISH GRADING

A. Following completion of the paving work, all swales, etc., adjacent to the roadway shall be shaped and graded to the elevations and cross-sections shown on the drawings. The finished surface shall be maintained until seeding and mulching work is completed.

3.09 SURVEYS

A. All initial surveys, including detail construction stakes, will be furnished by the CONTRACTOR.

B. The CONTRACTOR will carefully maintain bench marks, monuments, stakes and other reference points, and if disturbed or destroyed, be replaced as directed at the CONTRACTOR's expense.

3.10 MEASUREMENT AND PAYMENT

A. Measurement and payment for this item will be made per square yard and will include clearing of the swales per Section 02110.

END OF SECTION 02210

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work shall consist of furnishing all materials, labor and equipment for excavation, trenching and backfilling for utilities. "Utilities" shall include storm water drains, culverts, water mains, gravity sewers, sewage force mains and appurtenant structures.

1.03 RELATED WORK

A. 02050 - Demolition

B. 02200 - Earthwork

C. 02210 - Site Grading

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXCAVATION

A. General: This work shall consist of the excavation of whatever substances shall be encountered to the depths as shown on the plans. Excavated materials not required for fill or backfill shall be removed from the work site as directed by the ENGINEER and shall be considered to be a part of the bid price of the utility pipe for which excavation and backfill is required.

B. Excavation for structures and other accessories shall have a minimum clearance of twelve inches and a maximum clearance of twenty-four inches on all sides.

C. Excavation shall not be carried below the required depths as indicated by the plans. Excess excavation below the required level shall be backfilled at the CONTRACTOR's expense with sharp sand, gravel or other suitable material thoroughly compacted and approved by the ENGINEER.

D. Any unstable soil shall be removed and shall be replaced by material acceptable to the ENGINEER. The removal and replacement of such unstable soil shall be considered to be part of the bid price of the pipe for which excavation and backfill is required.

E. Water shall not be permitted to accumulate in the excavated area. It shall be removed by pumping or other means as approved by the ENGINEER. The removal of water shall be considered to be a part of the bid price of the pipe for which excavation and backfill is required.

Well points, pumps or other approved means shall be used to keep the ground water sufficiently low in the opinion of the ENGINEER to permit the placing of concrete, masonry or pipe in first class condition, and sufficiently long thereafter to protect the concrete, masonry or joints against washing or damage.

The CONTRACTOR shall also use such other means as may be necessary to keep the excavation in satisfactory condition for the construction of the work, and the use of well points, or other approved method, will not relieve the CONTRACTOR of CONTRACTOR'S responsibility to make structures watertight.

F. Banks and trenches shall be vertical unless shown otherwise on plans. The width of the trench shall be no less than 8" and no more than twelve inches, or as approved by the ENGINEER, on each side of the pipe bell for pipe up to 16" diameter. Bell holes shall be accurately excavated by hand.

G. If the bottom of the trench is rock, the excavation shall be carried eight inches below the invert of the pipe and backfilled with thoroughly compacted sharp sand, gravel or other suitable material approved by the ENGINEER.

H. Rock excavation shall include any rock encountered, which cannot be removed with a 3/4-yard backhoe under normal operating conditions. Rock excavation shall be incidental to construction of all piping systems and no separate payment will be made.

I. Whenever it is necessary, in the interest of safety, to brace or shore the sides of the trench, such bracing or shoring shall be considered to be part of the bid price of the pipe for which excavation and backfill is required.

The CONTRACTOR shall furnish, put in place and maintain such sheeting, bracing, as may be required to support the side of the excavation, and to prevent any movement which can in any way damage the work or endanger adjacent structures. If the ENGINEER is of the opinion that supports are insufficient, the ENGINEER may order additional supports. The compliance with such order shall not release the CONTRACTOR from CONTRACTOR'S responsibility for the sufficiency of the sheeting. The CONTRACTOR shall leave all sheeting in place. The ENGINEER may require sheeting to be cut off at any specified elevation, but in no case will any sheeting be left closer than two (2) feet below the natural surface, nor cut off below the elevation of the top of the pipe.

3.02 BACKFILLING

A. After pipes, structures and other appurtenances have been installed, the trench or opening shall be backfilled with material free from large stones or clods of a quality acceptable to the ENGINEER.

B. Backfill around the pipe and to a point twelve inches above the top of the pipe shall be placed in six inch layers compacted with 20 pound hand tampers or mechanical tampers suitable for this purpose. Backfilling shall follow lying closely and shall not be more than one hundred (100) feet behind completed lying. Backfill over pipe shall be carefully placed by experienced labor and thoroughly consolidated without shock to the pipe and carried up uniformly on both sides of the pipe. No backfilling with bulldozers will be permitted adjacent

to pipeline.

C. Within roadway right-of-ways, or within areas where pavements are to be constructed over the pipe, the remainder of the trench shall be placed in six-inch layers (compacted thickness) and shall be compacted to that as noted in Section 02200. CONTRACTOR will be responsible for correcting settlement in all backfilled areas whether under the pavement or otherwise.

D. In areas where no pavement is to be constructed, the backfill above the twelve inch line above the pipe shall be compacted to a firmness approximately equal to that of the soil adjacent to the pipe trench or to that as noted in Section 02200. Backfill below the 12-inch line shall be compacted in 6-inch layers (compacted thickness) and shall be compacted to 98% of maximum density as determined by AASHTO T-180.

3.03 EXPLOSIVES

A. The use of explosives will not be permitted.

3.04 PAYMENT AND MEASUREMENT

A. No separate payment is provided for work covered by this Section. All costs in connection with Excavation and Backfilling, including testing, shall be included in the bid price of any item for which excavation and backfilling is required.

END OF SECTION 02221

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the work, as indicated on the drawings, as specified herein or both.

B. Including but not necessarily limited to the following:

1. Topsoil Stripping

2. Topsoil Mixing and Spreading

C. There shall be no classification of excavation for measurement of payment regardless of materials encountered.

1.03 RELATED WORK

A. Section 02110 - Clearing

B. Section 02200 - Earthwork

C. Section 02210 - Site Grading

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be obtained from any previously established stockpile on site, to the extent that suitable material is available.

B. Additional topsoil, if required, shall be obtained by mixing existing on-site sandy fill with imported muck or compost.

C. Topsoil, whether obtained from stockpile, or mixed as described in "B" above, shall be sandy loam, and shall have the following characteristics:

1. 95% of topsoil shall pass a 2-mm. sieve.

2. Topsoil shall be free of stones 1" in longest dimensions, earth clods, plant parts, and debris.

3. Organic matter content shall be 4% to 12% of total dry weight.

4. pH and nutrient content shall be adjusted as necessary to conform to

recommendations made by testing laboratory. (See 2.01 (D))

D. Samples shall be submitted to CITY for testing. Test shall indicate compliance with the specifications and recommendations as to the type and quantity of soil additives required to bring the nutrient content and pH to satisfactory levels for planting specified plant material. Tests shall be required at a rate of one per 500 cubic yards of material placed, for the first 5,000 cubic yards of material, and may be reduced at the ENGINEER discretion thereafter. Sampling shall be done in the presence of the ENGINEER. The CONTRACTOR shall be responsible for the cost of testing.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

A. Protection: Use all means necessary to protect existing objects and vegetation. In the event of damage, immediately make all repairs, and replacements necessary to the acceptance of the ENGINEER.

3.02 FILLING AND GRADING:

A. Topsoil shall be spread in a uniform 2" layer after compaction, over all sodded and pervious areas, and finished to grades shown on the plans, making allowance, where necessary, for sod. Grades shown include 0.2' for thickness of sod in all sodded areas.

3.03 MEASUREMENT AND PAYMENT

A. Topsoil shall be measured and paid for by the square yard of actual topsoil in place as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02284

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. This section of the specifications covers the control and general conduct of asphalt paving construction for roads, parking, walks and court areas.

B. All work within the right-of-way shall be constructed using materials and methods in accordance with the drawings, Broward County and Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

C. Provide all labor, materials, necessary equipment and services to complete the Asphaltic Concrete Paving work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

D. Including, but not necessarily limited to the following:

1. Preparation of subgrade

2. Installation and compaction of base course

3. Spreading of asphalt surface course

1.03 RELATED WORK

A. Section 02200 - Earthwork

1.04 TRAFFIC CONTROL

A. The CONTRACTOR shall provide and maintain access to and from all properties along the line of CONTRACTOR'S work. The CONTRACTOR shall also provide temporary bypasses and maintain them in a safe and usable condition whenever the public cannot do detouring of traffic to parallel routes without hardship or excessive increases in travel.

1.05 SPECIAL SUBGRADE CONDITIONS

A. When special subgrade conditions are encountered for which these "Asphaltic Concrete Paving Specifications" are not applicable, portions of these specifications shall be deleted or revised to provide a properly finished paved surface. A requested revision or deletion of the specifications shall be accompanied with reports and laboratory tests on existing field conditions. Any change from these "Asphaltic Concrete Paving Specifications" shall be approved by the ENGINEER and shall be in effect only for a specified area or paving project.

1.06 QUALITY ASSURANCE

A. D.O.T. Standard Specifications.

Work and materials shall conform to all applicable requirements of Florida Department of Transportation "Standard Specifications for Road and Bridge Construction - 2004" (referred to herein as D.O.T.).

B. American Society for Testing and Materials.

ASTM 3515-80 "Standard Specification for Hot-Mixed, Job Laid, Bituminous Paving mixtures."

1.07 SUBMITTALS

A. Provide copies of materials, notarized certificates of compliance signed by material producer and CONTRACTOR, certifying that each material item complies with, or exceeds, specified requirements.

1.08 JOB CONDITIONS

A. Apply prime and tack coats when ambient temperature is above 50 degrees, and when temperature has not been below 35 degrees for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees, and when base is dry. Base course may be placed when air temperature is above 30 degrees and rising.

1.09 LOCATIONS, LAYOUT AND GRADES

A. Locate and layout paved areas and right-of-ways with reference to benchmarks, property lines or buildings according to the drawings and as accepted by the ENGINEER.

B. Determine locations of paved edges and right-of-way line from surveyor's permanent reference monuments and information on the drawings.

C. Where permanent reference monuments are not available, obtain proper line locations from authorities having jurisdiction.

D. Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 FILL

A. All fill shall be clean rock and sand (maximum rock size = 1 inch).

B. Fill shall be compacted thoroughly as per Section 02200 - Earthwork.

2.02 LIMEROCK

A. Limerock shall be obtained from pits for which all overburden has been removed previous to blasting and shall show no tendency to air slake and must undergo the following chemical requirements.

		Percent
1.	Carbonates of Calcium	Min.70.0 (Miami Limerock) and Magnesium. 95.0 (Ocala Limerock)
2.	Oxides of Iron and Aluminum	Max. 2.0
3.	Organic Matter	Max. 0.5

4. Any constituents of other than the above shall be silica or inert material.

5. The material shall be crushed to such size that not less than 97% shall pass a 3-1/2" sieve and it shall be graded uniformly down to dust. All fine material shall consist entirely of dust of fracture.

6. Limerock from on-site may be used if the material meets the requirements of this section of the specifications.

B. All limerock shall comply with requirements set forth under D.O.T. Section 911.

C. Equipment: The equipment for constructing the rock base shall be in first class working condition and shall include:

1. Three wheel roller weighing not less than ten tons.

2. Self-propelled blade grader weighing not less than three tons. The wheelbase shall be not less than fifteen feet and blade length not less than ten feet.

3. Scarifiers shall have teeth space not to exceed 4-1/2 inches.

   a. Provision for furnishing water at the construction site by tank or hose at a rate not less than 50 gallons per minute.

2.03 PRIME COAT

A. Prime coat shall be Grade RC-70, cut-back asphalt, D.O.T. Section 916-2.

B. Prime coat shall have full compatibility with surface treatment asphalt.

C. The bituminous material shall conform to the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 300-2.

D. The sand for cover shall be clean dry sand.

2.04 TACK COAT

A. The bituminous material to be used for the tack coat shall conform to the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 300-2.

2.05 ASPHALT

A. The asphaltic concrete surface course shall be in accordance with Broward County, Florida Department of Transportation Standard Specifications for Type S-1 and Type S-3 Asphaltic Concrete Surface Course.

B. Pavement within public road right-of-way, which has been disturbed by this construction, shall be replaced with the same type and thickness to match the existing pavement section.

C. General composition of mixtures:

1. The aggregate in the asphaltic concrete shall be crushed stone and manufactured sand screening of natural sand or combination of both when necessary to meet requirements of composition of mix. All aggregate shall have a Los Angeles abrasion loss of less than 40%.

2. The mineral aggregate shall be so graded, and the prescribed constituents, prepared as hereinafter set out, shall be combined in such proportions as to produce a mixture conforming to the following general composition limits by weight:

Constituent	Passing Sieve	S-1 Percent by Weight	S-3 Percent by Weight
Course Aggregate	3/4"	100	100
	1/2"	80-100	100
	3/8"	75-93	88-100
	No. 4	47-75	60-90
Total Course Aggregate	No. 10	31-53	40-70
Fine Aggregate	No. 40	19-35	20-45
	No. 80	7-21	10-30
Filler	No. 200	2-6	2-6

Constituent		Percent by Weight	
Total Fine Aggregate and Filler	No. 10	100	100
Total Mineral Aggregate		100	100

Total Mix	100	100
Total Mineral Aggregate	91-95	
Asphalt Cement	5-9*	
(Bitumen) Total Mix	100	

*For highly absorptive aggregates the upper limit may be raised.

2.06 SEAL COATING

A. Homogeneous mixture of emulsified coal tar pitch, asbestos, sand and other inert fillers. It shall be easily remixed if settlement occurs in storage (except in the case of freezing). It shall be capable of application and complete coverage by rubber squeegee, brush, or approved mechanical method, to the surface of bituminous pavements at the spreading rate of point two (.2) to point three (.3) gallons per square yard in two (2) coats.

B. Approved product: "TARFEX" manufactured by Bitucote Products Co. or approved equal.

PART 3 - EXECUTION

3.01 BARRICADES

A. Provide substantial temporary barricades around all areas of operation and maintain until work under this section is completed and approved.

B. Install temporary traffic markers, signals, and signs as per Broward County Engineering Division Standard Specification to:

1. Eliminate potentially hazardous conditions.

2. Maintain adequate traffic patterns free of conflict with work under this Contract.

3.02 PREPARATION OF SUBGRADE

A. This work consists of bringing the bottom of excavations and top of embankments of the roadway between the outer limits of the shoulders or base course to a surface conforming to the grades, lines, and cross sections shown on the plans. The subgrade shall be of uniform density ready to receive the rock base of the paving course.

B. All soft and yielding material and other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material and the entire subgrade brought to line and grade to provide a foundation of uniform compaction and supporting power.

C. Stumps, roots, and other deleterious organic matter encountered in the preparation of the subgrade shall be removed.

D. Where fills are required on areas covered or partly covered by existing paving, the entire

area of such existing paving shall be scarified to a depth of at least six inches, and the scarified material spread evenly over the area to be filled to a width not less than that of the proposed paving.

E. Material for fills shall consist of sand or other suitable material approved by the ENGINEER free from stumps, roots, brushes, and other deleterious organic matter.

F. Where fill is more than one foot (1') in depth, the backfill material above the ground water table shall be compacted on one (8") depth lifts. Each individual layer of fill under the rock base shall have a density as specified in Section 02200, Paragraph 3.14.I. unless shown otherwise on the plans. Each individual layer of fill under the shoulder area shall have a density as specified in Section 02200, Paragraph 3.14.I., unless shown otherwise on the plans.

G. The bottom of all excavated areas and the top of all fills where rock base is to be constructed shall be thoroughly compacted by rolling. Water shall be used to insure thorough compaction. The stability of the top 12 inch thickness of the subgrade immediately under the base, for the full base width plus one foot (1') on each side, shall be at least LBR 40 as determined by AASHTO T-180.

H. Bring subgrade, which has been properly filled and shaped to a firm unyielding surface, by rolling an entire area with an approved vibratory power roller weighing a minimum of 10 tons.

1. Thoroughly compact area inaccessible to the roller with approved hand tamper.

2. Apply water sufficiently to compact the subgrade where the subgrade is of a dry, sandy nature and cannot be rolled.

I. The subgrade shall be maintained free from ruts, depressions or other irregularities until rock base material is spread.

J. For all roads and streets other than State Highway, the stabilized subgrade shall have a minimum Limerock Bearing Ratio (LBR) of 40, unless otherwise noted on the plans.

K. Where the bearing value of the existing subgrade is adequate without addition of stabilizing material, the subgrade shall be scarified and disked, harrowed, bladed or tilled for removal of boulders, roots, etc. to assure uniformity and thorough mixing of material to the full width and depth of required stabilization. The compacted subgrade shall conform to the lines, grades and cross-section shown on the plans.

L. Test subgrade for crown and elevation after preparation and immediately before base of paving course is laid.

1. Remove or add material and compact to bring to a correct elevation and uniform bearing if the subgrade is found not to be at the specified elevation at all points.

2. Adjust the manhole rims, catch basin frames and valve boxes where necessary to match proposed finish grade.

3.03 CONSTRUCTION OF BASE COURSE

A. This work consists of construction of lime rock base course for the asphaltic concrete wearing surface. The base course shall be constructed on the prepared subgrade in a 8" thick limerock bases constructed in two four inch lifts as shown on the drawings. Twelve (12) inch thick limerock bases shall be constructed in two six-inch lifts. The limerock base shall be a minimum LBR of 100.

B. Spreading Rock: The rock shall be transported to the points where it is to be used over rock previously placed, and dumped on the end of the preceding spread. It shall then be spread uniformly with hand tools, or mechanical equipment. In no case shall rock be dumped directly on the subgrade. No hauling shall be done over the subgrade.

C. Compacting Rock

1. Following spreading, the rock shall be rolled with a three wheel roller weighing not less than ten tons, water being added as required, until the entire depth of base is compacted into a dense unyielding mass.

2. No greater area of rock base shall be placed during any one day than that which can be rolled and compacted on the same day.

D. Finishing Base

1. After watering and rolling, the entire surface shall be thoroughly scarified to a depth not less than four inches (4") and shaped to exact crown and cross section, re-watered and again thoroughly rolled. Rolling shall continue until the entire depth of base is bonded and compacted into a dense, unyielding mass, true to grade and cross section.

a. Any irregularities, which may develop in the surface during such finishing, shall be corrected by the removal or addition of rock as the case may be.

b. If at any time the subgrade material becomes churned up and mixed with the base rock, the CONTRACTOR shall dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean rock which shall be watered and rolled until satisfactorily compacted.

c. Where cracks or checks appear in the base either before or after priming, which in the opinion of the ENGINEER would impair the structural efficiency of the base course, the CONTRACTOR shall remove such cracks or checks by re-scarifying, reshaping, watering, rolling and adding rock where necessary.

d. During final compacting operations, if grading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density tests on the finished base.

E. Inferior Rock: If in the opinion of the ENGINEER at any time during the progress of the

work, rock of inferior quality is being delivered to the construction site, a laboratory analysis of the rock shall be made. Should the results of such tests indicate that the rock does not conform to specifications, the CONTRACTOR shall, at CONTRACTOR's own expense, remove such inferior material from the area indicated and deliver and spread satisfactory rock on said area.

F. Testing Surface: The finished surface of the rock base shall be true to the required cross section. Any irregularities in the grade greater than 1/4", as determined by placing a ten foot straight edge parallel with the centerline, shall be corrected by scarifying to a depth of three inches (3"), removing or adding rock as may be required and again watering, rolling, and compacting the scarified area. In testing the surface for irregularities, the measurements under the straight edge shall not be taken in small holes caused by individual pieces of rock having been pulled out by the road grader.

G. Thickness Determination: Thickness of the base shall be measured by intervals as required by the ENGINEER. Measurements shall be taken at various points on the cross section. The measurements shall be taken in holes through the base of not less than three inches (3") in diameter. Where the base is more than 1/2" less than the required compacted thickness, the CONTRACTOR shall correct such areas by scarifying and adding rock. The affected areas shall then be watered, rolled and brought to a satisfactory state of completion, and of required thickness and cross section.

H. Density: Density determinations shall be made by the CONTRACTOR or at intervals required by the ENGINEER. An average required density shall be as specified in Section 02200, Paragraph 3.14.I. No section of base shall be accepted when more than 10% of tests fall below 98% of maximum density and in no case shall a density of less than 96% of maximum be accepted.

I. Testing: The CONTRACTOR shall coordinate with ENGINEER for all testing. One test shall be made in accordance with AASHTO, T-180 for each class of material in the subgrade and base.

1. In place density tests in accordance with AASHTO T-147 shall be made in the locations shown on the plans. Two copies of the test reports will be sent directly to the ENGINEER for evaluation.

2. Any material, which fails to meet these specifications, shall be removed, replaced, and retested, all at the CONTRACTOR's expense.

3. Tests shall be taken at least every 1,000 square yards and taken at locations and lifts as directed by the ENGINEER.

3.04 PRIME COAT FOR BASE COURSE

A. Cleaning the prepared base:

1. Before any bituminous material is applied, all loose material: dust, dirt, caked clay and foreign matter which might prevent proper bond with the existing surface shall be moved to the shoulders, to the full width of the treatment, by means of revolving brooms or approved mechanical sweepers and by mechanical blowers, of approved

types, supplemented by hand sweeping. Dust and other loose materials not removed by mechanical means shall be removed with hand brooms. Particular care shall be taken to clean the outer edges of the strip to be treated in order to insure that the prime coat will adhere. Sweeping and blowing shall be continued until all the loose dust and dirt is removed from the surfaces.

2. Application of bituminous material shall be made during the same day surface has been swept and as soon as practical thereafter.

B. Application for prime coat:

1. The bituminous material shall be applied to the clean dry surface of the rock base at such temperature as will insure uniform distribution. The amount applied will be at the rate of approximately 0.10 to 0.20 gallons per square yard of base area. The application shall be made by means of self-propelled pressure distributor operating under a pressure not less than 20 pounds per square inch. Application of bituminous material shall be made on only one-half of the width of base at one time.

2. The primed base shall then be covered with a uniform layer of clean sand, and kept thoroughly and uniformly covered by additional sand or sweeping until it shows no signs of picking up under traffic. For a period of one week after priming, the CONTRACTOR shall again broom any area where insufficient cover sand or excess of bituminous material causes "bleeding" and, if necessary, spread additional sand on such area.

C. Prime coat finish: After prime has cured or sat and been sanded, the shoulder shall be shaped to conform to all grade lines and cross sections and the entire area shall be rolled and compacted with a rubber tired roller or a power roller before asphalt surface is laid on the finished base.

3.05 BITUMINOUS TACK COAT

A. Before applying any bituminous material, all loose material: dust, dirt and foreign material, which might prevent proper bond with the existing surface, shall be removed for the full width of the application.

B. Application for tack coat:

The surface to receive the tack coat shall be clean and dry. The tack coat shall be clean and dry. The tack coat shall be applied with a pressure distributor except that on small jobs, if approved by the ENGINEER, the application may be made by other approved mechanical methods or by hand methods. The pressure distributor shall operate at a pressure not less than 20 pounds per square inch and at a consistency such that it can be properly pumped and sprayed uniformly over the surface.

The bituminous material shall be applied in a thin uniform layer. The rate of application shall be between 0.02 and 0.10 gallon per square yard. The tack coat shall be applied sufficiently in advance of the laying of the wearing surface to permit drying, but shall not be applied so far in advance that it might lose adhesiveness as a result of being covered with dust or other foreign material. The tack coat surface shall be kept free from traffic until the wearing

surface is laid.

3.06 ASPHALTIC CONCRETE WEARING SURFACE COURSE

A. Cleaning and preparing base:

1. Prior to the laying of the asphaltic concrete, the base of pavement to be covered shall be cleaned of all loose deleterious material by the use of power brooms or blowers. A tack coat shall be applied on all pavements. The tack coat shall not be applied so far in advance of laying operations as to allow shifting and sand or weather conditions to nullify its effectiveness.

2. After the surface has been thoroughly cleaned, all holes shall be filled with asphaltic concrete, if necessary, and thoroughly compacted to conform to the existing surface and to form a smooth surface.

B. Placing asphaltic concrete: The asphaltic concrete surface course shall be applied after the tack coat may be permitted a reasonable time for drying but not to an extent that the tack coat is allowed to lose its adhesiveness.

1. Machine spreading: Upon arrival the mixture shall be dumped into the approved mechanical spreader and immediately spread and struck off to the full width required and to such appropriate loose depth for each successive course that when the work is completed the required weight of the mixture per square yard or the specified thickness will be secured. An excessive amount of mixture shall be carried ahead of the screen at all times. Hand raking shall be done behind the machine as required.

2. Hand spreading: In limited areas, where, on account of irregularities or unavoidable obstacles, the use of mechanical spreading and finishing equipment is impractical, the mixture may be spread by hand, when so authorized by the ENGINEER.

3. The mixture shall be laid only when the surface to be covered is dry and only when weather conditions are suitable.

4. All structures which will be in actual contact with asphaltic mixture, including the face or surface of curbs or gutters and their vertical faces of existing pavements, shall be painted with a uniform coating of asphalt material to provide a closely bonded, watertight joint.

5. Where necessary, due to the traffic requirements, the mixture shall be laid in strips in such manner as to provide for the passage of traffic.

6. Any mixtures caught in transit by a sudden rain may be laid at the CONTRACTOR's risk. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered.

7. The depth of the layer being spread shall be gauged as directed, and where the thickness fails to average the specified thickness, immediate steps shall be taken to correct the depth.

8. Before any rolling is started, the course surface shall be checked, any inequalities adjusted, and all drippings, fat sand accumulations from the screed and fat spots from any source shall be removed and replaced with satisfactory material.

9. Straight-edging and back patching shall be done after initial completion has been obtained and while the material is still hot. Any irregularity greater than 1/4" either longitudinally or traversely shall be corrected at this time.

10. No skin patching shall be done. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture. If irregularities occur and are not corrected while the mixture is still hot, the irregularities shall be cut out the full depth of the layer and replaced with fresh mixture.

C. Compacting mixture: After the spreading, the mixture shall be rolled when it has set sufficiently or come to the proper condition to be rolled, and when the rolling does not cause undue displacement or shoving.

1. The motion of the roller shall at all times be slow enough to avoid displacement and shall at once be corrected by the use of rakes and fresh mixture where required. The rolling shall include all transverse, longitudinal, and diagonal rolling, as may be necessary to obtain the maximum density.

2. The seal rolling with tandem steel rollers weighing from five to eight tons shall follow as close behind the spreader as is possible without picking up, or displacing or blistering the material.

3. Rolling with the self-propelled pneumatic-tired rollers shall follow as soon as possible and as close behind the seal rolling as the heat of the mixture will permit. The rolling shall be done while pavement temperature is between 175^{o} and 240^{o}F, and to such an extent that the self-propelled traffic roller shall cover every area of the surface with at least ten passes. Final rolling with tandem steel rollers shall be done after the rolling with self-propelled pneumatic tired rollers is completed. This final rolling shall be done before the pavement temperature is lower than 175^{o}F., and shall be continued until all roller marks or tire marks are eliminated.

4. Self-propelled pneumatic rollers shall be used for the rolling of patching and leveling courses. At the option of the CONTRACTOR, a steel-wheeled roller may be used to supplement the self-propelled pneumatic-tired rollers but not more than one steel-wheeled roller may be used in conjunction with the necessary number of self-propelled pneumatic-tired rollers. After final completion, the finished pavement shall at no point have a density less than 95% of the laboratory compacted density.

5. Rolling with the self-propelled pneumatic-tired roller shall proceed at a speed from six to twelve miles per hour and the rate of rolling shall not exceed 3,000 square yards per hour per roller. A sufficient number of self-propelled pneumatic-tired rollers shall be used so that the rolling of the surface for the required number of 10 passes within this maximum rolling rate shall not delay any other phase of the placing operation and not result in excessive cooling of the mixture before the rolling is complete. In the event that the rolling is not properly maintained to schedule as

outlined above, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.

6. In all places inaccessible to a roller, such as adjacent to curbs, headers, gutters, bridges, manholes, etc., the required compaction shall be secured with tamps. Depressions, which may develop before the completion of the rolling, shall be remedied by loosening the mixture laid and adding new material to bring such depressions to a true surface.

7. Should any depressions remain after final compaction has been obtained, the mixture shall be removed sufficiently and new material added to form a true and even surface. All high spots, high joints and honeycombs shall be adjusted as directed by the ENGINEER.

8. The mixture, after compaction, shall be of the thickness shown on the plans. The surface, after compactions, at no place shall snow an excess of asphalt and any area showing such excess or other defect, shall be cut out and replaced with fresh mixture and immediately compacted to conform with the surrounding area. Any mixture which becomes loose or broken, mixed with dirt in the wearing course shall be removed and replaced with fresh mixture which shall be immediately compacted to conform with surrounding areas.

9. Gasoline or oil from rollers shall not be allowed to deposit on the pavement and any pavement damaged by such deposits shall be removed and replaced as directed by the ENGINEER.

10. Any mixture remaining unbonded after rolling shall be removed and replaced.

D. Protection of pavement: After the completion of the pavement, no vehicular traffic of any kind shall be permitted on the pavement until it has set sufficiently as approved by the ENGINEER.

3.07 ABUTTING EXISTING PAVING

A. Meet elevation of existing paving and structures, facilities and utilities where applicable by sawcutting and removing no less than two (2) feet from abuttment. Milling of asphalt for a width of two (2) feet is an alternative if approved by engineer. Do not cover access covers, manhole tops, water meters or other similar devices.

3.08 PAVEMENT EDGES

A. Make edges of paved area conform to details and sections as shown on drawings.

3.09 SEAL COATING

A. Preparation of surface: Pavement to be sealed must be sound and free of loose dust, dirt, stones, or other foreign matter:

1. Repair any breaks or holes.

2. Scrape off accumulations of oil or fuel drippings and scrub with detergent and water. Remove all traces of detergent.

3. Soft or damaged spots must be repaired.

4. Flush entire area with clean water.

5. Pavement should be damp (no puddles or excess water) when seal coating is applied.

B. MIXING: Stir seal coating to a uniform consistency, use no solvents for thinning. Dilute seal coating with ten (10) percent to twenty (20) percent clean water, stirring to uniform consistency.

C. Application:

1. Seal coat may be applied to dampened surface with a rubber squeegee, soft bristled push broom, or approved mechanized equipment.

2. Seal coating may be poured directly onto pavement in a ribbon or windrow. Squeegee is placed on pavement at a slight angle to edge line of pavement and pulled in a window along pavement in parallel lines, always working excess material toward bottom edge of squeegee.

3. Seal coating should be applied in two (2) thin coats. After first coat is completely dry to touch, a second coat may be applied at right angles to the first. Rate of application will depend on porosity of surface.

4. Allow to cure for twenty-four (24) hours before opening to traffic.

5. Do not apply seal coating when temperature is below fifty (50) degrees Fahrenheit, or falling, before sealer is dry, or rain appears imminent or forecast.

6. Apply in strict accord with manufacturers published instructions.

3.10 FIELD QUALITY CONTROL

A. Test in place asphalt concrete course for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by CITY's Representative and ENGINEER.

1. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

a. Base Course: Not greater than 1/2" of specified thickness.
b. Surface Course: Not greater than 1/4" of specified thickness.

2. Test finished surface of each asphalt concrete course for smoothness, using 10' straight edge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for

smoothness.

a. Base Course Surface: 1/4".
b. Wearing Course Surface: 1/8".

B. Check surface area at intervals as directed by the ENGINEER.

C. Finish grade shall be within ±0.01 feet of the grades indicated on the plans or ± 0.05 feet as long as no ponding of water is observed after final paving.

3.11 CLEAN UP

A. Remove all debris and excess material immediately from project site.

B. Take down all barricades and temporary traffic markers, signals and signs only after all work included in this section is finished and inspected, and only after so directed by the ENGINEER.

C. Leave project area clean, orderly and free of any hazardous conditions.

3.12 CONSTRUCTION OF SWALES

A. This work consists of regrading existing swales and construction of new swales adequate for conveying storm water along the right-of-way to catch basins. The swale shall be shaped according to the cross section shown on the plan. In areas adjacent to existing roadways all swales shall be regraded to match their existing condition prior to construction, unless otherwise noted.

B. Requirements: All soft and yielding material and other portions of the swale which will not compact readily shall be removed and replaced with suitable material and the entire swale area brought to the proper grade. Stumps, roots, and other deleterious organic matter encountered during the shaping for the swale shall be removed.

C. The bottom of all excavated areas and the top of all fills of swale areas shall be thoroughly compacted by rolling. Water shall be used as necessary to insure thorough compaction. The stability of the top 12" thickness of swale area shall be at least LBR 40 as determined by ASSHTO T-180. Sufficient stabilizing material shall be added to swale area soil as required to provide the specified stability.

D. The CONTRACTOR shall place sod over existing areas damaged by construction. The sod shall match the existing sod type in the affected areas.

3.13 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02513

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1-General Requirements shall govern the WORK under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Portland Cement Concrete Paving work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Including, but not necessarily limited to the following:

1. Fill, subgrade, and limerock base.

2. Concrete formwork.

3. Concrete reinforcement.

4. Expansion and contraction joints.

5. Concrete paving.

1.03 RELATED WORK

A. Section 02200 – Earthwork

A. Section 02513 - Asphaltic Concrete Paving – General

B. Section 01410 – Testing Laboratory Services

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Perform work in accordance with local building and other applicable codes.

B. Applicator Qualifications: Experience on a minimum of 5 comparable concrete projects.

C. Inspection and Testing: Performed in accordance with Section 01410 unless otherwise specified.

1. Test cylinders - as per ASTM C-39.

a. Minimum of three (3) concrete test cylinders shall be taken for every 75 or less cubic yards of concrete placed.

b. Minimum of one (1) additional test cylinder shall be taken during any cold weather concreting, and be cured on job site under same conditions as the concrete it represents.

2. Slump test - as per ASTM C-143:

    a. Minimum of one (1) slump test shall be taken for each set of test cylinders taken.

1.05 SUBMITTALS

A. Test Reports: Reports of concrete compression, yield, air content, and slump tests.

B. Certificates:

1. Manufacturer's certification that materials meet specification requirements.

2. Material content per cubic yard of each class of concrete furnished.

    a. Dry weights of cement.

    b. Saturated surface-dried weights of fine and coarse aggregate.

    c. Quantities, type and name of admixtures.

    d. Weight of water.

3. Ready-mix delivery tickets, ASTM C-94.

C. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

2. Indicate bar schedules, stirrup spacing, and diagrams of bend bars.

3. Detail items of form systems affecting appearance of Architectural concrete surfaces such as joints, tie holes liners, patterns and textures. Show items in relation to entire form system.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

1.07 JOB CONDITIONS

A. Allowable concrete temperatures:

1. Hot weather: Maximum 90 degrees F as per ASTM C-94.

B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 FILL

A. As specified in Section 02513 - Asphaltic Concrete Paving - general.

2.02 SUBGRADE

A. As specified in Section 02513 - Asphaltic Concrete Paving – general.

2.03 LIMEROCK BASE

A. As specified in Section 02513 - Asphaltic Concrete Paving - general.

2.04 READY-MIXED CONCRETE

A. Cement: ASTM C-150, normal Type 1.

B. Admixtures:

1. Air entraining: ASTM C-260.

2. Chemical: Type (as required) ASTM C-494.

3. Fly ash and pozzolans: ASTM C-618.

C. Coarse aggregate: Not less than 50% clean, hard, crushed stone conforming to requirements of Table 2, size number 467 ASTM C-33.

D. Slump Range: 2-4 inches - tested according to ASTM designation C143 (AASHTO T119).

E. Air content: 5% + 1%.

F. Mix proportioning:

1. 28 day compressive strength of cured laboratory samples 3,000 psi.

2. Minimum cement content 5-sacks/cubic yard.

G. Curing Material: Liquid membrane, ASTM C-309, Type 1.

H. Mixes:

1. ASTM C-94.

2. Mix concrete only in quantities for immediate use.

3. Do not retemper or use set concrete.

2.05 REINFORCEMENT

A. Reinforcing Steel Bars: 60 psi yield strength; deformed billet steel bars; ASTM A-615, plain finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A-185, hot dip galvanized, plain finish.

C. Tie Wire: FS QQ-W-461-G, annealed steel, black, 16-gage minimum.

D. Bar Supports: Conform to "Bar Support Specifications," CRSI Manual of Standard Practice.

2.06 FORMWORK AND ACCESSORIES

A. Formwork: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of concrete, conform with ACU 347, Chapter 3, Material and Form Work.

B. Lumber:

1. Softwood framing lumber: Kiln dried, PS-20.

2. Boards less than 1-1/2 inch thick and 2 inches wide, used for basic forms and form liners: Kiln dried.

3. Grade marked by grading rules agency approved by American Lumber Standards Committee.

4. Light framing or studs for board or plywood forms, 2 inches to 4 inches width and thickness, construction standard grade.

5. Boards for basic forms, construction standard grade.

6. Board surface: Smooth.

C. Plywood:

1. Exterior type softwood plywood, PS 1-66.

2. Each panel stamped or branded indicating veneer grades, species, type and identification.

3. Wood faced plywood for Architectural concrete surfaces.

a. Panel veneer grades: B-C.

b. Mill-oiled sides and mill-sealed edges of panels.

D. Ties:

1. Material: Steel

2. Type: Snap ties

3. Depth of breakback: 1 inch

4. Maximum diameter, 1/4 inch

E. Form coatings:

1. Non-staining type.

2. Agent: Pine oil derivative.

2.07 EXPANSION AND CONTRACTION JOINTS

A. Minimum 3/4-inch thick asphaltic impregnated fiberboard as per ASTM D-1751.

2.08 OTHER

A. Water: Clean and potable.

PART 3 - EXECUTION

3.01 BARRICADES

A. Provide substantial temporary barricades around all areas of operation and maintain until work under this section is completed and approved.

B. Install temporary traffic markers, signals, and signs as per D.O.T. Standard Specifications to:

1. Eliminate potentially hazardous conditions.

2. Maintain adequate traffic patterns free of conflict with work under this Contract.

3.02 PREPARATION OF SUBGRADE

A. Ensure rough grading has brought subgrade to required elevations.

B. Fill soft spots and hollows with additional fill.

C. Level and compact subgrade, to receive limerock base for concrete walks, curbs and gutters, to a density as specified in Section 02200, Paragraph 3.14.I.

3.03 FORMWORK

A. CONTRACTOR is responsible for the design, construction, removal and complete safety of formwork and shoring.

B. Form construction shall be provided to shape, lines dimensions of members shown: substantial, tight enough to prevent leakage, and properly braced or tied to maintain position and size, form sides and bottoms of members unless specifically excepted.

C. Fill voids of plywood joints with sealant and tool smooth.

D. Form vertical surfaces to full depth and securely position to required lines and levels. Ensure form ties are not placed so as to pass through concrete.

E. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.

3.04 REINFORCING

A. Reinforce concrete curbs and gutters. Allow for minimum 1-1/2 inch concrete cover.

B. Do not extend reinforcing through expansion and contraction of joints. Provide dowelled joints through expansion and contraction joints, with one end of dowels fitted with capping sleeve to allow free movement.

3.05 FORMING EXPANSION AND CONTRACTION JOINTS

A. Place expansion and contraction joints at 20 foot intervals or as indicated on drawings. Where possible, make joints of curbs coincide with joints in paving slabs. When sidewalks abut building, provide continuous joint filled.

B. Fill joints with filler of required profiles set perpendicular to longitudinal axis of walks, curbs and gutters. Recess 1/2 inch below finished concrete surface.

3.06 INSPECTION

A. Assure that excavation and formwork are completed, and excess water is removed.

B. Check that reinforcement is secured in place.

C. Verify that expansion joint material, anchors, and other embedded items are secured in position.

3.07 PREPARATION FOR PLACEMENT

A. Notify the ENGINEER and other inspectors at least 36 hours prior to inspection.

B. Equipment forms, and reinforcing shall be clean and wet down, reinforcing firmly secured in place, runways set up and not resting on or displacing reinforcing.

3.08 PLACING CONCRETE

A. Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate.

B. Avoid working mortar to surface.

C. Round all edges, including edges of expansion and contraction joints, with 1/2 inch of radius edging tool.

D. Where concrete curbs are adjacent to pavement slabs, make concrete curbs and gutters integral with slabs. Make expansion and contraction joints of curbs coincide with slab joints.

E. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8 inch in 10 feet when measured with straightedge.

F. Apply curing compound on finished surfaces immediately after finishing. Apply in accordance with manufacturer's recommendations.

3.09 PROTECTION OF COMPLETED WORK

A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

3.10 CLEAN UP

A. Remove all debris and excess material immediately from project site.

B. Take down all barricades and temporary traffic markers, signals and signs only after all work included in this section is finished and inspected, and only after so directed by OWNER's Representative.

C. Leave project area neat, orderly and free of any hazardous conditions.

3.11 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02515

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work covered by this section shall include the furnishing of all labor, equipment, services, materials, products and tests to perform all operations in connection with the construction of all new structures or modifications or abandonment of existing structures as shown on the plans, defined in these specifications and subject to the terms and conditions of this contract, including, but not limited to, manholes, catch basins, and inlets.

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02221 - Excavation and Backfilling for Utilities

1.04 SUBMITTALS

A. The CONTRACTOR shall furnish the ENGINEER shop drawings of the precast drainage structures and manholes for approval. Shop drawings should illustrate all dimensions, reinforcements and specifications for the complete manual.

PART 2 - PRODUCTS

2.01 MORTAR

A. Mortar for use in constructing and plastering sewer structures shall conform to ASTM C-270, "Specifications for Mortar for Unit Masonry". A Portland cement-hydrated lime mixture or a masonry cement may be used provided that the same materials are used throughout the project.

B. Mortar materials shall be proportioned by volume and shall consist of one part Type II Portland Cement to two parts aggregate (sand). Portland Cement shall conform to ASTM C-150, "Specifications for Portland Cement". Aggregate shall conform to ASTM C-144, "Specifications for Aggregate for Masonry Units."

2.02 PRECAST CONCRETE MANHOLES

A. Precast manhole sections shall conform to ASTM C-478, Specifications for Precast Reinforce Concrete Manhole Sections as modified thereto. Concrete shall attain a minimum compressive strength of 4,000 psi at 28 days. Minimum wall thickness shall be 8 inches.

B. Unless otherwise specified on the plans, all joints shall be made with neoprene or rubber "O" ring compression joints; mastic joint sealing compound or approved equal. After

assembly, all joints shall be filled with mortar and pointed to provide a smooth surface without joint voids.

C. The base and walls that compose the bottom section of precast manholes shall be of monolithic construction, minimum 8 inches thick, and the edge of the base slab shall project a minimum 4 inches beyond the outside diameter of the wall.

D. Holes for piping shall be 6" inches larger than the outside diameter of the respective pipe. After the pipe is set, the void space between the pipe and the hole perimeter shall be completely filled with non-shrinking, quick-setting, waterproof cement mortar and struck smooth.

E. The minimum height of precast base section shall be 36 inches from the bottom of the base slab; however, no holes for piping shall be cast less than 8 inches from the top of the base section or less than 2 inches from the top of the base slab.

2.03 CASTINGS (INCLUDING FRAMES, COVERS AND GRATINGS)

A. Iron castings shall conform to ASTM A-48, "Specifications for Gray Iron Castings", and shall be Class 30. Frames and grates may be Class 20.

B. All castings shall be made of clean, even grain, tough grey cast iron. The castings shall be smooth, true to pattern and free from projections, san holes, warp and other defects. The horizontal surface of the frame cover seats and the under surface of the frame cover seat which rests upon the cover seat shall be machined. After machining, it shall not be possible to rock any after it has been seated in any position in its associated frame. Machining shall be required only on those frames and covers intended for vehicular traffic.

C. Bearing surfaces between cast frames, covers and grates shall be machined and fitted together to assure a true and even fit. Within areas of vehicular traffic, the frames, covers and gratings shall be machined-ground so that irregularity of contact will be reduced to a minimum and will be rattle-proof.

D. All manhole covers shall be provided with concealed pick holes. Manufacturer's name and catalog number shall be cast on all frames, covers, grates, etc. Covers shall be lettered "Storm Sewer" or "Sanitary Sewer" as applicable and shall be plainly visible. The manhole frames and covers shall be flush with finished grade.

E. Grates and covers for inlets shall be as shown on the plans, set to the grades indicated and conforming with the requirements of the castings described above. Grates shall be furnished complete with frames specifically constructed to provide full bearing at all points of contract.

PART 3 - EXECUTION

3.01 CHANNELS

A. Channels shall be accurately and smoothly formed in accordance with the plans. Channels shall be constructed of concrete with trowel-finished surfaces. The upper surface of the manhole shall be sloped toward the channels as shown.

B. Drop pipe at sanitary sewer manholes shall be installed when the difference in elevation between the pipe invert and the invert at the center of the manhole exceeds two feet (2'), or where directed by the ENGINEER. The drop manhole structure shall be built according to the plans and specifications.

A. After channels are formed and section joints are pointed, the interior of the sanitary sewer manhole shall be painted with Sewpercoat.

B. The exterior of the sanitary manhole shall be painted with two coats of Koppers Bitumastic 300-M (10 mils per coat – 1st coat red and 2nd coat black) or approved equal.

C. Storm drainage structures are not required to be painted inside or outside. Provide finish and water proofing as specified in 3.02 and 3.03 below.

3.02 BRICKS

A. All bricks shall be thoroughly wetted before being laid. Brick shall be laid by the above shove joint method so as to bond them thoroughly into the mortar. Headers and stretcher courses shall be so arranged as to bond and mass thoroughly. Joints shall be finished smooth and shall be not less than 1/4 inch or more than 1/2 inch in thickness.

3.03 MANHOLES AND OTHER STRUCTURES

A. All joints shall be finished watertight; all openings for sewers, frames, etc., in precast manholes and catch basins shall be cast at time of manufacture. Spaces around all piping entering or leaving manholes shall be completely filled with Type 2 cement mortar.

B. All manholes shall be set plumb to line and grade and shall rest on a firm carefully graded subgrade which shall provide uniform bearing under base.

C. Grout for manhole bottoms shall consist of broken block, brick and 2:1 cement mortar.

3.04 CLEANING AND MAINTENANCE

A. All structures shall be cleaned and maintained in workable condition until accepted by the ENGINEER

3.05 ABANDONMENT OF EXISTING STRUCTURES IN PLACE

A. All structures shown on the drawings to be abandoned in place shall be removed to a minimum of 3 feet below existing grade and properly filled with material as in section 02200 paragraph 3.14. Excavation, backfill, and restoration shall be executed in accordance with requirements for removing existing and installing new structures.

3.06 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02601

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The CONTRACTOR shall install and place in operation submersible sewage pumps and control panel, pump shoes, guide rails (or bars), brackets and all other equipment shall be supplied and installed by the CONTRACTOR as indicated on the drawings and specified herein.

B. To assure unity of responsibility, pumps, motors, driving mechanisms and base plate shall be supplied and coordinated by the pump manufacturer. The CONTRACTOR shall assume responsibility for the satisfactory installation and operation of the entire pumping system.

C. The work covered by this section consists of furnishing all labor, equipment, services, materials, products and tests to perform all operations in connection with the improvement of the existing lift station/wet well as shown on the plans, defined in these specifications and subject to the terms and conditions of this Contract, including but not limited to the following:

1. Excavation and Backfill
2. Wet Well and Valve Vault
3. Pumps
4. Electrical
5. Force Main

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02221 - Excavation and Backfilling for Utilities

C. Section 02601 - Subterranean Structures

D. Section 02610 - Piping - General

E. Section 02641 - Valve - General

F. Section 02722 - Sanitary Sewerage System

1.04 SUBMITTALS

A. The CONTRACTOR shall submit to the ENGINEER for preliminary approval of the construction materials selected and shall furnish to the ENGINEER shop drawings of the modifications to the wet well for approval. Shop drawings shall illustrate all dimensions, reinforcements, joint details, materials and material specifications.

B. The CONTRACTOR shall submit a certificate from the equipment manufacturer stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

C. CONTRACTOR shall submit a complete wiring schematic for the pump station package.

PART 2 - PRODUCTS

2.01 WET WELL AND VAULT

A. The interior walls of the wet well, valve vault and meter vault shall be lined with SewperCoat or approved equal with the following specifications, per product data sheet, reference PDS-US-PG-10/06:

Sieve Analysis

	Min (%)	Max (%)
#8	0	0
#16	1.5	9.5
#30	22	32
#50	38	52
#100	48	62
#200	52	68
Pan	32	48

Mortar Properties

- Vibration Flow
  - 0 Min 120-160%
  - 30 min 110-160%
- Penetrometer Final Set
  - 4-10 hours
- Compressive Strength @ 24 hours
  - 5500-11000 psi

B. All interior surfaces, other than those protected with the Sewpercoat lining, shall be painted as follows:

SCHEDULE OF PAINT	PAINT	MIL
Description		
All surfaces submerged and non submerged including valve pits, piping, vents, concrete, and steel	Polymorphic Resin or equal	Primer 7-10 Intermediate 20-25
	Final Coat to be Gloss White	Final 10-12

2.02 PUMPS

A. The pumps shall be submersible type. Operational characteristics shall be as shown on the plans. The pumps shall alternate in service and operate in accordance with the sequence outlined on the plans. Sealed mercury switches shall be used for actuation. Furnish and install three submersible non-clog wastewater pumps for each lift station. Each pump shall be equipped with a close coupled 3 HP, submersible electric motor connected for operation on 230 volts, 3 phase, 60 hertz with submersible cable (SUBCAB) suitable for submersible pump applications. Pumps shall be dual voltage rated. The power cable shall be sized according to NEC and ICEA standards. An adequate length of multiconductor submersible cable (SUBCAB) will be used to convey pump monitoring device signals between control panel and submersible pumps. The pump shall be supplied with a mating discharge connection and be capable of delivering flow per the operating points defined within the plans. Pump shut off head shall be no less than 52 feet. Each pump shall be fitted with adequate length of lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight of 209 pounds.

B. Pump Design

The pump(s) shall be capable of handling raw, unscreened sewage. The design shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection, permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter the wet well. Each shall be fitted with a stainless steel chain of adequate strength and length to permit raising and lowering the pump for inspection or removal. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 165 feet.

Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. The entire weight of the pump/motor unit shall be borne by the pump discharge elbow. No portion of the pump/motor unit shall bear on the sump floor directly or on a sump floor mounted stand. Power and pilot cable supports shall be provided and consist of a wire braid sleeve with attachment loops or tails to connection to the underside of the access frame.

C. Pump Construction

1. All major parts, such as the stator casing, oil casing, and impeller shall be of gray iron ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other casting irregularities. A coating of rubber asphalt paint resistant to sewage shall protect all surfaces coming into contact with sewage. All exposed bolts and nuts shall be of AISI Type 304 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

2. A wear ring system shall be stainless steel and installed to provide efficient sealing between the volute and impeller. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit. Rectangular cross sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

3. The impeller shall be Class 35B gray cast iron of non-clogging design, capable of handling solids, fibrous material, heavy sludge and other matter found in normal sewage applications. The impeller shall be multiple vaned, double shrouded, and constructed with a long throughlet without acute turns. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. The impeller shall be a slip fit to the shaft and key driven. Non-corroding fasteners shall be used. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

4. Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly hydro-dynamically lubricated lapped seal faces. The (lower) seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The (upper) seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating tungsten carbide ring. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. Shaft seals without positively driven rotating members or conventional double mechanical seals with a common single or double spring acting between the upper and lower units, requiring a pressure differential to offset external pressure and effect sealing shall not be considered acceptable nor equal to the dual independent seal system specified. The shaft sealing system shall be capable of operating submerged to depths of, or pressures equivalent to 165 feet. No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pump media for lubrication.

5. The pump motor shall be housed in a water-tight casing and shall have moisture resistant Class F 155^{o} insulation. The motor shall be NEMA Design B and designed for continuous duty. The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be

insulated with moisture resistant Class H insulation rated for 180^{O}C (356^{O}F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) with an 80°C temperature rise and capable of at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of at least 65 feet.

6. Each unit shall be provided with an adequately designed cooling system. Each pump/motor unit shall be provided with an integral, self-supplying cooling system. The motor water jacket shall encircle the stator housing and shall be of cast iron, ASTM A-48, Class 35B. The water jacket shall thus provide heat dissipation for the motor regardless of whether the motor unit is submerged in the pumped media or surrounded by air. After passing through a classifying labyrinth, the impeller back vanes shall provide the necessary circulation of the cooling liquid, a portion of the pumpage, through the cooling system. Two cooling liquid supply pipes, one discharging low and one discharging high within the jacket, shall supply the cooling liquid to the jacket. An air evacuation tube shall be provided to facilitate air removal from within the jacket. Any piping internal to the cooling system shall be shielded from the cooling media flow allowing for unobstructed circular flow within the jacket about the stator housing. Two cooling liquid return ports shall be provided. The internals to the cooling system shall be non-clogging by virtue of their dimensions. Drilled and threaded provisions for external cooling and, seal flushing or air relief are to be provided. The cooling jacket shall be equipped with two flanged, gasketed and bolted inspection ports of not less than 4"Ø located 180° apart. The cooling system shall provide for continuous submerged or completely non-submerged pump operation in liquid or in air having a temperature of up to 40°C (104°F), in accordance with NEMA standards. Restrictions limiting the ambient or liquid temperatures at levels less than 40°C are not acceptable.

7. Pump and motor shaft shall be a solid continuous shaft. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be of carbon steel ASTM A 572 Grade 50 and shall be completely isolated from the pumped liquid. The pump shaft shall rotate on at least three grease-lubricated bearings. The upper bearing, provided for radial forces, shall be a single roller bearing. The lower bearings shall consist of at least one roller bearing for radial forces and one or two angular contact ball bearings for axial thrust. The minimum L_{10} bearing life shall be 100,000 hours at any point along the usable portion of the pump curve at maximum product speed. The lower bearing housing shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm and shut the pump down.

8. The cable entry water seal design shall be such that precludes specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the cable entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. Epoxies, silicones or other secondary sealing systems shall not be required or used. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign materials gaining access through the pump top.

9. Pump motor cable installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. Motor electrical cables shall be of sufficient length to extend from the motor to the above ground disconnect switch unspliced.

10. The pilot cable shall be designed specifically for use with submersible pumps and shall be type SUBCAB (SUBmersible CABle). The cable shall be shielded, multi-conductor type with a chloroprene outer jacket and the tinned copper conductors insulated with ethylene-propylene rubber. The conductors shall be arranged in twisted pairs. The cable shall be rated for 600 Volts and 90°C (194°F) with a 40°C (104°F) ambient temperature and shall be approved by Factory Mutual (FM). The cable length shall be adequate to reach the junction box without the need for splices.

11. A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices.

12. Installation of each pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guide by no less than two 2" stainless steel guide bars.

13. No other motion of the pump unit, such as tilting or rotating, shall be required. Sealing of the discharge interface by means of a diaphragm, O-ring or other devices will not be considered acceptable nor equal to a metal to metal contact of the pump discharge flange and mating discharge connection specified and required. No portion of the pump unit shall bear directly on the floor of the wet well. There shall be no more than one 90° bend allowed between the volute discharge flange and station piping.

14. All mating surfaces of major parts shall be machined and fitted with nitrile O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression in 2 planes and O-ring contact made on four surfaces, without the requirement of specific torque limits to affect this. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered adequate nor equal.

15. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to insure sealing as described above. No secondary sealing compounds, greases or other devices shall be used.

16. Integral thermal sensors shall not be a requirement on any unit without a water jacket. Thermal sensors shall be used to monitor stator temperatures on any unit with a water jacket. There shall be one for each phase group in the motor. These shall be used in conjunction with and supplemental to external motor over current protection and available at the control panel.

17. All units of 100 HP or more shall have thermal sensors monitoring bearing temperatures in addition to the motor thermal sensors described above. Bearing thermal monitors shall be independent of the motor sensors and available at the control panel circuitry to effect alarm and/or shut down functions.

D. Pump Test

1. The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory.

    a. Impeller, motor rating and electrical connections shall first be checked for compliance to the customer's purchase order.
    b. A motor and cable insulation test for moisture content or insulation defects.
    c. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
    d. The pump shall be run for 30 minutes submerged, a minimum of 6 feet under water.
    e. After operational test (item d), the insulation test (item b) is to be performed again.
    f. Test shall consist of checking the unit at its noted speeds for head capacity, efficiency and brake horsepower at a number of points to properly establish the performance curve.

2. A certified written test report and performance curve stating the foregoing have been done shall be supplied with each pump at the time of shipment.

3. The pump cable end will then be fitted with a shrink fit rubber boot to protect it prior to electrical installation.

E. Pump Warranty

1. The pump manufacturer shall fully warrant the units being supplied to the CITY against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form, include a warranty schedule, and apply to all similar units.

F. Documentation

1. Standard drawings supplied shall include pump outlines, controls, access frames and typical installation guides. Each station shall be supplied with installation and maintenance manuals and pump parts lists for the pumps installed. Electrical control wiring diagrams shall accompany each control.

2.03 ELECTRICAL

A. All work shall be in conformance with the National Electric Code, NEMA, South Florida Building Code, and CITY Standards.

B. Pump Motors:

1. Motor Design

a. Dry shell type, NEMA Design B, induction squirrel cage motor. Class F insulation rated 155°C, 40°C ambient plus 115°C rise. Combined service factor for CP and CS types of 1.15 (Combined effect of voltage, frequency, and specific gravity not to exceed this value). For CT type, the combined service feeder is 1.10.

2. Electrical Service Specifications

a. Voltage Tolerance: +10%, - 14%
b. Frequency Tolerance: +5%
c. Voltage Balance (Phase to Phase): ±1%

3. Cable Specifications

a. Material: Jacket-Dupont Hypalon (Chlorosulfanated-Polyethylene) or equal.
b. Insulation: Dupont Nordel (Ethylene Propylene-Diene) or equal.

4. Motor Protection

a. Motor and power line protection for overload and short circuit conditions must conform to N.E.C. standards, ref. NATIONAL ELECTRIC CODE, 1984 edition, Article 430.

5. Thermal Protection

a. The stator is protected by three thermal switches (one per phase) imbedded in the windings. These switches are wired in series and two leads are brought up to the pump terminal board for connection to the control panel. The switches must be connected so that the pump is turned off if the stator overheats.

C. Control Panel

1. The control panel shall be supplied by the CONTRACTOR completely factory wired with all necessary motor starters, circuit breakers, etc. for complete operation of the pumps. It shall be of the safety type and components shall bear the label of approval of Underwriters Labs; as well as meeting all applicable requirement of NEMA. The top of the cabinet shall be mounted 6'-0" above the floor, properly aligned and adequately supported independently of the connecting raceways. Each device in the control circuit shall be mounted on a frame with plastic cover mounted on the inside of the door.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.

B. Pipe handling. All loading or unloading of pipe, fittings, valves and accessories shall be done in such a manner so as to avoid damage. The pipe shall not be skidded or rolled against pipe already unloaded.

C. Force mains shall be constructed of ductile iron pipe or PVC plastic pipe as specified on the Plans. Fittings 4 inches and over shall be properly anchored and braced with restrained joints conforming to the details shown in the plans.

D. The interior of all pipes, fittings and other appurtenances shall be kept free of dirt and foreign matter at all times. Pipe shall be flushed clean before valves and other appurtenances are installed.

E. Pipe laying. All pipes shall be laid to line and grade with valves stems plumb. All pipes shall have a minimum cover of 30 inches for DIP pipe and 36 inches for PVC pipe. The pipe installation shall include the placement of Omni electronic markers at a maximum spacing of 100 feet and at every fitting and change of direction.

F. All fittings, encasement and appurtenances shall be incidental to the cost of furnishing and installing the force mains, unless separate payment for such items is provided in the Bid Schedule.

3.02 EXCAVATION FOR PUMP STATION WET WELL

A. The pump station is designed as a caisson. The excavation within the open caisson shall be made in a manner and with the equipment best suited for removing the excavated material without damaging the caisson walls. The caisson shall be sunk to its final depth by excavation of the material from within the caisson. A portion of the excavation will be below the water table. Water within the caisson shall not be removed until the tremie concrete seal has been placed (see Section 03200, entitled “Concrete Reinforcement”). Control the rate and location of excavated materials removed so as to prevent undue stress or damage to the open caisson as it settles. Sink the caisson so that, in its final position, the walls of the caisson will be as close to plumb as possible, but in no event greater than 1 percent from plumb.

3.03 PLACING TREMIE CONCRETE SEALS

A. Place concrete with water level inside the area to be filled with concrete equal to the groundwater elevation outside.

B. Maintain this relation of water levels until tremie concrete design strength is obtained.

C. Proceed with dewatering after concrete seal has obtained full compressive design strength and tremie concrete has cured for at least 7 continuous days.

D. Remove all laitance or other unsatisfactory material from exposed surface by scraping, chipping, or other means which will not reduce strength of concrete before structural slab is poured over tremie concrete.

3.04 PLACING PRECAST PUMP STATION SECTIONS

A. Section Installation:

1. Thoroughly clean ends of sections to be joined.

2. Thoroughly wet joint with water prior to placing mortar.

3. Place mortar on groove of lower section.

4. Set next section in place.

5. Fill joint completely with mortar of proper consistency.

6. Trowel interior and exterior surfaces smooth on standard tongue-and groove joints.

7. Prevent mortar from drying out and cure by applying an approved curing compound or comparable approved method.

8. Do not use mortar mixed for longer than 30 minutes.

9. Chip out and replace cracked or defective mortar.

10. Completed Manholes: Rigid and watertight.

B. Preformed Plastic Gaskets: If used in lieu of mortar joints, install in accordance with manufacturer's instructions and the following:

1. Carefully inspect precast manhole sections to be joined.

2. Do not use sections with chips or cracks in the tongue.

3. Use only pipe primer furnished by gasket manufacturer.

4. Install gasket material in accordance with manufacturer's instructions.

5. Completed Manholes: Rigid and watertight.

C. Rubber Gasketed Joints: Install in accordance with manufacturer's instructions.

3.05 SHOP PAINTING

A. Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt and other foreign matter.

B. All pumps and motors shall be shop primed, with primer compatible with the field painting.

C. All nameplates shall be properly protected during painting.

D. Gears, bearing surfaces and other similar surfaces, which are not to be painted, shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the ENGINEER up to the time of the final acceptance test.

3.06 FIELD PAINTING

A. The primer and paint used in the field shall be products of the same manufacturer as the shop paint to assure compatibility.

3.07 INSPECTION AND TESTING

A. The ENGINEER shall have the right to inspect, test or witness tests of all materials or equipment to be furnished under these Specifications, prior to the shipment from the point of manufacture.

B. The ENGINEER shall be notified in writing prior to initial shipment, in ample time so that the ENGINEER can make arrangements for inspection.

C. The ENGINEER or ENGINEER'S representative shall be furnished all facilities, including labor, and shall be allowed proper time for inspection and testing of material and equipment.

D. Materials and equipment shall be tested or inspected as required by the ENGINEER, and the cost of such work shall be included in the cost of the equipment. The CONTRACTOR shall anticipate that delays may be caused because of the necessity of inspection, testing and accepting materials and equipment before their use is approved.

E. The services of a factory representative shall be furnished for one (1) day and shall have complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.

F. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.

3.08 PUMP TESTING

A. After all pumps have been completely installed, and working under the direction of the manufacturer, CONTRACTOR shall conduct pump testing in the presence of the CITY and ENGINEER. Pump tests are necessary to indicate that pump efficiency and discharge conform to the Specifications. Field tests shall include all power, water or wastewater, labor, equipment and incidentals required to complete the field tests.

B. If the pump performance does not meet the Specifications, corrective measures shall be taken or pumps shall be removed and replaced with pumps, which satisfy the conditions, specified.

3.09 MOTOR TESTING

A. The CONTRACTOR shall check all motors for correct lubrication in accordance with manufacturer's instructions. The CONTRACTOR shall check direction of rotation of all motors and reverse connections, if necessary.

3.10 ELECTRICAL

A. All electrical wiring shall comply with the minimum requirements of the South Florida Building Code, Broward Edition, National Electric Code, and Underwriters Laboratories.

3.11 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the lump sum bid as more specifically discussed and described in SECTION 01025 for measurement and payment

END OF SECTION 02603

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The CONTRACTOR shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, expansion joints, flexible connectors, valves, accessories, electronic markers, heat tracing, insulation, lining and coating, testing, disinfection, excavation, backfill and encasement, to provide a functional installation.

B. The piping shown is intended to define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, etc., for a complete and functional system.

1.03 RELATED WORK

A. Division 2 as applicable

B. Section 02200 - Earthwork

C. Section 02221 - Excavation and Backfilling Utilities

E. Section 02601 - Subterranean Structures

F. Section 02603 – Pump Station and Force Main

G. Section 02713 – Water Distribution System

1.04 REFERENCE STANDARDS

A. Codes: All codes, as referenced herein are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch)
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
ANSI/AWWA C207	Steel Pipe Flanges for Water Works

	Service, Sizes 4 inch through 144 inch
ANSI/AWWA C606	Grooved and Shouldered Joints
ANSI/AWS D1.1	Structural Welding Code
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 6,000 psi Tensile
ASTM A 325	Specification for High-Strength Bolts for Structural Steel Joints
ASTM D 792	Test Methods for Specific Gravity and Density of Plastics by Displacement
ASTM D 2000	Classification System for Rubber Products in Automotive Applications

1.05 SUBMITTALS

A. The CONTRACTOR shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the requirements in Section 01340, "Shop Drawings, Product Data and Samples", and as specified in the individual sections. The shop drawings shall include all necessary dimensions and details on pipe joints, fittings, fitting specials, valves, appurtenances, design calculations, and material lists. The submittals shall include detailed layout, spool, or fabrication drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports necessary to accommodate the equipment and valves provided in a complete and functional system.

B. All expenses incurred in making samples for certification of tests shall be borne by the CONTRACTOR.

C. The CONTRACTOR shall submit as part of the shop drawings a certification from the pipe fabricator stating that all pipes will be fabricated subject to a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the fabrication of any pipe

1.06 QUALITY ASSURANCE

A. Inspection: All pipes shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

B. Tests: Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards. [Welds shall be tested as specified. The CONTRACTOR shall perform all tests at no additional cost to the CITY.

C. Welding Requirements: All welding procedures used to fabricate pipe shall be pre-qualified

under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

D. Welder Qualifications: skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. The CONTRACTOR shall furnish all material and bear the expense of qualifying welders.

1.07 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is advisable, in order to obtain perfect pipe joints, supports, or special connections, the CONTRACTOR shall furnish such assistance at no additional cost to the CITY

1.08 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

1.09 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

PART 2 - PRODUCTS

2.01 GENERAL

A. All pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Sections of Division 2 and as specified herein.

B. Lining: All requirements pertaining to thickness, application, and curing of pipe lining, are in accordance with the requirements of the applicable Sections of Division 2, unless otherwise specified.

C. Coating: All requirements pertaining to thickness, application, and curing of pipe coating, are in accordance with the requirements of the applicable Sections of Division 2, unless otherwise specified. Pipes above ground or in structures shall be field-painted as directed by the ENGINEER.

D. Grooved Piping Systems: Piping systems with grooved joints and fittings may be provided in lieu of screwed, flanged, welded, or mechanical joint systems for ductile iron yard piping. (All piping above and below ground within the property limits of treatment plants, pump

stations, and similar installations). All grooved couplings on buried piping must be bonded. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer. The CONTRACTOR shall make the coupling manufacturer responsible for the selection of the correct style of coupling and gasket for each individual location.

2.02 PIPE FLANGES

A. Flanges: Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-lb class. However, AWWA flanges shall not be exposed to test pressure greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-lb class. Flanges shall have flat faces and shall be attached with boltholes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flanges for miscellaneous small pipes shall be in accordance with the standards specified for these pipes.

B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or with the standards for miscellaneous small pipes. All blind flanges for pipe sizes 12 inches and over shall be provided with lifting eyes in form of welded or screwed eyebolts.

C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

D. Flange Bolts: All bolts and nuts shall conform to pipe manufacturers recommendations. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.

E. Insulating Flanges: Insulated flanges shall have boltholes 1/4-inch diameter greater than the bolt diameter.

F. Insulating Flange Sets: Insulating flange sets shall be provided where shown. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A 325. Insulating gaskets shall be full-face.

G. Insulating Flange Manufacturers, or equal:

1. JM Red Devil, Type E
2. Maloney Pipeline Products Co., Houston
3. PSI Products, Inc., Burbank, California

H. Flange Gaskets: Gaskets for flanged joints shall be full-faced, 1/16-inch thick compressed sheets of aramid fiber base, with nitrile binder and non-stick coating, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

I. Flange Gasket Manufacturers, or equal:

1. John Crane, style 2160
2. Garlock, style 3000

2.03 THREADED INSULATING CONNECTIONS

A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.04 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. General: Cast mechanical-type couplings shall be provided where shown. The couplings shall conform to the requirements of ANSI/AWWA C606. All gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of all grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, all equipment connections shall have rigid-grooved couplings, or harness sets in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. The CONTRACTOR shall have the coupling Manufacturer's service representative verify the correct choice and application of all couplings and gaskets, and the workmanship, to assure a correct installation.

B. Couplings for Steel Pipe, Manufacturers, or equal:

1. Gustin-Bacon (banded or grooved)
2. Victaulic Style 41 or 44 (banded, flexible)
3. Victaulic Style 77 or 07 (grooved)

C. Ductile Iron Pipe Couplings, Manufacturers, or equal:

1. Gustin-Bacon

2. Victaulic Style 31

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

2.05 SLEEVE-TYPE COUPLINGS

A. Construction: Sleeve-type couplings shall be provided where shown, in accordance with ANSI/AWWA C219 unless otherwise specified, and shall be of steel with steel bolts, without pipe stop, and shall be of sizes to fit the pipe and fittings shown. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for sizes up to and including 30 inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Buried sleeve-type couplings shall be epoxy-coated at the factory as specified.

B. Pipe Preparation: The ends of the pipe, where specified or shown, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

1. Color - Jet Black

2. Surface - Non-blooming

3. Durometer Hardness - 74 ± 5

4. Tensile Strength - 1000 psi Minimum

5. Elongation - 175 percent Minimum

The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with the piping service and fluid utilized.

D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. Restrained Joints: All sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be in accordance with the requirements of the appropriate reference standard, or as shown.

F. Manufacturers or Equal:

1. Dresser, Style 38
2. Ford Meter Box Co., Inc., Style FC1 or FC3
3. Smith-Blair, Style 411

2.06 FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment, and where shown. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise shown. The connectors shall be 9 inches long, face-to-face flanges, unless otherwise shown. The manufacturer shall approve the final material selection. The CONTRACTOR shall submit manufacturer's shop drawings and calculations.

2.07 EXPANSION JOINTS

A. All piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement, without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials, best suited for each individual service. The CONTRACTOR shall submit detailed calculations and manufacturer's shop drawings, guaranteeing satisfactory performance of all proposed expansion joints, piping layouts showing all anchors and guides, and information on materials, temperature and pressure ratings.

2.08 PIPE THREADS

A. All pipe threads shall be in accordance with ANSI/ASME B1.20.

2.09 ELECTRONIC MARKER

A. All electronic markers shall be manufactured by Omni Marker. The electronic markers shall be installed along with the piping at a maximum spacing of feet and at every fitting and change of direction. The electronic marker for the water main shall be blue in color and set to 145.7 kHz frequency. The electronic marker for the sanitary force main shall be green in color and set to 121.6 kHz frequency.

PART 3 - EXECUTION

3.01 GENERAL

A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Section of Divisions 2. The lining manufacturer shall take full responsibility for the complete, final product and its application. All pipe ends and joints at screwed flanges shall be epoxy-coated, to assure continuous protection.

B. Where core drilling is required for pipes passing through existing concrete, core drilling

locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebars.

C. All exposed piping shall be painted. All piping to be painted shall be color coded in accordance with CITY's standard color code. Color samples shall be submitted to ENGINEER for final color selection.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for measurement and payment.

END OF SECTION 02610

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provide all labor, materials, necessary equipment and services to complete the Pump Station and Force Main and Water Distribution System work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.02 WORK INCLUDED

A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the CONTRACTOR shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.

B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections and Division 2 of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other Sections of these Specifications.

1.03 RELATED WORK

A. Section 02221 - Excavation and Backfilling for Utilities

B. Section 02603 - Pump Station and Force Main

C. Section 02610 - Piping, General

D. Section 02713 - Water Distribution System

1.04 REFERENCE STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys
ANSI/ASME B31.1	Power Piping
ASTM A 36	Specification for Structural Steel
ASTM A 48	Specification for Gray Iron Castings

ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 536	Specification for Ductile Iron Castings
ASTM B 61	Specification for Steam or Valve Bronze Castings
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings
ASTM B 148	Specification for Aluminum-Bronze Castings
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems
ANSI/AWWA C502	Dry-Barrel Fire Hydrants
ANSI/AWWA C503	Wet-Barrel Fire Hydrants
ANSI/AWWA C504	Rubber-Seated Butterfly Valves
ANSI/AWWA C507	Ball Valves 6 Inches Through 48 Inches
AWWA C508	Swing-Check Valves for Waterwork Service, 2 Inches Through 24 Inches NPS
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water and Sewage Systems
ANSI/AWWA C511	Reduced-Pressure Principle Backflow-Prevention Assembly
AWWA C550	Protective Interior Coatings for Valves and Hydrants
SSPC-SP-2	Hand Tool Cleaning
SSPC-SP-5	White Metal Blast Cleaning

1.04 SUBMITTALS

A. Shop Drawings: Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in Section 01340, "Shop Drawings, Product Data and Samples".

B. Valve Labeling: The CONTRACTOR shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.

1.05 QUALITY ASSURANCE

A. Valve Testing: Unless otherwise specified, each valve body shall be tested under a test

pressure equal to twice its design water-working pressure.

B. Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or where not subject to dezincification, to ASTM B 584.

C. Certification: Prior to shipment, the CONTRACTOR shall submit for all valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc.

PART 2 - PRODUCTS

2.01 VALVES, GENERAL

A. General: The CONTRACTOR shall furnish all valves, gates, valve-operating units, stem extensions, and other accessories as shown or specified. All valves and gates shall be new and of current manufacture. All shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Shut-off valves mounted higher than 5 feet-6 inches above working level shall be provided with chain operators.

B. Valve Flanges: The flanges of valves shall be in accordance with Section 02610, "Piping, and General".

C. Gate Valve Stems: Where subject to dezincification, gate valve stems shall be of bronze conforming to ASTM B 62, containing not more than 5 percent of zinc nor more than 2 percent aluminum. Gate valve stems shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used.

D. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, as well as the exterior surfaces of all submerged valves, shall be coated with 2 part thermal setting epoxy coatings. Flange faces of valves shall not be epoxy coated. The valve manufacturer shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

E. Valve Operators: Where shown, certain valves and gates shall be furnished with electric operators, provided by the valve or gate manufacturer. The same manufacturer shall furnish all operators of a given type. Where different manufacturers supply these operators, the CONTRACTOR shall coordinate their selection to provide uniformity of each type of electric operator. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.

F. Valve Labeling: Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all shut-off valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.

G. Nuts and Bolts: All nuts and bolts on valve flanges and supports shall be in accordance with manufacturers recommendations. Where submerged or buried, all nuts and bolts on valve flanges and valve bodies shall be stainless steel.

2.02 GATE VALVES

A. All buried valves shall be of the inside screw, non-rising stem type. Valves shall be capable of being repacked under line pressure. Valves 14-inch and larger installed vertical pipes with their stems horizontal shall be fitted with bronze slides, tracks, rollers, and scrapers to assist the travel of the gate assembly. Quick opening valves shall have quick opening levers and cams in lieu of handwheel operators.

B. Knife Gate Valves

1. Knife gate valves shall be provided with raised face and resilient seats for positive seating. Wetted parts shall be constructed of Type 316 stainless steel. Gates shall be finish-ground on both sides to prevent packing or seat damage. Valves 2 to 4 inches in size shall be furnished with cast stainless steel bodies; valves 6 to 24 inches in size shall be furnished with cast semi-steel bodies with stainless steel linings. Valve ends shall be of the flanged or wafer design, as shown. Gate guides and jams shall be steel. Actuator shall be handwheel. Port design shall be full-round.

2. Manufacturers or equal:

   a. Red Valve Company Inc.
   b. DeZurik Corporation
   c. Fabri-Valves
   d. Rovang, Inc.

C. Resilient-Seated Gate Valves

1. Resilient-seated gate valves conforming to ANSI/AWWA C509 shall be provided. Resilient-seated gate valves shall have cast iron bodies with flanged, bell, or mechanical joint ends, rubber-coated cast iron disc, flanged bonnet, bronze stem, O-ring seals, and operators with handwheel or square nut, unless otherwise shown.

2. Manufacturers or equal:

   a. Clow Valve Co.; F-6100
   b. Kennedy Valve; Ken-Seal
   c. Mueller Company; 2370
   d. American - Darling Valve Co.; 80 line

2.03 ECCENTRIC PLUG VALVES

A. Equipment Requirements: Plug valves shall be on the non-lubricated, eccentric type with resilient faced plugs, port areas for valves 20 inches and smaller shall be at least 80% of full pipe area. Port area of valves 24 inches and larger shall be at least 70% of full pipe area. The body shall be of semi-steel (ASTM A-126 C1.B) and shall have bolted bonnet, which

gives access to the intervals of the valve. Seats shall be welded overlay of high nickel content or a stainless steel plate locked in the body cavity. If a plate is used, it shall be replaceable through the bonnet access. Bearings shall be permanently lubricated of stainless steel, bronze or teflon lined, fiberglass backed duralon. Bearing areas shall be isolated form the flow with grit seals. Valves shall have packing bonnets where the shaft protrudes from the grit seals. Valves shall have packing bonnets where the shaft protruded from the valve and the packing shall be self-adjusting chevron type, which can be replaced without removing the bonnet. All nuts, bolts, springs and washers shall be stainless steel.

B. Valves shall be designed for a working pressure of 150 PSI. The valve and actuator shall be capable of satisfactory operation in either direction of flow against pressure drops up to and including 100 PSI (for plug valves over 12 inches in diameter). Valves shall be bubble tight in both directions at 100-psi differential.

C. Plug valves over 12" in diameter shall have worm gear operators. The operating mechanism shall be for buried service with a 2-inch square-operating nut.

D. Plug valves are to be installed with the sear pointed towards the upstream flow, when specified.

E. Manufacturers or equal:

1. Clow Valve Co.
2. DeZurik Corporation
3. U.S. Pipe

2.04 BALL VALVES (4-INCH AND SMALLER)

A. General Requirements: Unless otherwise specified or shown, general purpose ball valves in sizes up to 4-inch shall have manual operators with lever or handwheel. Ferrous surface of 4-inch valves, which will be in contract with water, shall be epoxy-coated. All ball valves shall be of best commercial quality, heavy-duty construction.

B. Body: All ball valves up to 1-1/2 inch (incl.) in size shall have bronze or forged brass 2 or 3 piece bodies with screwed ends for a pressure rating of not less than 300 psi WOG. Valves 2-inch to 4-inch in size shall have bronze forged brass or steel 2 or 3 piece bodies with flanged ends for a pressure rating of 125 psi or 150 psi.

C. Balls: The balls shall be solid brass or chrome plated bronze, or stainless steel, with large or full openings.

D. Stems: The valves seats shall be of Teflon or Buna N, for bi-directional service and easy replacement.

F. Manufacturers or equal:

1. Jamesbury Corporation
2. Jenkins Bros.
3. Lunkenheimer Flow Control
4. Wm. Powell Company

5. Worcester Controls
6. Valve Primer Corporation

2.05 SWING CHECK VALVES (3-INCH AND LARGER)

A. General: Swing check valves for water, sewage, sludge, and general service shall be of the outside lever and spring or weight type, in accordance with ANSI/AWWA C 508 - Swing-Check Valves for Waterworks Service, 2 in. through 24 in. NPS, unless otherwise indicated, with full-opening passages, designed for a water-working pressure of 150 psi. They shall have a flanged cover piece to provide access to the disc.

B. Body: The valve body and cover shall be of cast iron conforming to ASTM A 126, with flanged ends conforming to ANSI B 16.1, or mechanical joint ends, as shown.

C. Disc: The valve disc shall be of cast iron, ductile iron, or bronze conforming to ASTM B 62.

D. Seat and Rings: The valve seat and rings shall be of bronze conforming to ASTM B 62 or B 148, or of Buna-N.

E. Hinge Pin: The hinge pin shall be of bronze or stainless steel.

F. Manufacturers or Equal:

1. American-Darling Valve Co.
2. Kennedy Valve
3. Mueller Company
4. Stockham Valves and Fittings

2.06 AIR-VACUUM AND AIR-RELEASE VALVES

A. Air and Vacuum Valves: Air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. They shall be of the size shown, with flanged or screwed ends to match piping. Bodies shall be of high-strength cast iron. The float, seat, and all moving parts shall be constructed of Type 316 stainless steel. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150-psi water-working pressure, unless otherwise shown.

B. Air-Release Valves: Air-release valves shall vent accumulating air while system is in service and under pressure and be of the size shown and shall meet the same general requirements as specified for air and vacuum valves except that the vacuum feature will not be required. They shall be designed for a minimum water-working pressure of 150 psi, unless otherwise shown.

C. Combination Air Valves: Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. They shall have the same general requirements as specified for air and vacuum valves.

D. Manufacturers or Equal:

1. APCO (Valve and Primer Corporation)
2. Golden-Anderson Valve Division (GA Industries, Inc)
3. Val-Matic (Valve and Manufacturing Corporation)

2.07 CORPORATION STOPS (Ball Valve Type)

A. Unless otherwise shown, corporation stops shall be made of brass alloy for key operation, with screwed ends with corporation thread or iron pipe thread, as required. AWWA taper thread for inlet thread and compression type fittings for outlet.

B. Manufacturer or Equal:

1. Ford Meter Box Company
2. James Jones Company
3. Mueller Company

2.08 VALVE OPERATORS

A. Electric Motor Operators

1. All motorized valves shall be furnished by the CONTRACTOR through the valve manufacturers as a complete package. Motor driven valve operators shall be furnished and installed in accordance with the applicable requirements shown on the process and instrumentation diagrams and electrical elementary diagrams. Operators shall comply with AWWA requirements for electrical operators.

2. Electric operators including the motor, all required gearing, integral continuous duty rated reversing starter, AC line surge suppressors, controls and switches shall be as manufactured by Rotork, Limitorque, EIM; or equal.

3. The motorized operators for modulating service shall be furnished with an integral position indicator/transmitter/controller. The above unit shall be internally powered, factory calibrated and furnished with adjustable zero, span, gain and deadband controls.

4. The position indicator/transmitter shall provide a linear, isolated, 4-20 mA, 24 VDC output to remote instrumentation and controls proportional to 0-100 percent travel span. An external DC power source shall not be required.

5. The position controller shall accept a linear 4-20 mA, 24 VDC input signal proportional to 0-100 percent travel span and shall generate appropriate outputs to the reversing starter to open/close the valve until the desired portion has been reached as determined by the position feedback signal to the position controller. Input signal isolation shall be provided.

6. The controller shall be furnished with circuitry to "lock in the last position" upon loss of control signal. CONTRACTOR shall be responsible for proper transmitter/controller calibration in accordance with the manufacturer's recommendations.

7. Operator capacity shall be adequate to continuously operate the valve under all operating conditions. Unless otherwise indicated, or specified, motor operators shall be furnished complete with motors, limit switch operating mechanisms, travel limit switches, torque switches, transmitters, controllers, starters, lighting and surge suppression, terminal blocks, gear reducers, handwheel, gearing, necessary components, and incidental accessories as follows:

    a. All phases of the power supply shall be monitored. The contractor shall open deenergizing the motor upon detection of single phasing.

    b. Logic circuits shall be protected against spurious voltage spikes, using opto-isolators in circuits connected to any remote input or output signals.

8. Enclosure: The starter for 240 volt single phase motor operators and all local devices shall be mounted on a common NEMA 4 and PVC coated cast aluminum enclosure. The enclosure shall be permanently affixed to the valve operator housing.

9. Valve Stops: Valve stops for the operators shall be positive in action. Closing shall be complete, and opening full. Stops shall be field adjustable to the required settings. The torque switches shall prevent any excessive mechanical stress or electrical overloading any direction of travel.

10. Limit switches and gearing shall be an integral part of the motorized valve operator. The limit switch gearing shall be of the intermittent type, totally enclosed in its own gear case, grease lubricated to prevent direct and foreign matter from entering the gear train and shall be made of bronze or stainless steel. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between the normal position (full open, or full closed) and 75 percent of the travel to the opposite position.

11. Local (Motor) Devices: Local devices shall include, but not be limited to the following:

    a. Torque Switches: Torque switches, responsive to high torque encountered in either direction of travel. A torque switch, which has tripped due to mechanical load, shall not reset when the operator motor has come to a halt.

    b. Limit Switches: Travel limit switches, for opening and closing direction of travel. Contract operations shall be as indicated on the Drawings. If not shown on the Drawings, the operator shall be furnished with a minimum of two DPDT switches. All switches shall be furnished with 5-ampere contacts. Switches shall be connected such that when the valve is fully open, or fully closed, the "open" or "close" light shall be illuminated. All limit switch contacts shall be wired out to a terminal strip so that the electrician in the field does not have to connect to the switches.

    c. Local/remote selector switch with phase motor relay and auxiliary to provide dry contacts for collective indication of placement in the "remote" operating mode, the unit is powered, and that all safety/overload interlocks are satisfied to provide the above signal. For further requirements refer to electrical elementary control schematic.

d. Open/close push-button for local manual operation (modulating service).

e. Position indicator calibrated to 0-100 percent travel span.

f. Terminals for remote indication of full open, full closed and overload (torque).

12. Operating Unit Gearing: The actuator shall be double reaction unit with the capability of quickly changing the output speed with a gear change. The power gearing shall consist of generated spur or helical gears of heat-treated steel, and worm gearing where required by the type of operator. Quarter turn or traveling unit operators do not specifically require worm gearing. The worm shall be of hardened alloy steel and the worm gear shall be of alloy bronze. All power gearing shall be grease-lubricated. Ball or roller bearings shall be used throughout for all motor operators. A mechanical dial position indicator to display valve position in percent of valve opening shall be provided. The gearing shall comply with AWWA requirements.

13. Stem Nuts: The actuator for other than quarter turn valves shall have a stem nut of high tensile bronze or other material compatible with the valve stem and suited to the application. The nut arrangement, where possible, shall be of the two-piece type to simplify field replacement. The stem nut for rising stem valves must be capable of being removed from the top of the actuator without removing the actuator from the valve, disconnecting the electrical wiring, or disassembling any of the gearing within the actuator.

14. Manual Operation: A handwheel shall be provided for manual operation. The handwheel shall not relocate during hand operation nor shall a fused motor prevent manual operation.

15. When in manual operating position, the volt motor driven unit will remain in this position until motor is energized at which time the valve operator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. This movement from motor operation to handwheel operation shall be accomplished by a positive declutching knob or lever, which will disengage the motor and motor gearing mechanically not electrically. Hand operation must be reasonable fast and require no more than 100 lbs. of rim effort at the maximum required torque. It shall not be possible for the unit to be simultaneously in manual and motor operation.

16. 240 Volt Single Phase Motors: All motors on valves shall be designed for 240 volts 1-phase 60 Hz power. The motor shall be specifically designed for valve actuator service and shall be of high torque, squirrel cage reversible, totally enclosed, non-ventilated construction, with motor leads brought into the limit switch compartment without having external piping or conduit box. Motor insulation shall be NEMA Class B with maximum continuous temperature rating of 120□ C (rise + ambient). Motors shall be sized to have a rated running time at the rated running torque of 15 minutes without exceeding the temperature rating of the insulation system. Running load torque shall be not more than 20 percent of the rated seating/unseating torque.

17. Speed-torque curves for the motors and torque calculations for seating, unseating, and

running conditions shall be submitted. The maximum valve torque (seating/unseating) shall be less than 50 percent of stall torque or starting torque potential of the motor whichever is greater.

18. Operator Type:

    Type A: Remote set point using a 4-20 mable analog signal

    a. Local Operation
        (1) LOCAL/REMOTE selector
        (2) OPEN/CLOSE push buttons
        (3) Position set-point potentiometer/indicator
        (4) LOCAL accepts local position set point
        (5) OPEN/CLOSE indication
        (6) Fault (torque) indication

    b. Remote operation
        (1) REMOTE - accept a remote 4-20 mA position set-point
        (2) Position transmitter 4-20mA signal to RTU
        (3) Available Ready of Auto to RTU
        (4) Fault torque status to RTU

19. Valve Closure Time: Valve closure time shall be 1 minute.

20. Spare Parts:

    a. The CONTRACTOR shall furnish loose, one unit valve operator, complete with all the devices specified herein and with all the features and characteristics similar to the equipment supplied in this Contract. The spare operator shall be delivered to the CITY still in crates.

PART 3 -EXECUTION

3.01 VALVE INSTALLATION

A. General: All valves, gates, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. All gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. Access: All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.

C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the CONTRACTOR to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.

D. Butterfly Valves: All exposed butterfly valves shall be installed with a means of removing

the complete valve assembly without dismantling the valve or operator.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

B. For valves used in Pump Station 10A3, the price is included in the lump sum bid.

END OF SECTION 02641

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1-General Requirements shall govern the WORK under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Water Systems work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02221 - Excavation and Backfilling for Utilities

C. Section 02610 - Piping, General

D. Section 02641 - Valves, General

1.04 EXISTING UTILITIES

A. Furnish temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, poles and other obstructions encountered in the progress of the work.

B. Where the grade or alignment of the pipe is obstructed by existing utility structure such as conduits, ducts, pipe branch connections to main sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with the OWNERs of such utility structures. No deviation shall be made from the required line or grade except as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 PIPE

A. All metallic pipes shall have bituminous outside coating conforming to:

Viscosity, KU at 25^{o}	56-60
Flashpoint ^{o}F (TCC)	40^{o}F
Dry set to touch	6 minutes
Dry hard	22 minutes

B. Ductile iron pipe shall conform to ANSI/NSF 61, ANSI/AWWA C151/A21.51, AWWA C150, AWWA/ANSI C111/A2.11, and AWWA/ANSI C110/A21.1, latest revisions. Ductile iron pipe shall be a pressure class 350 for 4 inch to 24 inch diameter pipe and pressure class 250 for 30 inch to 60 inch diameter pipe. Pipe shall be cement-lined and seal-coated in accordance with ANSI/AWWA C104/A21.4.

1. Unless otherwise indicated, all ductile iron pipes shall be factory lined and coated.

a. Lining: All pipes shall be cement mortar lined in accordance with AWWA Standard C104.

b. Coating: Unless specified otherwise, all pipe shall be coal-tar enamel coated outside to a dry film thickness of at least 1 mil with Koppers Bitumastic Tank Solution, or equal.

c. Repair: Anywhere that the coating is removed purposely or accidentally, the area shall be cleaned of any rust, grease and dirt and recoated to a minimum dry film as specified for the individual piece.

C. All PVC pipe shall be Class 150 D.R. 18 ANSI/AWWA C900 suitable for use at maximum hydrostatic working pressure of 250 PSI. All pipes must meet requirements as set forth and bare the National Sanitation Foundation seal for potable water pipe.

D. All HDPE water main pipe shall be SDR 9 and shall be in accordance with ANSI/AWWA C906 and ANSI/NSF 61 suitable for potable water conveyance. Resin material Shall meet or exceed the requirements of ASTM D3350, latest revision. Material shall be high density polyethylene (HDPE), PE 4710.

2.02 FITTINGS

A. The pressure rating shall be 350 PSI for fittings.

B. Fittings shall be ductile iron, meeting the ANSI/AWWA standard Specification C153-A21.53.

C. Fitting must be cement lined and seal coated per ANSI/AWWA C104/A21.4.0.

D. Flanged fittings shall conform to ASA Specifications for Class 125.

E. Ductile iron fittings shall conform to ANSI/AWWA standard specification C110-A21.10 latest revision.

2.03 JOINTS

A. BELL AND SPIGOT CONNECTIONS:

1. Joints in bell and spigot pipe shall be push-on, mechanical, or restrained mechanical joints in accordance with ANSI/ANWA Standard C-111/21.11, latest revision.

B. FLANGED CONNECTIONS:

1. All flanged pipe barrels shall comply with the physical and chemical requirements as set forth in the Handbook of Ductile Iron Pipe of the Ductile Iron Pipe Research Association. Flanges shall be in accordance with ANSI Specification B16.1 for Class 125 flanges. Bolts shall comply with ANSI Specification B18.2.

2. Before starting fabrication of the cast iron pipe and fittings, complete detailed working drawings shall be submitted by the CONTRACTOR for approval by the ENGINEER. Such drawings shall show the piping layouts and contain schedules of all pipe, fittings, valves, expansion joints, hangers and supports and other appurtenances. Where

special fittings are required, they shall be shown in large detail with all necessary dimensions. The drawings submitted shall show flanged jointed sections placed so as to be removed without disturbance to the main pipe sections.

3. Flanged pipe shall be faced and drilled to the American Standard drilling, unless special drilling is called for or required. Where tap or stud bolts are required, flanges shall be tapped. Flanges shall be accurately faced and drilled smooth and true, at right angles to the pipe axis and shall be covered with zinc dust and tallow or a rust preventive compound immediately after facing and drilling.

4. Flanged pipe with screwed-on flanges shall be furnished with long hubs and the flanges shall be screwed on the threaded end of the pipe in the shop and the face of the flange and end of pipe refaced together. There shall be no leakage through the pipe threads and the flanges shall be designed to prevent corrosion of the threads from outside.

5. Flanged joints shall be made with bolts or stud bolts and nuts. Bolts, stud bolts, and nuts shall conform to American Standard heavy dimensions; semi-finished with square or hexagonal heads and cold punched hexagonal nuts, meeting the requirements of ASTM Designation A-307. Bolt sizes shall be American Standard for the flanges specified, and bolts and nuts shall have good, true threads.

C. Pipe Joints

1. Lengths of pipe shall be assembled into suitable installation lengths with restrained joints. All pipe so joined shall be made from the same class and type made by the same supplier.

2.04 HYDRANTS

A. Fire hydrant shall have a 5 ¼ inch main valve opening. Pumper nozzle to be 18 inches from finish grade. Fire hydrant shall comply with ANSI/AWWA C502-85 and ANSI/NSF 61, latest revision. Hydrants shall be per County Products Specification Sheet (latest edition) or approved equal.

B. Fire hydrants installed that have not been placed into service shall be tagged with a sign approved by OWNER and City of Dania Beach to indicate that they are out of service.

2.05 WATER TAPS

A. Tapping Existing Pipelines.

1. Tapping sleeves shall meet or exceed ANSI/NSF 61 and AWWA C223, latest revision. Tapping sleeves shall be per County Products Specification Sheet (latest edition) or approved equal.

2. Cast iron tapping sleeve or tapping cross shall have mechanical joint connections. The flanged end for tapping valve shall include a recess to provide positive alignment of the tapping valve.

3. Tapping valves shall conform to ANSI/NSF 61, AWWA C500 standards. An Affidavit of Compliance shall be furnished for the valves. Tapping valves shall be per County Products Specification Sheet (latest edition) or approved equal.

4. Tapping valves 16 inch diameter and smaller shall be designed for operation in a vertical position with a vertical operating shaft. Tapping valves over 16 inch diameter shall be designed for operation in a horizontal position and shall have a vertical operating shaft.

2.06 WATER SERVICES

A. Water services shall be polyethylene tubing, SDR 9, with a minimum working pressure of 200 psi.

B. All water service tubing and fittings shall be in conformance with "Broward County Water and Wastewater Services- Minimum Design and Construction Standards."

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Unloading Material: The CONTRACTOR shall exercise care in unloading and handling pipe, valves, fittings, and all other material. Dropping pipe from trucks and allowing pipe to roll against other pipe will not be permitted.

B. Excavation: Pipeline trenches shall be excavated to required depth as shown on the drawings or as directed by the ENGINEER. In general, water distribution lines shall have a minimum of 30 inches cover for DIP pipe. If rock is encountered, excavation shall be carried a minimum of 8 inches below bottom of pipe, and trench backfilled with sand or earth and thoroughly tamped. Width of trench shall be sufficient to allow laborers to perform all operations incidental to constructing the pipeline. Hand dug bell holes shall be provided to permit proper joint making. No section of pipe shall bear on rock or on placed blocks/boulders. All excavations will be dewatered to permit dry joints.

C. Work shall be properly braced where necessary. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level two feet above the top of the installed pipe and that portion below that level shall be left in place. If interlocking steel sheeting of a design approved by the ENGINEER is used, it may be removed providing removal can be accomplished without disturbing the bedding or alignment of the pipe. Any damage to the pipe bedding, pipe or alignment of the constructed main caused by removal of sheeting shall be cause for rejection of the affected portion of the work.

3.02 PIPE

A. Installation of Pipe: All installation shall conform to AWWA C-600. Pipe shall not be rolled or pushed into the trench from the bank. Before pipe is lowered into the trench, it shall be thoroughly inspected by the CONTRACTOR, as necessary, to ensure sound conditions and eliminate the possibility of leakage or bursting under test pressure.

B. Water mains shall be laid at least 6 feet horizontally (10 feet preferred) from any existing or proposed sewer mains. A vertical distance of at least 18 inches should be maintained when a sewer pipe crosses under a water main per County standards. If it is not possible to obtain at least a minimum 12 inches clearance per the F.A.C. Rule, then the sewer pipe material must be of water main material quality with 20-foot lengths of pipe centering on the point of crossing. If a crossing where the sewer is laid above a water line is unavoidable, then the above-mentioned

precautions shall be observed regardless of the distance of vertical separation between water mains and sewer piping.

C. Pipes and valves, fittings, and all other materials showing defects shall not be used for construction. All such defective materials shall be removed from the construction site immediately. Before pipe is lowered into the trench, it shall be swabbed or brushed to ensure that no dirt or foreign matter will be in the finished line.

D. Pipe shall be laid on a flat bottom trench and backfill tamped to 6 inches above the top to the pipe. Pipe installation shall conform to "Type B Method" as adopted by Committee A-21 of the American Standards Association. A firm even bearing shall be provided throughout the length of each section of pipe. Pipe shall not bear on any unyielding structures, nor shall it support any other structures. All dead ends shall be plugged or capped, anchored and held in place with restrained joints as required. Except while work is in progress, all pipe openings shall be suitably plugged to prevent entrance of water or any foreign matter. Material deemed unstable for providing adequate support for pipe shall be removed and replaced by suitable material. Adequate backfill shall be deposited on the pipe to prevent floating. Any pipe, which has floated, shall be removed from the trench and reinstalled as directed by the ENGINEER.

E. Joints: All joints shall be suitable for the type of pipe being jointed and shall be made in accordance with manufacturer's recommendations.

1. Mechanical joints: Mechanical joints shall be of the stuffing box type. The gland, followed by the rubber gasket, shall be placed over the plain end of the pipe, which is inserted into the socket. The gasket is then pushed into position so that it is evenly seated in the socket. The gland shall be moved into position against the face of the socket, bolts inserted and made finger-tight. Bolts shall be tightened by a ratchet wrench suitable for the size of pipe being connected alternately, bottom, then top, etc., until the joint is completed.

2. Compression Pipe joints: Compression joints shall be a rubber seal joint, made pressure tight by a molded rubber gasket and lubricated to facilitate assembly. The joint shall be made tight by inserting the plan end into the bell after lubrication. Joints shall be made up as recommended by the manufacturer.

3. Flanged joints: Flanged joints shall be made with rubber gaskets. Bolts shall have rough square hands and hexagonal nuts and made to American Standard rough dimensions and shall be recommended size trimmed. Bolts shall be recommended size for the diameter of the pipe being jointed and shall be tightened as to distribute evenly the stress in the bolts and bring the pipe into alignment.

4. Threads shall be neatly cut with sharp tools and the jointing procedure shall conform with the best practices. Before jointing, all scale shall be reamed. All pipe shall be screwed with an application of graphite and engine oil or other approved pipe compound applied to the threads. This application shall be thoroughly wiped off the inside of every joint.

3.03 PIPE BURSTING

A. Assuming all qualifications for skill and materials are met, the Pipe Bursting will repeat the method outlined below for each section of pipe being rehabilitated. These processes may be performed in series or in parallel with other sections of pipe within the project; however, each

section will require these steps.

1. Excavate a Burst Pit (BP) at one end of the section down to pipe grade for placement of the pipe bursting equipment.

2. Excavate an Insertion Pit (IP) at the opposite end of the section down to pipe grade for entry of the product pipe.

3. Excavate Service Connection Pits (SCP)

4. Isolate the section of pipe to be rehabilitated from the rest of the system, including bypass pumping of the existing system.

5. Rod string to be assembled as it is thrust through the host pipe from Burst Pit to Insertion Pit.

6. Burst tooling and product pipe attached to rod end at Entry Pit.

7. Rod string pulled back and disassembled simultaneously while tooling and product pipe travels from Insertion Pit to Burst Pit.

8. Inspect for leaks at new connections.

9. Final connection of the replaced section of pipe into the system.

B. Contractor Pre-Qualifications – In order to assure quality execution of the method, the contractor shall submit the following to the COUNTY. The contractor shall provide documented evidence of:

1. The Pipe Bursting Contractor shall have actively engaged in the installation of pipe using pipe bursting and have installed, a minimum of 50,000 feet in similar conditions.

2. Experience must be with the use of a pneumatic or static pipe bursting system (depending on conditions and soil material) with evidence of 6, 8, 10 or 12 inch projects.

3. References must accompany each project experience submitted with detailed project description and contact information.

4. Certificate of training endorsed by the manufacturer of the pipe bursting equipment.

5. Certificate of training endorsed by the manufacturer of thermal fusion equipment in butt fusing of HDPE pipe, in lieu of certificate, evidence of training may be substituted. HOWEVER, THE COUNTY RECOMMENDS USE OF DIP OR PVC PIPE.

6. Certificate of training endorsed by the supplier or manufacturer of HDPE electro-fusion fusion couplers to be used in the method. In lieu of certificate, evidence of training may be substituted. HOWEVER THE COUNTY RECOMMENDS USE OF DIP OR PVC PIPE.

7. Field Supervisory Personnel employed by the Pipe Bursting Contractor shall documented experience in the performance of the work and tasks as stated in the contract documents.

C. Product Compliance – Certificate of compliance shall be supplied to the County that the Product Pipe is as specified in the General Requirements Section.

1. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.

D. Product Handling – Pipe transport and handling shall be per manufacturer's recommendations. Product other than pipe must be stored and handled per manufacturer's recommendations.

E. Documentation and Planning – Contractor shall submit a plan to the County on a marked up copy of the Project Drawings showing the Contractor's construction phasing and plans at the Preconstruction Meeting. Plan details should include:

1.Pit locations for pipe insertion and bust machine location.

2.Pit locations for service re-connect.

3.Schedule of when various sections are to be rehabilitated.

4. Distances of each pull.

5.Isolating points used to seal the system during the pipe burst.

The Project Construction drawings provided by the County shall be marked by the contractor to show actual locations of laterals, maintenance access structures, adapters and other reconnects. These markups shall be done the day of the actual placement. A set of marked up plans shall be returned to the County within seven (7) days of substantial completion of the pipe bursting.

F. EQUIPMENT

1. The pipe bursting unit shall be designed and manufactured to force its way through the existing line by fracturing the pipe and compressing the broken pieces into the surrounding soil as the equipment progresses. The bursting unit shall generate sufficient force to burst and compact the existing pipeline. In each case the pipe bursting unit shall pull the polyethylene pipe with it as it moves forward.

G. PIPE BURSTING EXECUTION GENERAL

1. Bypass Pumping shall be accomplished when and where necessary. The Contractor shall provide flow diversion with pumps adequate in size and capacity to handle all flows generated during the pipe burst process. All costs for bypass pumping shall be incidental unless specific pay items for this work are included in the pay schedule.

2. Excavation of insertion pits shall be at locations determined by the Contractor.

3. Insertion pits shall be of sufficient length to allow the bursting head and new HDPE pipe to enter the host pipe at an angle that will maintain the grade of the existing sanitary sewer.

H. PREPARATION

1. All sewer service connections shall be located prior to pipe bursting the main by PACP Pre-CCTV Inspection.

2. If the PACP Pre-CCTV inspection reveals obstructions or pipe materials that will prevent the existing pipe from being pipe burst properly and cannot be removed by conventional cleaning equipment, a point repair will be made by the Contractor, with approval from the Owner/Engineer. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

3. If the PACP Pre-CCTV inspection reveals a sag or hump, a sag or hump removal will be made by the Contractor, with approval from the Owner/Engineer. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

4. Before any excavation is done for any purposes, the Contractor shall contact the appropriate One Call agency for determining field locations of existing utilities. Backfill and Surface Reinstatement – Backfill used to restore pits shall be applicable Sections of Contract Documents. Lawn restoration shall be per applicable Sections of Contract Documents. Asphalt, concrete or other roadway surface restoration shall be per applicable Sections of Contract Documents.

I. INSERTION OF THE PIPE

1. The pipe shall be assembled and joined at the site using restrained joints, to provide a leak proof joint. All equipment and procedures used shall be in compliance with the manufacturer's recommendations.

2. Service connections to the pipe shall be made with materials submitted and approved in accordance with County standards.

3. If concrete encasements are encountered, a point repair shall be performed to excavate and break out concrete prior to the bursting operation to allow the steady and free passage of the pipe bursting head, with approval from the Owner/Engineer. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

6. The new pipe shall be inserted immediately behind the bursting head in accordance with the manufacturer's recommended procedures. The bursting tool shall be specifically designed and manufactured for the type of insertion process being used. It shall be utilized to guide and assist the bursting head during the operation. A pushing machine may be utilized to aid pipe insertion from the rear.

7. New pipe shall extend a minimum of 6 inches into each maintenance access structure. The annular space shall be sealed at each maintenance access structure with structure connectors and finished with a quick setting grout.

   a. SERVICE RECONNECTIONS

      1. Service connections to the pipe shall be made with materials listed on the County Products Specification Sheet (latest edition) or approved

equal. Services shall be reconnected so as to minimize disruption of service.

2. After the new pipe has been installed and tested, the Contractor shall be responsible for reconnecting existing services in the manner described in the bid form. All service lines shall be the size indicated in the plans and specifications.

3.04 INSTALLATION OF FITTINGS

A. Applicable portions of these specifications shall apply to installation of fittings. Reaction of restrained joints shall be applied at bends and tees and where changes in pipe diameter occur at reducers or in fittings.

3.05 INSTALLATION OF FIRE HYDRANTS

A. All hydrants shall stand plumb and burial line shall be set at finished grade. The pumper nozzle shall be set at 18 inches above finished grade.

3.06 INSTALLATION OF VALVES

A. All valves shall stand plumb unless otherwise shown on the plans or directed by the OWNER's Representative. The operation of installing tapping sleeves and valves shall be done by an experienced organization that has been engaged in this type of work not less than one (1) year with a representative list of successful installations. All valves shall be tagged per BCWWS.

3.07 PRESSURE TESTS

A. After pipe has been adequately backfilled all laid pipes shall be subjected to hydrostatic pressure of 150 PSI. The duration of the pressure test shall not be less than two (2) hours. Test sections shall be limited to a maximum length of 2000 feet. Care shall be taken to ensure that all air has been removed from the pipe previous to pressure tests. The CONTRACTOR shall provide such means of venting the pipe as are required. The CONTRACTOR shall replace any material or installation proving defective.

3.08 LEAKAGE TEST

A. After the main has been brought up to test pressure, it shall be held at this pressure and make up water shall be carefully measured by use of displacement meter or by pumping water from a vessel of known volume. The pipeline shall be walked and all visible joints inspected for leakage and movement of pipe. All visible leaks shall be repaired. Should any section of pipeline disclose joint leakage greater than that permitted, the CONTRACTOR shall at CONTRACTOR'S own expense, locate and repair the defective joints until leakage is within the permitted allowance.

B. The leakage test shall be conducted in accordance with AWWA Specification C-600, latest revision. Leakage shall be less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD\,P^{1/2}}{148{,}000}$$

in which L equals the allowable leakage in gallons per hour, S is the pipe length of the main tested, D is the nominal diameter of the pipe in inches, and P is the average test pressure during

the leakage test, in pounds per square inch, gauge. Length of test shall not be less than two (2) hours. Test pressure shall be 150% of working pressure at point of test but not less than 125% of normal working pressure at highest elevation . The test shall be conducted as directed by the ENGINEER.

3.09 BACKFILL

A. No trenches or excavations shall be backfilled until the trench and installation has been inspected and written approval given by the ENGINEER. All backfill shall be carefully placed to avoid movement of the pipeline. Backfill shall be free from rock, large stones, boulders, brush, or other unsuitable material. It shall be placed in the trench uniformly on both sides of the pipe for full width of the trench and to the horizontal diameter of the full length of the pipe. This backfill shall be thoroughly tamped to provide support free from voids.

B. Additional backfill shall then be placed between joints to an average depth of 12 inches over the top of the pipe where pipe is of 8 inch and smaller diameter, and 24 inches over larger pipe. Pipe joints shall remain exposed until completion of the pressure and leakage tests unless otherwise directed by the ENGINEER.

C. On completion of pressure and leakage tests, the exposed joints shall be backfilled to a depth of 12 inches above the top of the pipe. Backfill shall be carefully compacted until 12 inches of cover exists over the pipe. The remainder of the backfill shall then be placed and compacted thoroughly by puddling and tamping as required. Where directed, puddling and tamping may be omitted, and backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation.

3.10 STERILIZATION OF COMPLETE PIPELINE

A. Before the final acceptance of complete pipeline, all requirements of the OWNER and Florida Department of Health of Broward County (BCHD) shall be satisfied. Satisfactory bacteriological test results from the CONTRACTOR shall be forwarded to the ENGINEER.

B. Prior to chlorination of mains, all dirt and foreign matter shall be removed by high velocity flushing through fire hydrants or other approved blow-offs. The main shall then be filled with a chlorine solution of at least 50 parts per million of chlorine and retained in the pipe not less than twenty-four (24) hours. Chlorine residual after retention period shall be not less than 30 parts per million. After chlorination, the mains shall be thoroughly flushed with potable water and required samples taken for bacteriological analysis. Sampling to be witnessed by the ENGINEER.

3.11 RESTORATION OF SURFACE AND/OR STRUCTURES

A. The CONTRACTOR shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points and other disturbed surfaces to a condition equal to that before the work was begun and to satisfaction of the ENGINEER, and shall furnish all labor and materials incidental thereto. Relative restoration of surfaces and/or structures, the CONTRACTOR shall comply with all governing agencies requirements including city, town, county and state.

3.12 CONNECTION TO EXISTING SYSTEM

A. The CONTRACTOR shall make proper arrangements for compliance with the regulations for connection to any existing distribution system with the OWNER of that system. Taps-in and

connection will be made in strict accordance with the ENGINEER. When making connections to the existing system, the existing pipe will need to be restrained in accordance with the County standard restraint joint requirements as noted in the Contract Documents.

3.13 ABANDONMENT OF EXISTING PIPELINE

A. All water mains to be abandoned in place as shown on the drawings shall be cut and plugged after new mains and services are installed and service is properly restored to the homeowner. The pipeline shall be filled with concrete 12 inches from the end of the pipe as specified in Division 3 - Concrete, section 03010. Excavation, backfill and restoration shall be executed in accordance with the requirements of removing existing and installing new pipelines.

3.14 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02713

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work under this Section shall consist of furnishing and installing sewer pipes and service connections and/or abandonment of pipelines in place as indicated on the plans and in accordance with these Specifications.

1.03 RELATED WORK

A. Section 02221 – Excavation and Backfilling for Utilities

B. Section 02601 – Subterranean Structures

C. Section 02603 – Pump Station and Force Main

D. Section 02610 – Piping – General

E. Section 02641 – Valves – General

PART 2 PRODUCTS

2.01 GRAVITY PIPE

A. PVC plastic pipe and fittings for gravity sanitary sewers shall be un-plasticized, PVC Plastic Gravity Sewer Pipe conforming to ASTM D 3034 with C and integral wall bell and spigot joints for conveyance of domestic sewage. Sewer pipe, including laterals and fittings shall be of the same material composed of PVC plastic having a cell classification of 12454B or 12454C as defined in ASTM D 1784. Rubber sealing rings for pipe joints shall meet the requirements of ASTM D 1869. No solvent welded pipe shall be permitted.

1. In addition to the above requirements, pipe shall also conform to the following tests:

    a. Drop Impact Test in accordance with ASTM D 2444.

    b. Pipe Stiffness Test in accordance with ASTM D2412.

    c. Acetone Immersion Test in accordance with ASTM D 2152.

B. PVC plastic gravity sewer pipe shall be as manufactured by Johns-Manville, Certain-Teed Products Corporation or approved equal. Prior to delivery of PVC plastic pipe to the jobsite, CONTRACTOR shall furnish the ENGINEER complete data from the manufacturer of the type of PVC pipe and fittings CONTRACTOR proposes to install.

C. C900 plastic gravity sewer pipe (or SDR 18) shall conform to ANSI/AWWA standard for pipes 4 inch through 12 inch made from class 12454-A or class 12454-B material. C-900 shall be required to be installed where the depth of installation is 12 foot or deeper.

D. Ductile iron pipe (DIP) shall be epoxy lined and conform to ANSI/AWWA standard C151/A21.51 and C150/A21.50.

1. DIP pipe shall conform with pressure class 350 for 4-inch through 24-inch.

E. Reinforced concrete pipe (RCP) shall be manufactured in accordance with ASTM C 76, Wall Type B or C, and shall be of the class that equals or exceeds the pipe class as specified herein or as shown on the Drawings. Minimum pipe laying lengths shall be four (4) feet. Portland cement shall conform to ASTM C 150, Type II.

2.02 FORCE MAIN

A. Pipe Material

1. Force mains shall be epoxy lined ductile iron pipe as specified on the Drawings. All pipes material shall be in accordance with material specified in Section 02610 entitled “Piping – General”.

2.03 SUBMITTALS

A. Shop Drawings: Shop drawings of all sanitary sewerage system products and materials shall be furnished as specified in Section 01340 entitled "Shop Drawings, Product Data and Samples".

PART 3 EXECUTION

3.01 SEWER INSTALLATION

A. All sanitary sewer pipes shall be true to line and grade with bells up grade. The sections of the pipe shall be so laid and fitted together that when complete, the sewer shall have a smooth and uniform invert. The pipe shall be maintained clean. All pipe shall be free from defects. Trenches shall be kept dry while the pipe is being laid.

B. Bedding of the pipe shall consist of well graded ASTM C33 #67 Rock or better, requiring the bottom of the trench to be shaped to fit the bottom of the pipe for distance equal to one-half of the outside diameter of the pipe. Bell holes shall be deep enough to insure proper bearing of the pipe barrel on the bedding.

C. All joints shall be carefully fitted so as to ensure a tight waterproof joint. Joints shall not be covered until approved by the ENGINEER. The exposed end of all pipe shall be protected so as to prevent dirt or other debris from entering the pipe. Pipes shall be thoroughly flushed at the completion of the work.

3.02 SERVICE LATERAL CONNECTIONS

A. All connections, which are for future use, shall be properly capped. No pipe shall be cut

for connections unless approved by the ENGINEER. Wyes for service connections shall be installed as shown on the plans. The upper end of service connections shall be laid at a depth not less than 36 inches nor more than 48 inches below finish grade elevation, unless specifically noted otherwise on Drawings.

3.03 ABANDONMENT OF PIPELINE IN PLACE

A. All sanitary sewer gravity or force mains shown on the Drawings to be abandoned in place shall be properly cut and plugged after new mains or services are installed and service is properly restored to the homeowner. The pipeline shall be filled with concrete one foot from end of pipe as specified in Section 03010. Excavation, backfill, and restoration shall be executed in accordance with requirements for removing existing and installing new pipelines.

3.04 TESTS

A. After the joints have been inspected and approved, backfilling may be done until backfilled to one foot over the pipes. Backfilling shall be in accordance with Section 02221 of these Specifications.

B. After backfilling gravity sewers to the pavement rock base, the ENGINEER shall "lamp" the lines between manholes. If this alignment is true and no pipes are broken or misaligned, the backfilling shall be completed. After the ENGINEER has determined that the pipe has been properly backfilled and sufficient time has passed to allow any settlement but not more than 30 days after backfill, the CITY shall perform a deflection test on all sections of gravity pipeline between manholes. Refer to Paragraph I within this Section for details on video deflection testing.

C. Tests for water tightness of gravity sewers shall be made by the CONTRACTOR in the presence of the ENGINEER. The sewer and connections shall not leak under the normal exterior ground water pressure at a rate in excess of 100 gallons per inch of diameter per mile per 24 hours for any section of line up to 15 inches in diameter. Special consideration shall be given to leakage allowance for sizes larger than 15 inches in diameter. Exfiltration from individual manholes shall not exceed 4 gallons in 24 hours. A maximum run of 3 manholes may be used per test.

D. Where the crown of the pipe is below the natural ground water table at the time and place of testing, the pipe shall be tested for infiltration. Suitable watertight plugs shall be installed and sections of pipe to be tested shall be pumped dry before start of the test. Where the crown of the pipe is above the natural water table, the pipe shall be tested for exfiltration by installing necessary plugs and filling pipes and manholes with water and maintaining a static head of water of two feet above the crown of the pipe during the test. Exfiltration tests shall be conducted on gravity lines, building and house lateral lines, unless waived by the ENGINEER. With sanitary sewers, the water level or internal pressure to be used for exfiltration tests shall be determined by the ENGINEER.

E. All visible leaks, regardless of results of infiltration tests, shall be repaired. All repairs shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, the sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final

acceptance is made.

F. Repair of any defects found in the system are to be completed at the expense of the CONTRACTOR.

G. On sanitary sewers, final infiltration and exfiltration tests shall be made by the CONTRACTOR at their expense after all limerock base has been installations are completed and the sewers are cleaned and ready for use.

H. The ENGINEER shall maintain a record showing date and time of inspection, calculation of allowable exfiltration or infiltration and amount of measured exfiltration or infiltration.

I. Video review of gravity sanitary sewer pipe shall be performed by the ENGINEER and reviewed for compliance with City Minimum Standards. First lift of rock must be installed before the gravity sewer pipe is videoed and available for review and approval by the ENGINEER.

3.05 WARRANTY

A. Repair and replacement. Any repairs or replacement necessitated by mechanical failure due to faulty materials, improper installation or poor workmanship shall be completed within five (5) days after notification by the ENGINEER. At the expiration of this time, the CITY shall be entitled to have work done by others at the expense of the CONTRACTOR. Such repair work done by others shall not void the warranty nor the responsibility of the CONTRACTOR as to balance of the installation by the CONTRACTOR.

3.06 MEASUREMENT AND PAYMENT

A. Measurement and payment shall be based on actual quantities installed as more specifically discussed and described in Section 01025 entitled “Measurement and Payment”.

END OF SECTION 02722

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work included in this section consists of furnishing all labor, supplies equipment and materials necessary to complete the installation of all landscaping as shown on the Plans as base bid including the installation of sod and seeding as shown, as well as all other related responsibilities as described in these Specifications and accompanying plans.

B. Installation: All plant materials included shall be of the specific size and quality indicated on the plans and in these specifications and shall be installed in strict accordance with sound nursery practices and shall include maintenance and watering for all work outlined on the plans and specifications until final acceptance.

C. Quantities and Locations: The ENGINEER reserves the right to adjust the number and locations of the designated types and species to be used at any of the locations shown in order to provide for any modifications which might become necessary.

1.03 RELATED WORK

A. Section 02050 - Demolition

B. Section 02210 - Site Grading

C. Section 02284 - Topsoil

D. Section 02910 - Sodding

1.04 QUALITY ASSURANCE

A. Responsibility for Assuring Quality Work: The CONTRACTOR'S Superintendent shall be well versed in Florida plant material, planting operations, blue print reading, and coordination with other performing contracts or services in the job area.

All employees shall be competent and highly skilled in their particular job in order to properly perform the work assigned to them. The CONTRACTOR shall be responsible for maintaining the quality of the material on the job throughout the duration of the CONTRACT.

B. Correct Grade of Plants: In the event that it becomes apparent that any nursery supplying plants for this work has knowingly and consistently represented the grade of plants as being higher than their actual grades as determined under these provisions, all plants already delivered from such sources shall be removed from the job at the CONTRACTOR'S expense, and no further plants will be accepted from such nursery until written evidence is

submitted and confirmed that all material for delivery has been inspected and approved by inspectors of the State Plant Board as being of the grade as represented.

C. Authority for Nomenclature, Species, Etc.: All plant material shall conform to the names given in Hortus Third, 1976 edition. Names of varieties not included therein conform generally with names accepted in the nursery trade.

D. Grade Standards: All plant materials shall be nursery grown except where specified as collected material, and shall comply with all required inspections, grading standards and plant regulations as set forth by the Florida Department of Agriculture's "Grades and Standards for Nursery Plants" revised 1973, or with any superseding specifications that may be called for on the Plans or in the Specifications. ALL PLANTS NOT LISTED IN THE GRADES AND STANDARDS FOR NURSERY PLANTS, shall conform to a Florida No. 1 as to: (1) Health and Vitality, (2) Condition of Foliage, (3) Root System, (4) Freedom from Pest or Mechanical Damage, (5) Heavily Branched and Densely Foliated according to the accepted normal shape of the species, or sport, (6) Form and branching habit.

E. Balled and Burlapped (B&B) and Wire Balled and Burlapped (WB&B) Plants: These plants shall be properly protected until they are planted. The plant shall be handled only by the earth ball and not be the plant itself.

Any (B&B) or (WB&B) plant which shows evidence of having handled by a method other than the method outlined above, and resulting in a cracked or broken ball or of the roots being loosened within the ball shall be rejected.

For plants grown in soil of loose texture, which does not readily adhere to the root system, (especially in the case of large plant material), WB&B plants may be specified. For WB&B plants, before plant is removed from the hole, sound hog wire shall be placed around the burlapped ball and looped and tensioned until the burlapped ball is substantially packaged by the tightened wire netting, such as to prevent disturbing of the loose soil around the roots during handling. Any wire, synthetic material or chemically treated material will be removed from the rootball at planting time, all ties shall be removed from the rootball and around the trunk at planting.

F. Container Grown Plants (CG): Any Container Grown (CG) plants, which have became "pot bound" or for which the top system is out of proportion (larger) to the size of the container, will not be acceptable.

With metal containers, unless the root-ball system slips easily and unbroken from the can, a nursery can-cutter shall be used to slit the can in such a way that the can may be opened fully.

CG plants shall not be removed from the can until immediately before planting, and with all due care to prevent damage to the root system.

G. Submit to the ENGINEER the names and locations of nurseries proposed as sources of acceptable plant material. The ENGINEER reserves the right to visit the nursery to inspect and/or select the specified material.

H. The ENGINEER will be included in the hand selecting of all Live Oaks for the project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Inspection and Transporting: Movement of nursery stock shall comply with all Federal, State, and local laws and regulations. Therefore, required inspection certificates shall accompany each shipment, and shall be filed with the ENGINEER.

Wrap root balls with burlap. Wire wraps burlap if root ball is not sufficiently compacted. Palms will not require burlap wrapping if the following requirements are met:

1. Dug from marl or heavy soil that adheres to roots and retains shape without shattering.

2. Moistened material used to cover ball and roots not exposed to wind and sun.

3. Transport material on vehicles large enough to allow plants not to be crowded. Plants shall be covered to prevent wind damage during transit and shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period, which the plants are in transit, being handled, or are in temporary storage.

B. All plant material shall not remain on the work site longer than two (2) days prior to being installed.

1.06 SUBSTITUTIONS

A. Substitutions of plant types or change in the size of plant material will only be permitted upon submission of documented proof that the particular plant type and size specified is not obtainable.

B. Where B&B or WB&B plants are specified, CG plants of the same species, etc., will not be accepted. Where a B&B or WB&B is not specified on a particular plant material, B&B, WB&B or CG plants may be used provided they meet all specifications.

1.07 GUARANTEE

A. All plant material shall be guaranteed for a minimum of one (1) calendar year from the time of final acceptance.

1.08 REPLACEMENT

A. The guaranteeing of plant material shall be construed to mean the complete and immediate replacement of plant material if it is:

1. Not in a healthy growing condition.

2. There is a question to its survival ability at the end of the guarantee period.

3. It is dead.

1.09 SIZE, QUALITY AND GRADE OF REPLACEMENT

A. Replacement plant material shall be of the same species, quality and grade as that of the plant to be replaced. The size of the replacement shall not necessarily be the same size as the original specified plant at its initial planting but shall closely match specimens of the same species. Replacements shall be guaranteed for a period equal to the originally specified guarantee. This guarantee period shall begin at time of plant replacement.

1.10 GUARANTEE NULL AND VOID

A. The guarantee shall be null and void for plant material which is damaged or dies as a result of "Act of God" limited to hail, freeze, lightening, winds which exceed hurricane force, and lethal yellowing, providing the plant was in a healthy growing condition prior to these "Acts of God".

PART 2 - MATERIALS

2.01 PLANT MATERIAL

A. Florida No. 1: Except where another grade is specifically called for in the Plans, all plant material shall be no less than Florida No. 1 at the time of final inspection immediately prior to the acceptance by the CITY.

B. Habit of Growth: All plant material shall have a habit of growth that is normal for that species and shall be sound, healthy, vigorous and free from insects, plant diseases, injuries, and dead limbs.

C. Branching, Leafing, Measurements and Ball Sizes:

1. Trees and Shrubs: Requirements for the measurement, branching character, ball diameter, depth and other standards shall follow the Code of Standards recommended by the American Association of Nursery Stock, Bulletin Z-60.1-1973 and as revised.

2. Palms: Requirements for the measurement of clear trunk, clear wood and graywood ball diameter and depth shall comply with requirements as set forth by the Florida department of Agriculture's "Grades and Standards for Nursery Plants, Part II for Palms and Trees".

D. Die-Back and Leaf-Drop: Plant material showing signs of die-back or leaf-drop will not be accepted and must be removed from the job immediately if so directed by the ENGINEER. Therefore, any plant material with tendencies toward leaf-drop or dieback must be root pruned early enough to provide a sound network of hair roots prior to relocation to the job site.

E. Mechanical Destruction of Foliage: Mechanical destruction of foliage resulting from root pruning shall not effect more than 10% of the total foliage prior to planting on the job site. Loss of foliage caused by seasonal change will be accepted.

F. Spanish Moss: If Spanish Moss (Tillandsia usneoides) exists on plant material, it shall be completely removed prior to planting on the job site.

G. Palms: Before transporting, see Delivery, Storage and Handling; for requirements related to wrapping of root balls.

1. Remove a minimum of fronds from the crown of the palms to facilitate transporting and handling.

2. Palms with burn marks, nail holes, and frond boots on trunk shall not be accepted.

3. Using untreated burlap strip or untreated cotton twine, tie Sabal Palmetto buds and leave in place until Palmetto is established. Tying shall be as set forth in Florida Department of Agriculture's "Grades and Standards for Nursery Plants". Tying of other palms shall be at the option of the CONTRACTOR.

4. To reduce head volume, Palm fronds may be taper trimmed by not more than one-third (1/3).

5. Palm trees showing cable or chain marks and equipment scars shall be rejected.

H. Chlorosis: The allowable level of Chlorosis in foliage shall be as set forth in the Florida Department of Agriculture's "Grades and Standards for Nursery Plants".

2.02 PLANTING SOILS

A. General Type: All plant material with the exception of Sabal palmetto shall be planted with planting soil mixed with 50% original soil, if the soil is of good quality, as determined by the ENGINEER. The planting soils shall be sandy loam (50% sand, and 50% muck) typical of the locality. The soil must be taken from ground that has never been stripped, with a slight acid reaction (5.5 to 6.5 ph) and without an excess of calcium or carbonate. Soil shall be delivered in a loose friable condition.

B. Special Type: Planting soil for palms shall be a good grade of salt free sand, which is free of all weeds.

2.03 WATER

A. Water shall be potable, from municipal water supplies or other sources, which are approved by a public health department.

2.04 MULCH

A. Mulch shall be Eucalyptus mulch or other approved non-native tree bark mulch. It must be uniformly shredded and be free from pieces of bark larger than 1", foreign matter, weed seeds and any other organic or inorganic material. Submit sample for approval. CONTRACTOR shall apply one application at initial installation and a second application prior to final acceptance.

2.05 FERTILIZER

A. New Plant Material: Trees, palms and shrubs, fertilize with Agriform planting tablets, 20-20-5 formula, 21 gram or approved equal.

B. New Ground Covers: Fertilize with an approved fertilizer of fifty percent (50%) or greater organic 6-6-6 or 8-8-8 with minor elements including, but not limited to, iron zinc and manganese.

C. Composition of Quality: All fertilizer shall be uniform in composition and dry. Granular fertilizer shall be free flowing and delivered in manufacturers standard container with name of material, weight and guaranteed analysis printed on container. Tabletized fertilizer shall be delivered in unopened containers or boxes. All bags, containers or boxes shall be fully labeled with the manufacturer's analysis. Submit labels to ENGINEER for approval prior to placement of fertilizer.

D. All shall comply with the State of Florida fertilizer laws.

2.06 PRUNING PAINT

A. Pruning Paint shall be commercial tree paint, which is waterproof, antiseptic, adhesive, elastic and free of kerosene, water, cresol and any other substances harmful to plant material.

2.07 VEGETATIVE ROOT INHIBITOR

A. A vegetative root inhibitor shall consist of a polypropylene fabric with root control time-release modules of Trifluralin with an effective life of 100 years or approved equal.

B. Vegetative root inhibitor shall Bio-Barrier as manufactured by Reemay, Inc. or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Utilities: The location and existence of utilities (overhead and underground) shall be thoroughly investigated and verified by the CONTRACTOR before the work begins in the area of said utilities. The CONTRACTOR shall exercise care in digging and work so as not to damage existing utilities in said areas, such as underground pipes, cables, wires, etc. Should such overhead or underground obstructions be encountered which interfere with planting, the ENGINEER shall be consulted immediately in order for a decision to made on the relocations of plant material to clear such obstruction. The CONTRACTOR shall be responsible for the immediate repair of any damage to utilities caused by CONTRACTOR's work.

3.02 PREPARATION

A. Staking Plant Locations: Plant locations must be staked or marked prior to plant hole excavation or placing on deck, by scaling the plants from existing features found on-site and shown on the plans or by given dimensions if shown.

B. Spacing of Shrubs: Shrub beds located next to another bed, walkway, structure, etc., shall have the plants along the perimeter spaced so that the plants can mature properly without growing into the other bed, walkway, structure, etc.

C. Excavation of Plant Holes: Excavation of plant holes shall be roughly cylindrical in shape with the sides approximately vertical. The ENGINEER reserves the right to adjust the size and shape of the plant hole and the location of the plant in the hole to compensate for unanticipated structures or unanticipated factors. All plant holes shall be sufficiently deep to allow the rootball to set on existing soil and have root collar at grade level. Plants shall be centered in the holes with the tree trunk locations scaled from existing permanent structures as shown on the drawings. Plants shall be set straight or plumb in locations. All plant holes to accommodate plants with ball sizes less than 24" in diameter shall be at least 18" greater than the diameter of the ball. All plants holes to accommodate plants with ball sizes two feet (2') and larger in diameter shall be at least twice the diameter of the ball. The excavated material from the plant holes may not be used to back-fill around the plant material. Such material shall be disposed of either on the project site or off the site as directed by the ENGINEER. Plant holes for shrub material planted in mass shall meet all requirements listed above for plant holes. However, they shall not be individual holes but one continuous hole or excavation. Plant holes for hedge material shall also meet all requirements listed above for plant holes, however, a continuous trench shall be used in lieu of individual holes.

3.03 INSTALLATION

A. Setting of Plants:

1. When lowered into the hole the plant shall rest on the prepared hole bottom such that the roots after settlement are level, or slightly above the level of its previous growth condition and the final level of the ground around the plant shall conform to the surrounding grade. The plants shall be set straight or plumb or normal to the relationship of their growth prior to transplanting. The ENGINEER reserves the right to realign any plant material after it has been set.

2. Palms of the Sabal species may be set deeper than the depth of their original growth condition in order to lessen the necessity for support or bracing. For such deeper planting however, it will be required that the underlying soil be friable and that the clear trunk requirements set forth in the plant list be maintained from the finished grade and NOT from the previous grade of the palm trees before it was transplanted.

3. Plant material of the shrub category and smaller must be handled by the ball only. Plant material too large for hand handling, if moved by winch or crane, must be thoroughly protected from chain, rope or cable marks, girdling, bark slippage, limb breakage and any other damage that might occur by improper handling or negligence.

4. All palm trees handled by the trunks must be wrapped with burlap and wood battens, held in place by banding strips as called for in the details.

B. Backfilling:

1. Use planting soils specified in Article 2.02, Planting Soil. Backfill to the bottom two thirds of the planting hole and firmly tamp and settle by watering as backfilling progresses. After having tamped and settled the bottom two thirds (2/3) of the hole, thoroughly puddle with water and fill remaining one third (1/3) of the hole with planting soil, tamping and watering to eliminate air pockets.

C. Application of Fertilizer:

1. Fertilize New Planting (Trees, Palms and Shrubs) as follows:

a.

Specified Container Size	Application Rate
1 gallon container	1 tablet
3 gallon container	2 tablets
5 gallon container	3 tablets
7 gallon container	5 tablets

b. Large tubs or boxes and B&B material shall receive one (1) tablet for each one-half (1/2) inch of trunk diameter (measured three (3) feet from ground). For large shrubs, one (1) tablet for each one (1) foot of height or spread.

D. Mulch: Within 24 hours after planting, planting areas must be mulched as called for in these specifications. The mulch shall be uniformly applied to a depth of two (2) inches over all shrub, tree and groundcover areas and any areas indicated on the plans.

E. Staking and Guying shall be installed within 24 hours; in accordance with details.

F. Initial Watering: Initially, water the plant material to develop uniform coverage and deep-water penetration of at least six inches (6"). Avoid erosion, puddling, and washing soil away from plant roots.

G. Hand Watering: Provide hand watering of plant material as necessary subject to weather conditions, to maintain healthy growing conditions until final acceptance. This shall be in addition to water received from irrigation system, if any.

H. Pruning:

1. The amount of general pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit of shape of a plant, and in accordance with National Arborist Association standards for pruning.

2. All broken or damaged roots shall be cut off smoothly. The tops of all trees shall be pruned in a manner complying with standard horticultural practices. All cut surfaces of one-half inch (1/2") or more in diameter above ground level shall be treated with approved commercial tree paint.

I. Weeding: In the event that weeds or undesirable vegetation becomes prevalent to such an extent that they threaten plant material, they shall be removed as directed by the

ENGINEER. If necessary, the plant material and/or planting soil shall be replaced as needed to eliminate the weeds at the expense of the CONTRACTOR.

3.04 CLEANING AND PROTECTION

A. Disposal of Trash: All debris and other objectionable material created through planting operations and landscape construction shall be removed completely on a daily basis from the job or as directed by the ENGINEER. Excess soil shall be disposed of as directed by the ENGINEER.

B. Responsibility for Protection and Restoration of Property: The CONTRACTOR shall be responsible for all damage to property whether it is accidental or necessary for the completion of the contract.

C. Protection Against Mechanical Damage: The CONTRACTOR's responsibility for protection against mechanical damage shall include providing protection from vehicles and providing warning signs and barricades as might be necessary and CONTRACTOR shall repair, restore and replace any planting areas which become damaged as a result of any negligence of the CONTRACTOR or CONTRACTOR's employees in complying with these requirements. Coordination shall be with the CITY and the ENGINEER.

D. Responsibility Prior to Final Acceptance:

1. Maintenance shall begin immediately after each plant is planted and continue until final acceptance.

2. Plants shall be watered by hose, soaking thoroughly each day for the first two weeks (14 calendar days) and every other day for the following two week period. Soaking then shall continue on a twice weekly basis for another period of three (3) weeks for material over five feet (5') height, amounting to a total of 28 days after installation of planting under five feet (5') and a total of 45 days for plants over five feet (5'). All watering is required without regard to an irrigation system.

3. Plant maintenance shall include watering, pruning, weeding, cultivating, mulching, tightening and repairing of guys, stakes, braces, etc., replacement of sick or dead plants, resetting plants to proper grades or upright position and maintenance of the watering saucer, and all other care needed for proper growth of the plants. Plant material rejected during the course of the construction shall be removed within five (5) working days and replaced before the inspection for completion will be scheduled.

4. During the maintenance period and up to the issuance of Certificate of Final Acceptance, the CONTRACTOR shall do all seasonal spraying and/or dusting of all planting. The materials and methods shall be in accordance with the highest standard nursery practices and as recommended by the CITY, or Horticultural Engineer and approved by the ENGINEER, prior to implementation.

5. Planting areas and plants shall be protected against trespassing and damage. If any plants become damaged or injured they shall be treated or replaced, as directed

and in compliance with this specification. No work shall be done within or over planting areas or adjacent to plants without proper safeguards and protection.

3.05 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on actual quantities installed as more specifically discussed and described in SECTION 01025 of MEASUREMENT AND PAYMENT.

END OF SECTION 02900

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work included in this section consists of furnishing all labor, supplies, equipment and materials necessary to complete the installation of sod and associated materials herein after listed and as shown on the plans.

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02210 - Site Grading

C. Section 02284 - Top Soil

D. Section 02900 - Landscape Work

1.04 QUALITY ASSURANCE

A. Sodding work shall be performed by a firm specializing in sodding.

B. Source Quality Control: Ship sod with certificates of inspection as required by governing authorities.

Do not make substitutions. If specified sod is not obtainable, submit proof of non-availability to ENGINEER, together with proposal for use of equivalent material.

C. Analysis and Standards: Package standard products with manufacturer have certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.05 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Plant and Material Certifications:

1. Certificate of inspection as required by governmental authorities.

2. Manufacturer's or vendor's certified analysis for soil amendments or fertilizer materials.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying.

C. Transporting:

1. Sod transported to the project in open vehicles shall be covered with tarpaulin or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod material. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.

2. Sod shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.

3. Upon arrival at the temporary storage location or the site of work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the ENGINEER will reject the sod. When sod has been rejected, the CONTRACTOR shall remove it at once from the area of the work and replace it.

4. Unless otherwise authorized by the ENGINEER, the CONTRACTOR shall notify the ENGINEER at least 48 hours in advance of the anticipated delivery date of sod material. A legible copy of the invoice, showing species and variety of sod included for each shipment shall be submitted to the ENGINEER. Certificate of Inspection must accompany each sod shipment.

1.07 JOB CONDITIONS

A. Begin installation of sod after preceding related work is accepted.

B. Environmental Requirements:

1. Install sod during months acceptable to the ENGINEER.

2. Do not install sod on saturated soil.

C. Protection: Erect signs and barriers to control vehicular traffic.

D. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

1.08 SEQUENCING AND SCHEDULING

A. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

B. Coordination with sodding: Plant trees, palms and shrubs after final grades are established and prior to planting of sod, unless otherwise acceptable to ENGINEER. If planting of trees, palms and shrubs occurs after sod work, protect sod areas and promptly repair damage to lawns resulting from planting operations.

1.09 SPECIAL PROJECT WARRANTY

A. Warranty sod through specified lawn maintenance period, and until final acceptance.

PART 2 - PRODUCTS

2.01 PLANTING SOIL

A. Provide new planting soil that is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.

B. Obtain planting soil from local sources or from areas having similar soil characteristics to that found at project site.

C. Refer to Section 162 of the "FDOT Standard Specifications for Road and Bridge Construction" dated 1991 for Topsoil Specifications.

2.02 COMMERCIAL FERTILIZER

A. For sod, provide fertilizer with percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 1,000 sq. ft. of lawn area and not less than 4 percent phosphoric acid and 2 percent potassium. Provide nitrogen in a form that will be available to sod during initial period of growth; at least 50 percent of nitrogen to be organic form.

2.03 SOD

A. Provide strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses, and machine cut to pad thickness of 1-1/2 inch (plus or minus 1/4 inch), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

B. Provide sod uniform pad sizes with maximum 5 percent deviation in either length or width. Broken pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected.

C. Provide sod composed of the following:

1. Bahia sod
2. St. Augustine

D. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been

mowed regularly and carefully maintained from planting to harvest.

E. American Sod Producers Association (ASPA) Grade: Nursery Grown or Approved. Field grown sod is not acceptable.

F. Furnished in pads:

1. Size:

a. Length: 24 inches plus or minus 5%
b. Width: 18 inches plus or minus 5%
c. Thickness: 1-1/2 inches excluding top growth and thatch

2. Not stretched, broken or torn

G. Uniformly mowed height when harvested: 2 inches

H. Thatch: Maximum 1/2 inch uncompressed

I. Inspected and found free of disease, nematodes, pests, and pest larvae, by entomologist of State Department of Agriculture.

J. Weeds: Free of Bermuda grass, nut grass or other objectionable weeds.

K. Uniform in color, leaf texture, and density.

2.04 WATER

A. Water shall be potable, from municipal water supplies or other sources which are approved by a public health department.

2.05 FERTILIZER

A. FS O-F-241c (1), Grade A or B.

B. The chemical designation shall be 1-8-8, with at least 50 percent of the nitrogen from a non-water-soluble organic source.

2.06 HERBICIDES

A. As recommended by the State Department of Agriculture.

2.07 STAKES

A. Softwood, 3/4-inch diameter, 8-inch length.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND SURFACE

A. Before mixing, clean planting soil of roots, plants, sods, stones, clay lumps, and other extraneous material harmful or toxic to plant growth.

B. Mix specified fertilizers with planting soil as necessary at rates specified. Delay mixing fertilizer if planting will not allow placing of planting soil within a few days.

C. For sod, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

3.02 PREPARATION OF PLANTING BEDS

A. Loosen subgrade of lawn areas to a minimum depth of 4 inches. Remove stones measuring over 1 1/2 inches in any dimension. Remove sticks, stones, rubbish, and other extraneous matter. Limit preparation to areas, which will be planted promptly after preparation.

B. Spread planting soil to minimum depth of 2" or as required meeting lines, grades, and elevations shown, after light rolling and natural settlement. Add specified fertilizer and mix thoroughly into upper 4 inches of topsoil.

C. Place approximately 1/2 of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil. Add specified soil amendments and mix thoroughly into upper 4 inches.

D. Where sod is to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than 6 inches. Apply fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

E. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of CITY's property. Do not turn existing vegetation over into soil being prepared for lawns.

F. Allow for sod thickness in areas to be sodded.

G. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2 inches of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.

H. Fine grade sod areas to smooth, even surface with loose, uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas, which can be planted immediately after grading.

I. Moisten prepared sod areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting lawns. Do not create a muddy soil condition.

J. Restore sod areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

3.03 SODDING NEW LAWNS

A. Lay sod within 24 hours from time of stripping.

B. Lay sod to form solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

C. Anchor sod on slopes with wood pegs to prevent slippage.

D. Water sod thoroughly with a fine spray immediately after planting.

3.04 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain lawns for not less than 30 days after substantial completion, and longer as required to establish an acceptable lawn.

C. Maintain sod by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

D. Mowing:

1. Whenever grass reaches a height of 3 inches, it shall be cut back to 2" with all clippings removed.

2. After two mowings, CONTRACTOR shall topdress the sod with an application of fertilizer at the rate of 1 pound of actual nitrogen per 1,000 square feet.

3.05 CLEANUP AND PROTECTION

A. During sodding work, keep pavements clean and work area in an orderly condition.

B. Protect sodding work and materials from damage due to landscape operations, operations by other CONTRACTORs and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged sod work as directed.

3.06 INSPECTION AND ACCEPTANCE

A. Sod areas will be accepted when in compliance with all the following conditions:

1. The roots are thoroughly attached to the soil.
2. Absence of visible joints.
3. All areas show a uniform stand of specified grass in healthy condition.
4. At least 60 days have elapsed since the completion of the work in this section.

B. When inspected sod work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from project site.

C. Procedure:

1. The CONTRACTOR shall submit a request for acceptance in writing to the ENGINEER. Request must be received not less than 10 days before the anticipated date for final inspection.

2. Upon completion of all repairs and/or renewals required by ENGINEER at the inspection, the ENGINEER will verify the completeness of the work and then notify the CITY in writing that the work is accepted.

3. Upon completeness, the CITY will assume maintenance of all sod areas.

3.07 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on actual quantities installed as more specifically discussed and described in SECTION 01025 of MEASUREMENT AND PAYMENT.

END OF SECTION 02910

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the concrete work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Including but not necessarily limited to the following:

1. Form work, shoring, bracing and anchorage
2. Concrete reinforcement and accessories
3. Cast-in-place concrete
4. Plugging abandoned pipelines and/or structures in place

1.03 RELATED WORK

A. Section 02510 - Concrete sidewalk

B. Section 02513 - Asphaltic Concrete Paving - General

C. Section 02515 - Portland Cement Concrete Paving

D. Section 03300 - Cast-in-Place Concrete

E. All applicable sections of Division 1, 2, 3 and 4

1.04 QUALITY ASSURANCE

A. All work shall be in accordance with ACI 301, latest edition, a copy of which shall be maintained on site.

B. Requirements of Regulatory Agencies: perform work in accordance with local building and other applicable codes.

C. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.

D. Inspection and Testing:

1. Test Cylinders - As per ASTM C-39.

a. Minimum of three (3) concrete test cylinder shall be taken for every 75 or less cubic yards of concrete placed each day.

b. Minimum of one (1) slump test shall be taken during any cold weather concreting, and be cured on job site under same conditions as the concrete it represents.

2. Slump Test - As per ASTM C-143.

a. Minimum of one (1) slump test shall be taken for each set of test cylinders taken.

1.05 SUBMITTALS

A. Test Reports: Reports of concrete compression, yield, air content and slump tests.

B. Certificates:

1. Manufacturer's certification that materials meet specification requirements.

2. Material content per cubic yards of each class of concrete furnished.

a. Dry weights of cement
b. Saturated surface-dried weights of fine and course aggregate
c. Quantities, type and name of all mixtures
d. Weight of water

3. Ready-mix delivery tickets as per ASTM C-94.

C. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

2. Indicate reinforcement sizes, spaces, locations and quantities or reinforcing steel, and wire fabric, bending and cutting schedules, splicing and supporting and spacing devices.

3. Indicate formwork dimensioning, materials, arrangement of joints and ties.

4. Shop drawings shall be prepared under seal of a Professional Structural Engineer, registered in the State of Florida.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

1.07 JOB CONDITIONS

A. Allowable concrete temperatures:

1. Hot weather: Maximum 90 degrees F as per ASTM C-94.

B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Materials shall conform to ACI 301, latest edition.

B. Plywood forms: Douglas Fir Species, solid one side, form grade, sound undamaged sheets

C. Lumber: Southern Pine Species, No. 2 Grade, with grade stamp clearly visible

D. Form Ties: Removable, snap-off metal, of fixed and adjustable length, cone ends

E. Tubular Column Type: Round, spirally wound laminated fiber material, clearly visible

2.02 REINFORCING STEEL

A. Reinforcing steel shall conform to ASTM A615, 60 ksi yield grade billet steel reformed bars; uncoated finish.

B. Welded steel wire fabric shall conform to ANSI/ASTM A185, plain type; coiled rolls, uncoated finish.

2.03 CONCRETE MATERIALS

A. Cement: shall conform to ASTM C150, normal Type II Portland, gray color.

B. Fine and coarse aggregate shall conform to ASTM C33.

C. Water: clean and not detrimental to concrete.

2.04 ADMIXTURES

A. Air Entraining: ASTM C-260

B. Chemical: Type (as required) ASTM C-494

C. Fly Ash and Pozzolans: ASTM C-618

D. Color - Conditioned Concrete: ASTM C-494 and ASTM C-979

2.05 ACCESSORIES

A. Non-shrink grout: pre-mixed compound with non-metallic aggregate, cement, water reducing and plasticing agents; capable of minimum compressive strength of 3500 psi.

B. Construction joints: locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to the ENGINEER. Place construction joints perpendicular to the main reinforcement, continue reinforcement across construction joints.

C. Expansion joints: shall be a minimum of 3/4-inch thick asphalt impregnated fiberboard as per ASTM D-1751.

D. Form release agent shall be a colorless material, which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

E. Water shall be clear and potable.

2.06 CURING MATERIALS

A. Water shall be clean and potable.

B. Absorptive mat shall be burlap fabric of 9 oz./sq. yd. clean, roll goods complying with AASHTO M182, Class 3.

C. Membrane curing compound shall conform to ASTM C309.

D. Clear Sealer: "Clear Bond" as manufactured by Guardian Chemical Co., Dayton Day-Chem Cure-W (J-9-A) or approved equal.

E. Color curing compound shall be liquid membrane-forming conforming to ASTM C 309 two-component Lithochrome Colorwax by L.M. Scofield Company, or approved equal, color to match admixture for color-conditioned concrete.

2.07 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Concrete:

1. Compressive strength (28 days): 3000 psi
2. Slump: 4(±) 1 inch

C. Concrete / Flowable fill for grouting and plugging:

1. Compressive strength (28 days) 2000 psi
2. Slump: as required to grout and plug

PART 3 - EXECUTION

3.01 FORMWORK ERECTION

A. Verify lines, levels, and measurement before proceeding with formwork.

B. Hand trimed sides and bottom of earth forms; remove loose dirt.

C. Align form joints.

D. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings, which may be affected by agent.

E. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.

3.02 REINFORCING

A. Place, support and secure reinforcement against displacement.

3.03 PLACING CONCRETE

A. Color Conditioned concrete, when batching, shall not be less than one-third of the capacity of the mixing drum (a minimum of four yards for a ten yard mixer) and will be in full cubic yard increments.

B. Notify ENGINEER minimum 24-hours prior to commencement of concreting operations.

C. Scratch, float, trowel, broom or belt finish surfaces, as scheduled or indicated on the Drawings.

D. Place 2000 psi concrete for pugging and grouting pipelines and structures in-place as required after proper connection to new service and function of system is complete.

3.04 TOLERANCES

A. Provide Class B tolerance to floor slabs according to ACI 301. Pitch to drains 1/4 inch per foot.

3.05 FINISHES FOR EXPOSED SURFACES

A. Provide exposed surfaces with finishes as called for on the Drawings.

3.06 CONCRETE CURING

A. Curing for standard grey work after finishing, cure concrete by keeping moist for one (1) week after placement. Floors and vertical surfaces may be sprayed with an approved curing compound to retard evaporation of water, if spraying is not objectionable because of future finishing requirements. Begin curing operations as soon as concrete has attained its initial set. Keep exposed concrete surface moist for at least one (1) week.

B. Apply a liquid membrane-forming compound, conforming with ASTM C 309, color to match that of the color condition concrete. Apply on flat work immediately after the finishing operation pursuant to the manufacturers recommendations.

3.07 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete work shall be included in the bid price of any item in the bid schedule for which concrete products, materials, or appurtenances are required.

END OF SECTION 03010

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Formwork for Cast-In-Place Concrete, with shoring, bracing, and anchorage

B. Openings for other affected work

C. Form accessories

D. Stripping forms

1.03 RELATED WORK

A. Section 03010 - Concrete.

B. Section 03200 - Concrete Reinforcement

C. Section 03300 - Cast-In-Place Concrete

1.04 SYSTEM DESCRIPTION

A. Design, engineer and construct formwork, shoring and bracing to meet design code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.05 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI 301 and 347.

1.06 SUBMITTALS

A. Indicate pertinent dimensions, materials, and arrangement of joints and ties.

B. Prepare shop drawings under seal of Professional Structural Engineer registered in the State of Florida.

C. Manufacturers certification that materials meet specification requirements.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials in accordance with manufacturers' recommendations.

B. Deliver form materials in manufacturer's packaging with installation instructions.

C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

D. Remove packaging from void forms.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Plywood: Douglas Fir Species; medium density overlaid one side grade; sound, undamaged sheets with straight edges.

B. Lumber: Southern Pine Species; No. 2 grade; with grade stamp clearly visible.

C. Tubular Column: Round, of spirally wound laminated fiber type; surface treated with release agent; of size required.

2.02 FORMWORK ACCESSORIES

A. Form Ties: Snap-off metal of adjustable length; cone type; 1 1/2 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches diameter in concrete surface.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding in color characteristics of coating intended for use on concrete.

C. Fillets for Chamfered Corners: Wood strips or rigid PVC plastic in maximum possible lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; or strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 PREPARATION

A. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.

B. Minimize form joints. Symmetrically align joints and make weathertight to prevent leakage of mortar.

C. Arrange and assemble formwork to permit dismantling, stripping, so that concrete is not damaged during its removal.

D. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.03 ERECTION

A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.

B. Camber slabs and beams to achieve ACI 301 tolerances.

C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly lifted so that joints will be apparent in exposed concrete surfaces.

D. Provide expansion strips on external corners of beams and columns, where exposed.

E. Install void forms. Protect from moisture before concrete placement. Protect from crushing during concrete placement.

F. Construct formwork to maintain tolerances in accordance with ACI 301.

3.04 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

B. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes or applied coverings, which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for work embedded in or passing through concrete.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.06 FORM REMOVAL

A. Notify ENGINEER prior to removing formwork.

B. Do not remove forms and shoring until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Remove load-supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is restored.

C. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50

degrees F for 24-hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

D. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location of members.

E. Restore structural members due to design requirements or construction conditions to permit successive construction.

F. Remove formwork progressively so no unbalanced loads are imposed on structure.

G. Do not damage concrete surfaces during form removal.

H. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.

I. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

3.07 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through clean-out ports.

3.08 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete formwork shall be included in the bid price of any item in the bid schedule for which concrete formwork is required.

END OF SECTION 03100

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Reinforcing steel bars, welded steel wire fabric, fabricated steel bar or rod mats for cast-in-place concrete

B. Support chairs, bolsters, bar supports, spaces, for supporting reinforcement

1.03 RELATED WORK

A. Section 03010 - Concrete

B. Section 03100 - Concrete Formwork

C. Section 03300 - Cast-In-Place Concrete

1.04 QUALITY ASSURANCE

A. Perform concrete reinforcement work in accordance with CRSI Manual and Standard Practice, and Documents 63 and 65.

B. Conform to ACI 301.

1.05 SUBMITTALS

A. Indicate sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.

B. Prepare shop drawings under seal of Professional Structural ENGINEER registered in the State of Florida.

C. Submit mill test certificates and supplied concrete reinforcing, indicating physical and chemical analysis.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel: ASTM A615, 60-ksi-yield grade billet-steel, deformed bars, uncoated finish

B. Welded Steel Wire Fabric: ANSI/ASTM A185 plain type; in coiled rolls; uncoated finish

C. Stirrup Steel: ANSI/ASTM A82

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gauge annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete, including load bearing pad on bottom to prevent vapor barrier puncture.

C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: Plastic coated or stainless steel type; sized and shaped as required.

2.03 FABRICATION

A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300.

B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles or coatings.

B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

C. Do not dispose or damage vapor barrier required by Section 03300.

3.08 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete reinforcement work shall be included in the bid price of any item in the bid schedule for which concrete reinforcement is required.

END OF SECTION 03200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1-General Requirements shall govern the WORK under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Cast-In-Place Concrete Work, as indicated on the drawings, as specified herein or both except as for items specifically indicated as "NIC ITEMS".

B. Including but not necessarily limited to the following:

1. Cast-In-Place concrete walls, footings, foundation walls, paving, walks, slabs, formwork, reinforcing and all other components as indicated on the Drawings.

1.03 RELATED WORK

A. Section 03010 - Concrete.

B. Section 03100 - Concrete Form work.

C. Section 03200 - Concrete Reinforcement.

D. Section 03370 - Concrete Curing.

E. Section 02510 - Concrete Sidewalk

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Minimum of 5 comparable concrete projects.

B. Requirements of Regulatory Agencies: Perform work in accordance with local building codes.

C. Allowable Tolerances: Flat work true to plane 1/8 inch in 10 feet.

D. Slump tests as per ASTM C-143, and test cylinders as per ASTM C-39.

1.05 TESTS

A. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

C. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein.

D. Three (3) concrete test cylinders will be taken for every 75 cubic yards. or less of each class of concrete placed each day.

E. One (1) slump test will be taken for each set of test cylinders taken.

F. All testing shall be at the expense of the CONTRACTOR.

1.06 SUBMITTALS

A. Provide product data for specified products.

B. Test Reports: Reports of concrete compression, yield, air content, and slump tests.

C. Certificates:

1. Manufacturer's certification that materials meet specification requirements.

2. Material content per cubic yard of each class of concrete furnished.

   a. Dry weights of cement.
   b. Saturated surface-dried weights of fine and coarse aggregate.
   c. Quantities, type and name of admixtures.
   d. Weight of water.

3. Ready-mix delivery tickets, ASTM C-94.

D. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

2. Indicate bar schedules, stirrup spacing, and diagrams of bend bars.

3. Detail items of form systems affecting appearance of architectural concrete surfaces such as joints, tie holes, liners, patterns and textures. Show items in relation to entire form system.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Allowable concrete temperatures:
- Hot Weather: Maximum 90° F as per ASTM C-94.

B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 MATERIALS & MANUFACTURERS

A. Concrete Ready-Mix concrete ASTM C-94.

1. Cement:

a. ASTM C 150, Type II

2. Admixtures:

a. Air entraining: ASTM C-260
b. Chemical: Type (as required) ASTM C-494.
c. Fly ash and pozzolans: ASTM C-618
d. Vapor Barrier: 6-mil thick film of type recommended for below grade application.

3. Coarse aggregate: Not less than 50% clean, hard, crushed stone conforming to requirements of Table 2, size number 467 ASTM C-33.

4. Slump 4 in. maximum; plus tolerance 0, minus tolerance 1 inch.

5. Air content: 5% + 1%.

6. Mix proportioning:

a. In accordance with ASTM C-94.
b. 28 day compressive strength of moist cured laboratory samples 3,000 PSI.
c. Use set retarding admixtures during hot weather only when approved by ENGINEER.
d. Minimum cement contents 5 sacks/cubic yards.
e. Add air-entraining agent to concrete work exposed to exterior.

7. Curing Material: Liquid membrane, ASTM C-309, Type 1.

8. Mixes:

a. ASTM C-94.
b. Mix concrete only in quantities for immediate use.
c. Do not retemper or use set concrete.

B. Bars.

1. Deformed billet steel: ASTM A 615, Grade 60.

C. Wire Fabric:

1. Welded Wire Fabric Steel: ASTM A 185

D. Tie Wire: FS QQ-W-461-G, annealed steel, black 16 ga. minimum.

E. Bar supports: Conform to "Bar Support Specification," CRSI Manual of Standard Practice.

F. Forms:

1. Conform with ACI 347, Chapter 3, Material and Form Work.

2. Lumber:

a. Softwood framing lumber: Kiln dried, PS-20.
b. Boards less than 1 1/2 inch thick and 2 inch wide, used for basic forms and form liners: Kiln dried.
c. Grade marked by grading rules agency approved by American Lumber Standards Committee.
d. Light framing or studs for board or plywood forms, 2 inch to 4 inch width and thickness Construction Standard grade.
e. Boards for basic forms Construction Standard grade.
f. Board surface: Smooth.

3. Plywood:

a. Exterior type softwood plywood, PS 1-66.

b. Each panel stamped or branded indicating veneer grades, species, type and identification.

c. Wood faced plywood for architectural concrete surfaces.

(1). Panel veneer grades: B - C.

(2). Mill-oiled sides and mill-sealed edges of panels.

4. Ties:

a. Materials: Stainless Steel.
b. Type: Snap Ties.
c. Depth of breakback: 1 inch.
d. Maximum diameter 1/4 inch.

5. Form coatings:

a. Non-staining type.
b. Agent: Pine oil derivative.

G. Water: Clean and potable.

PART 3 - EXECUTION

3.01 FORMWORK

A. Conform to ACI 347, Chapter 2, Construction; and Article 4.2, architectural Concrete.

B. Framing, Bracing and Plywood Form Liners: APA Form V 345-72.

C. Provide temporary openings in framework for concrete placement.

D. Fill voids of plywood joints with sealant and tool smooth.

E. CONTRACTOR is responsible for the design, construction, removal and complete safety of formwork and shoring.

F. Form construction shall be provided to shape, lines dimensions of members shown; substantial, tight enough to prevent leakage, and properly braced or tied to maintain position and size, form sides and bottoms of members unless specifically excepted.

3.02 REINFORCING

A. Fabrication shall be provided to latest ACI Manual of Practice ACI-315.

B. Reinforcing free from excessive rust, scale or coating reducing bond. Bars bent cold in fabrication plant. Chairs, support bars, and other accessories furnished to carry and provide coverage as required by ACI Manual.

C. Unless otherwise indicated the minimum coverage is 3 inch for footings (slabs to have 3/4 inch minimum). Call any "crowding" of reinforcement to ENGINEERs attention during placing.

D. Splices shall be Mesh 6 inch lap, bars 30 X diameter minimum.

E. Conduit or pipes embedded in concrete must have specific approval and be located to avoid cracking or reduction in strength. Provide extra strong pipe sleeves where pipes are allowed to pierce concrete beams or walls.

F. Placement:

1. Bar supports: CRSI 65.

2. Reinforcing bars: CRSI 63.

G. Steel Adjustment:

1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, expansion joints, or embedded items.

2. Do not move bars beyond allowable tolerances without concurrence of ENGINEER.

3. Do not heat, bend or cut bars without concurrence of ENGINEER.

H. Splices:

1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.

2. Splice devices: Install in accordance with manufacturer's written instructions.

3. Welding: Perform in accordance with AWS Standards.

4. Do not splice bars except at locations shown on drawings without concurrence of ENGINEER.

I. Wire Fabric:

1. Install in longest practicable length.

2. Lap adjoining pieces one full mesh minimum, and lay splices with 16-gauge wire.

3. Offset end laps in adjacent widths to prevent continuous laps.

J. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

K. Protection During Concreting: Keep reinforcing steel in proper position during concrete placement.

3.03 JOINTS

A. Construction pours shall be continuous pours except where joints are indicated. No additional joints except by special acceptance in writing by the ENGINEER. Allow no construction or interrupted pour joints in any exposed surface, unless treated as part of design.

1. Where indicated and as detailed, provide saw cut type construction joints of sizes as called for on the drawings.

B. Expansion joints shall be constructed as shown on drawings.

1. Expansion material shall be ½ inch continuous full depth strips set ½ inch below finish surface with ½ inch x ½ inch joint sealant filler above.

3.04 BUILT-IN ANCHORING DEVICES, FIXTURES, PIPE SLEEVES AND OTHER INSERTS

A. Build-in and coordinate as required and called for on the drawings all items to be constructed into concrete such as anchoring devices, fixtures, piping, sleeves and other inserts and items as required for a complete installation.

3.05 INSPECTION

A. Assure that excavation and formwork are completed, with smooth rubbed finish, and that excess water is removed.

B. Check that reinforcement is secured in place.

C. Verify that expansion joint material, anchors, and other embedded items are secured in position.

D. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.06 CONCRETE QUALITY

A. Design of mix shall be a laboratory designed mix to satisfy the following requirements and shall

be approved by the ENGINEER.

1. Ready mixed concrete as per ASTM C-94 with 28 day strength 3,000 PSI minimum, for all standard grey concrete work.

2. Proportion the concrete to work readily into forms and around reinforcement, without excessive manipulation, segregation or water gain. Approved additives may be used to achieve the above results.

3. Slump shall be maximum 3 inch for footings, and for all other concrete shall be 3 inches to 5 in.

4. Submit for approval representative test results by independent laboratory to substantiate proposed mix design.

3.07 PREPARATION FOR POURS

A. Notify the OWNER's Representative, ENGINEER and other inspectors at least 36 hours prior to inspection.

B. Equipment forms, and reinforcing shall be clean and wet down, reinforcing firmly secured in place, runways set up and not resting on or displaying reinforcing.

C. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instruction.

D. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

3.08 PLACING

A. Mixing and conveying shall be as per ASTM C-94 and as follows:

1. Maximum elapsed time from addition of water to placing in forms -60 minutes, (total mixing time).

2. Concrete handled and placed by methods, which keep concrete plastic, prevent separation of materials, and do not displace reinforcement.

B. Deposit as close as possible to final position to avoid segregation of materials. Restrict drop to 3 ft maximum (less for exposed concrete), using tremie if necessary.

1. Compact by mechanical vibration to thoroughly work around reinforcing and eliminate honeycomb.

C. Place concrete in accordance with ACI 301.

D. Hot Weather Placement: ACI 301.

E. Cold Weather Placement: ACI 301.

F. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during

concrete placement.

G. Maintain concrete cover around reinforcing as follows:

Item	Coverage
Beams	1 1/2 inch
Supported Slabs	3/4 inch
Column Ties	1 1/2 inch
Walls (exposed to weather or backfill)	2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	2 inch

H. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

I. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 depth of slab thickness.

J. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.

K. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.

3.09 CONCRETE CURING

A. Curing for standard grey work after finishing, cure concrete by keeping moist for one (1) week after placement. Floors and vertical surfaces may be sprayed with an approved curing compound to retard evaporation of water, if spraying is not objectionable because of future finishing requirements. Begin curing operations as soon as concrete has attained its initial set. Keep exposed concrete surface moist for at least one (1) week.

B. Apply a liquid membrane-forming compound, conforming to ASTM C 309, color to match that of the color condition concrete. Apply on flat work immediately after the finishing operation pursuant to the manufacturers recommendations.

3.10 CONCRETE FINISHING

A. Unexposed concrete work shall be patched and repaired immediately after removal of forms.

1. Cut off metal ties a minimum of 1 inch. back from surface of concrete.

2. Moderate honeycomb cut out and prepared for patching. Severe honeycomb with exposed steel reinforcing is to be removed or "united" at the discretion of the ENGINEER.

3. Wet areas for patching and pack carefully with rich mortar rubbed to match surface.

B. Provide concrete surfaces to be left exposed, walls, columns, beams, with smooth rubbed finish.

C. Provide Class B tolerances to floor slabs and toppings according to ACI 301.

D. Pitch to drains 1/4 inch per foot.

E. Exposed concrete work shall be patched and repaired as accepted by ENGINEER after consultation. Patching and rubbing will be kept to a minimum if possible, but when necessary will be done with great care to obtain maximum degree of matching in color and texture to adjacent finished concrete surfaces.

F. Monolithic finish using care to obtain a level surface; floors out of level or with variation greater than 1/8 in in 10 feet shall be corrected.

G. All finishes shall be as called for on the drawings.

3.11 SEPARATE FLOOR TOPPINGS

A. Prior to placing, roughen concrete base course and remove foreign materials. Broom and vacuum clean.

B. Place dividers, edge strips, reinforcing and other items to be cast in.

C. Apply bonding agent on base course in accordance with manufacturer's instructions. Apply sand and cement slurry coat on base course immediately prior to placing toppings.

D. Place concrete floor toppings to required lines and levels.

3.12 PATCHING

A. Notify ENGINEER immediately upon removal of forms.

B. Patch imperfections.

3.13 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

3.14 FIELD QUALITY CONCRETE

A. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.15 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shocking, and vibration.

3.16 APPLICATION OF BOND COAT FOR CONCRETE LEVELING COAT FOR PAVERS AND TEXTURED SURFACES

A. Provide installation as per manufacturer's standard printed specifications, instructions and recommendations.

3.17 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All cast in place concrete shall be included in the bid price of the relevant item in the Item Response Form.

END OF SECTION 03300

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Maintenance of conditions for proper concrete curing.

1.03 RELATED WORK

A. Section 02510 - Concrete Sidewalk

B. Section 03010 - Concrete

C. Section 03300 - Cast-in-Place Concrete

1.04 QUALITY ASSURANCE

A. Conform to requirements of ACI 301.

1.05 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings

B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete

1.06 SUBMITTALS

A. Provide product data for specified products.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature at 70 degrees F. for three (3) days.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Water: Clean and not detrimental to concrete.

B. Absorptive Mat: Burlap fabric of 9 oz./sq. yd. clean, roll goods.

C. Curing Compound: As per ASTM C309.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify concrete surfaces are ready for curing.

3.02 CURING COMPOUND

A. Apply curing compound in two (2) coats with second coat at right angles to first.

B. Apply in accordance with manufacturer's instructions.

3.03 SPRAYING

A. Spray water over slab areas; maintain wet for three (3) days.

3.04 ABSORPTIVE MAT

A. Saturate burlap side of burlap fabric mat. Place over slab areas, burlap side down; lap edges and ends 12 inches. Maintain in place for seven (7) days..

3.05 CONCRETE CURING

A. Curing for standard grey work after finishing, cure concrete by keeping moist for one (1) week after placement. Floors and vertical surfaces may be sprayed with an approved curing compound to retard evaporation of water, if spraying is not objectionable because of future finishing requirements. Begin curing operations as soon as concrete has attained its initial set. Keep exposed concrete surface moist for at least one (1) week.

B. Apply a liquid membrane-forming compound, conforming with ASTM C 309, color to match that of the color condition concrete. Apply on flat work immediately after the finishing operation pursuant to the manufacturers recommendations.

C. Cure concrete as scheduled or indicated.

D. Remove absorptive mat after curing.

3.06 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete curing shall be included in the bid price of any item in the bid schedule for which concrete curing is required.

END OF SECTION 03370

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Mortar and grout for unit masonry, and stucco

1.03 RELATED WORK

A. Section 03300 - Cast-In-Place Concrete

1.04 SUBMITTALS

A. Submit manufacturers certifications that product used meets the specifications.

B. Include design mix, environmental conditions, and admixture limitations.

C. Submit manufacturer's installation instructions.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F. prior to, during and 48-hours after completion of masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, normal - Type 1

B. Masonry Cement: ASTM C98, for general use

C. Mortar Aggregate: ASTM 144, standard masonry type; clean, dry protected against dampness and foreign matter

D. Grout Course Aggregate: Maximum 3/8 inch

E. Grout Fine Aggregate: Mason's sand

F. Hydrated Lime: ASTM C207, Type S

G. Quicklime: ASTM C5, non-hydraulic type

H. Premix Mortar: ASTM C387, using grey cement

I. Water: clean and potable

2.02 MIXES

A. Mortar for Load Bearing Walls and Partitions: ASTM C270, Type M, 2500 PSI

B. Mortar for Non-load Bearing Walls and Partitions: ASTM C270, Type 2500 PSI

C. Mortar for Reinforced Masonry: ASTM C476, Type PM

D. Pointing Mortar: ASTM C270, Type M

E. Pointing Mortar: One Part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristerate calcium, stearate, or ammonium sterate equal to two percent (2%) of Portland cement weight (for exposed surfaces).

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.

B. If water is lost by evaporation, retemper within two (2) hours of mixing. Do not retemper mortar after two (2) hours of mixing.

PART 3 - EXECUTION

3.01 INSTALLATION

A. After inspection of concrete grout spaces by ENGINEER, plug cleanout holes in masonry units. Brace against wet grout pressure.

B. Install mortar and grout in accordance with Section 04200 and Section 03300.

C. Work grout into cores and cavities to eliminate voids.

D. Do not displace reinforcing steel placing grout.

E. Clean concrete grout spaces of excess mortar and debris.

3.02 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with mortar products and work shall be included in the bid price of the applicable item in the bid schedule.

END OF SECTION 04100

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work covered by this Section shall include the furnishing of all labor, equipment, services, materials, products and tests to perform all operations in connection with the installation of new collection device inside wetwell structure as shown on the Drawings, defined in these Specifications and subject to the terms and conditions of this contract.

1.03 RELATED WORK

A. Section 02601- Subterranean Structures

1.04 SUBMITTALS

A. The CONTRACTOR shall furnish the ENGINEER shop drawings of plastic composite collection device for approval. Shop drawings should illustrate all dimensions and specifications for the complete manual.

PART 2 – PRODUCTS

2.01 RELINER INSIDE DROP SYSTEM

A. RELINER® INSIDE DROP SYSTEM is a plastic composite collection device that facilitates the controlled drop of effluent into the main stream flow of a sanitary manhole. The Drop Bowl permits easy inspection and cleaning without the need to enter the structure. The custom made adjustable stainless steel straps fully support the drop pipe.

2.01 TECHNICAL DATA

A. RELINER® INSIDE DROP components consist of

1. Standard size composite Drop Bowls
2. Stainless steel adjustable clamping brackets

B. RELINER composite components are hand and chopper gun laminations of these properties:

1. Physical Properties of Unsaturated Polyester Resin Reinforced Laminates (33 / 66 Glass / Resin 1.5 oz mat Laminates .125 in.)

Flexural Strength (psi) ASTM D-790	27,100
Flexural Modulus (psi) ASTM D-790	1,157,000
Tensile Strength (psi) ASTM D-638	16,700
Tensile Modulus (psi) ASTM D-638	1,457,000

Tensile Elongation (%) ASTM D-638	1.54
Hardness, Barcol 934.1 ASTM D-2583	55 – 60

2. Curing

Physical Properties of ISO Gel Coat	Room Temperature Cured for 45 hours	Post Cured at 50 for 24 hours
Tensile Strength	6,218	6,581
Elongation, %	2.70	1.90
Flexural Strength, psi	11,363	11,329
Heat Distortion, °F	0.544×10^6	0.713×10^6
Mandrel Flex, Mandrel Diameter in Inches	--	1.0

3. Stainless steel clamping bracket materials:
   304 series non-magnetic stainless steel - 11GA
   18-8 series non-magnetic stainless steel 3/8 x 18

PART 3 – EXECUTION

3.01 APPLICATION

A. New wet well structure employing inside drop shall be outfitted with RELINER Inside Drop Components. The bowl size shall be determined by incoming pipe size and flow rates. The bowl shall be installed as per manufacturer's instructions using stainless steel fasteners. The appropriately sized drop pipe of SDR 35 PVC shall be securely attached to the manhole wall using stainless steel RELINER Adjustable Clamping Brackets and stainless steel fasteners. The connection of Drop Bowl to drop pipe shall be by flexible external pipe coupler. The turn-out at the base end of the drop pipe shall be accomplished with an appropriately angled PVC pip elbow (45 degree recommended).

3.02 INSTALLATION

A. Select Drop Bowl of size appropriate to flow rate and pipe diameter.

B. Trim incoming pipe so that only 2" maximum protrudes into manhole. For improved flow control, cut a "V" shaped notch at bottom edge of incoming pipe.

C. Center Drop Bowl directly under incoming pipe, allow approximately 1" clearance between pipe and bowl.

D. Attach Drop Bowl to manhole wall with four 3/8" diameter stainless steel bolts in lead expansion anchors. (See following instructions).

1. Drill a 3/4"hole into the base material to the required depth (approximately 1-1/4" deep.)

2. Blow the hole clean of dust and other material.
3. Insert the anchor into the hole (Lead shield out).

4. Position a setting tool or a 9/16 socket against the anchor outer cone. (The outer rim of the tool or socket should seat onto the lead shield rim.)

5. Using the tool or socket, set the anchor by driving the lead sleeve over the cone using several sharp hammer blows. (Be sure the anchor is at the required embedment depth.)

6. Position the fixture, insert screw or bolt and tighten.

E. Cut and mount SDR 35 PVC drop pipe of diameter appropriate to Drop Bowl size and flow using RELINER adjustable stainless steel clamping brackets (RELINER clamping brackets will adjust to allow drop pipe to maintain correct stand off from wall).

F. Connection from Drop Bowl to drop pipe shall be by flexible external pipe connector ("Fernco" recommended.)

G. Attach drop pipe to wall using RELINER Adjustable Clamping Brackets using a minimum of 2 brackets with a maximum spacing of 4 to 5 feet.

H. Install appropriate pipe elbow to provide smooth transition into channel flow.

3.03 CLEANING AND MAINTENANCE

A. All structures shall be cleaned and maintained in workable condition until accepted by the ENGINEER

3.04 MEASUREMENT AND PAYMENT

A. Measurement and payment shall be based on the actual quantities installed as more specifically discussed and described in Section 01025 entitled "Measurement and Payment".

END OF SECTION 13610

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for the furnishing, construction, and installation of all pipe supports, hangers, guides, and anchors shown, specified, or required for a complete and operable piping system, in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02610 – Piping – General.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ANSI / ASME B31.1	Power Piping.
ASTM A 123	Specifications for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

1.04 SUBMITTALS

A. Shop Drawings: The CONTRACTOR shall furnish complete shop drawings of all pipe supports, hangers, anchors, and guides, as well as calculations for special supports and anchors, in accordance with Section 01340 entitled "Shop Drawings, Product Data and Samples".

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Code Compliance: All piping systems and pipe connections to equipment shall be properly supported, to prevent undue deflection, vibration, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1, except as supplemented or modified by these Specifications. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code, or local administration requirements.

B. Structural Members: Wherever possible, pipes shall be attached to structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the CONTRACTOR at no additional cost to the CITY. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction.

C. Support Spacing: Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending and shear stresses in the piping, with special consideration given where components, such as

flanges and valves, impose concentrated loads. Spacing of supports shall be as specified herein and/or indicated on the Drawings.

D. Pipe Hangers: Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow for free expansion and contraction of the piping, and shall prevent excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed so that they cannot become disengaged by any movement of the supported pipe. Hangers subject to shock or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading only.

E. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2 inch, or where the hanger rod deflection from the vertical is greater than four (4) degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

F. Spring-Type Hangers: Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. The support shall be designed for a maximum variation in supporting effort of 25 percent for the total travel resulting from thermal movement.

G. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints. They shall permit the piping to expand and contract freely in directions away from the anchored points and shall be structurally suitable to withstand all loads imposed.

H. Heat Transmission: Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat shall not be transmitted to the structure or to other equipment.

I. Riser Supports: Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

J. Freestanding Piping: Freestanding pipe connections to equipment, like chemical feeders, pumps, etc., shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams anchored to the structure. Exterior, freestanding overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps securing the pipes.

K. Submerged Supports: All submerged piping shall be supported with hangers, brackets, clips, or fabricated supports and anchors of Type 316 stainless steel, unless otherwise shown on the Drawings.

L. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, fiberglass, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on plastic and fiberglass piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

M. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material, at each pipe support, bracket, clip, or hanger.

2.02 MANUFACTURED SUPPORTS

A. Stock Parts: Where not specifically shown or detailed, designs, generally accepted as exemplifying good engineering practice, using stock or production parts shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, and designed and rated for the intended purpose. See Article 2.04 of this Section for pipe support materials in chemical containment areas.

B. Suppliers:

1. Basic Engineers, Pittsburgh, PA;
2. Bergen-Paterson Corp., Boston, MA;
3. Elcen Metal Products Company, Franklin Park, IL;
4. ITT-Grinnell Corp., Warren, OH;
5. NPS Industries, Inc., Secaucus, NJ;
6. Or approved equal.

2.03 COATING

A. Galvanizing: Unless otherwise shown or specified, all fabricated pipe supports, other than stainless steel or non-ferrous supports, shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123.

B. Other Coatings: Other than the supports mentioned in Paragraph 2.03A, all supports shall receive protective coatings in accordance with City of Pompano Beach standards.

2.04 PIPE SUPPORTS IN CHEMICAL AREAS

A. Pipe supports in chemical areas shall be wall or slab mounted 1-5/8 X 1-5/8 AIKINSTRUT (or equal) heavy duty FRP channels with stainless steel Type 316 straps and lock nuts. Supports shall be attached to walls and slabs by 3/8-inch diameter, 6-inch long Type 316 stainless steel anchor bolts with lock nuts. Bolt support spacing shall be maximum 12 inches on center.

B. Support spacing shall comply with requirements noted in Table 15020-1.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

B. Appearance: Pipe supports and hangers shall be positioned in such a way as to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

C. Pipe Support Spacing: The distance between supports for each size of pipe shall not exceed those listed in the attached schedule. However, if the pipe size to be supported is not listed in the schedule, the next smaller nominal pipe size spacing shall be used. In all cases, there shall be a minimum of one (1) support per laying length of pipe on uninterrupted horizontal runs. This support shall be placed within one (1) foot of the joint. If the pipe manufacturer recommends a smaller spacing interval than specified herein, then the manufacturer's spacing shall be used.

D. The distance between supports shall not exceed that listed in the following schedule unless otherwise noted:

Table 15020-1
Pipe Support Spacing Requirements

Nominal Pipe Size (in)	Metallic Piping (ft)	Plastic, Fiberglass and Copper Piping (ft)
½	5	3
3/4 to 1-1/2	6	3
2 to 3	6	4
4	10	5
6 and larger	10	6

3.02 FABRICATION

A. Quality Control: Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

END OF SECTION 15020

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Conditions, apply to all work specified in the Electrical 16000 Sections.

1.02 LAWS, PERMITS, FEES AND NOTICES

A. Secure and pay all permits, fees and licenses necessary for the proper execution of the work. Submit all notices and comply with all laws, ordinances, rules and regulations of any public agency bearing on the work. Contractor shall be licensed Electrical Contractor in the county of construction.

1.03 DEPARTURES

A. If any departures from the Contract Documents or Specifications are deemed necessary, details of such departures and the reasons therefore shall be submitted to the Engineer for advance written approval, prior to departure.

1.04 GUARANTEES

A. Furnish written guarantee covering all materials, workmanship, labor and equipment for a period of one (1) year from the date of acceptance as described in the Contract General Conditions.

B. The Owner reserves the right to operate and use all materials and equipment failing to meet the requirements of the Contract Documents until such unacceptable materials and equipment are replaced or repaired to the satisfaction of the Engineer.

1.05 AS-BUILT INFORMATION

A. A set of “red-lined” electrical drawings shall be carefully maintained at the job site. Actual conditions are to be put on the drawings in red on a daily basis so the drawings will continuously show locations and routes of cable trays, conduits, pull-boxes, circuit numbers, and other information required by the Engineer.

1.06 JOB SITE VISIT

A. Visit the project site before submitting a bid. Verify all dimensions shown and determine the characteristics of existing facilities which will affect performance of the work, but which may not be shown on drawings or described within these Specifications.

1.07 CLEANUP

A. Maintain a continuous cleanup during the progress of the work and use appointed storage areas for supplies. The premises shall be kept free from accumulations of waste materials and rubbish.

1.08 CUTTING AND PATCHING

A. Cut and prepare all openings, chases and trenches required for the installation of equipment and materials. Repair, remodel and finish in strict conformance with the quality of workmanship and materials in the surroundings. Obtain written permission from the Engineer for any alternations to structural members before proceeding.

1.09 MAINTENANCE

A. Render all necessary measures to ensure complete protection and maintenance of all systems, materials and equipment prior to final acceptance. Any materials or equipment not properly maintained or protected to assure a factory new condition at the time of final acceptance shall be replaced immediately at no additional cost to the Owner.

1.10 WATERPROOFING

A. Whenever any work penetrates any waterproofing, seal and render the work waterproof. All work shall be accomplished so as not to void or diminish any waterproofing bond or guarantee.

1.11 TESTS

A. Conduct an operating test of equipment prior to the Engineer's approval. The equipment shall be demonstrated to operate in accordance with the requirements of these Specifications. The tests shall be performed in the presence of the Engineer or an authorized representative. The Electrical Contractor shall furnish all instruments, electricity and personnel required for the tests.

1.12 SUMMARY OF ELECTRICAL WORK

A. Provide all labor, materials, tools, supplies, equipment and temporary utilities to complete the work shown on the drawings and specified herein. All systems are to be completely installed and fully operational. Specifically, the work includes, but is not necessarily limited to:

1. Demolition of existing electrical equipment. Including all coordination with power company for disconnect of existing service and installation of new service.

2. All electrical work associated with Lift Station as called out in the drawings.

3. Power and control raceways and wiring at lift station.

4. Provide new power service as called out in drawings.

5. Power distribution including panel, grounding, surge protection, conduit and wire.

6. Provide new lift station RTU system per drawings and specifications.

7. Provide arc flash and coordination study; provide arc flash labels for main, control panel, control enclosures.

8. Provide new field instruments as indicated on the drawings and specifications

8. Temporary power service as required for bypass operation, including Contractor furnished standby generator for by pass operation during power outages.

9. Grounding

10. Start-up, testing, training, and documentation.

11. Lift Station Panel Rehabilitation

    a. The Contractor shall install a new pump control panel, along with main disconnect, RTU tower and Combustible Gas Detector instrument, flow meter, pressure transmitters, floats, level transducer, and all other electrical equipment shown on the drawings and called out on the specifications, field instruments and level controls and the RTU system as indicated in drawings. Install new wiring and conduit for power and control as required by contract documents.

    b. The Contractor shall provide all trenching, cutting, patching, compaction and restoration for the installation of equipment and materials. Careful coordination of work shall be carried out and turned in for Engineer's approval.

    c. Contractor shall become familiar with station. Provide site visit to existing station before bid.

1.13 ELECTRICAL POWER SERVICE REQUIREMENTS

A. The Contractor shall coordinate with Florida Power and Light (FPL) all service installation requirements for the lift station listed in these contract documents and include in the bid cost the demolition of existing service, including primary service, relocation of FPL transformer to new pad location, provide by-pass pumping, and/or generator for emergency power as required, and new FPL service including the installation of FPL furnished primary conduits, and any FPL temporary service costs. The Owner shall pay FPL the costs of the new permanent power service.

B. The Contractor shall visit the project site before submitting the bid and shall verify all field conditions and characteristics which will affect the work, but which may not be indicated on the drawings or specifications.

1.14 CODES AND STANDARDS

A. General applicable provisions of the following codes and standards and other codes and standards required by the State of Florida and local jurisdictions are hereby imposed on a general basis for electrical work (in addition to specific applications specified by individual work sections of these specifications.

1. U.L.: Electrical materials shall be approved by Underwriters' Laboratories, Inc. This applies to materials which are covered by U.L. standards. Factory applied labels are required.

2. National Electrical Code

3. OSHA: Standards of the Occupational Safety and Health Administration are to be complied with.

4. NEMA: National Electrical Manufacturers Association Standards are to be met wherever standards have been established by that agency and proof is specifically required with material submittals for switchboards, motor control centers, panelboards, cable trays, motors, switches, circuit breakers and fuses.

5. ANSI: America National Standards Institute

6. NESC: National Electrical Safety Code

1.15 ELECTRICAL TEMPORARY FACILITIES

A. The Electrical Contractor shall include in his bid the cost of furnishing, installing, maintaining, and removing all materials and equipment required to provide temporary light and power to perform his work during construction and until work is completed.

B. The Electrical Contractor shall include in his bid the cost of furnishing, installing, maintaining, and removing temporary emergency generator(s) to provide by pass pumping during power outage conditions.

1.16 EXCAVATING FOR ELECTRICAL WORK

A. General

1. Excavation or drilling, backfill and repair of paving and grassing is to be in the bid of the Electrical Contractor. The actual work need not be performed by electrical trades. However, the Electrical Contractor is responsible for all excavation, drilling, dewatering, backfilling, tamping and repair of pavements and grassing required in support of electrical work. All areas disturbed by electrical work shall be repaired to their original condition, or as indicated on the drawings.

B. Coordination

1. The Electrical Contractor must check for existing utilities before commencing any excavation or drilling.

2. Contract drawings and other trades are to be consulted to avoid interferences with other utilities on this project.

3. In the event of damage to existing utilities, the Engineer shall be immediately notified, and damage shall be immediately repaired.

4. The Owner is to be consulted to ascertain locations of existing interferences by referring to "As Built" drawings and Owner's experience. The excavations are to be scheduled at the Owner's convenience.

C. Precautions

1. The Electrical Contractor must take every reasonable precaution to avoid interferences. In the vicinity of a suspected interference, excavations shall be dug by hand.

1.17 ELECTRICAL SUBMITTAL

A. Submittals for Approval

1. Refer to Contract General Conditions for additional instructions on the General Conditions and this Section, the more stringent requirements shall apply.

2. Shop Drawings and manufacturer's data sheets are required for all electrical materials.

3. Submittals will not be accepted for partial systems. Submit all materials for each specification section at one time. Submittals must be arranged, correlated, indexed and bound in orderly sets for ease of review.

4. Samples are to be supplied for any substitute as requested by the Engineer.

5. The following numbers of copies are required:

Shop drawings	5 sets
Samples	1 each
Manufacturer's data	5 sets
Certifications	5 sets
Test reports	5 sets
Warranties/Guarantees	5 sets

6. Submit shop drawings, manufacturer's data and certifications on all items of electrical work prior to the time such equipment and materials are to be ordered. Order no equipment or materials without approval from the Engineer. Submittals will not be accepted for partial system submittals; submit all data at one time. Submittals will be promptly returned, approved, approved as noted, or not approved. Items "approved as noted" must be changed to comply with the Engineer's comments and need not be resubmitted for "approved" status. Items "not approved" are not suitable, requiring complete new re-submittals.

7. Time delays caused by rejection of submittals are not cause for extra charges to Owner or time extensions. Contractor shall be responsible for investigating existing systems or shop drawings in order to fully integrate the new equipment into the system. Adequate shop drawings may or may not exist for all existing systems.

B. Operation and Maintenance Manuals

1. Submit to the Engineer five (5) copies of all manufacturer's service installation and operation manuals, instructions and bulletins. These manuals shall be subject to review of the Engineer. If acceptable they shall be forwarded to the Owner. If not acceptable they shall be returned to the Contractor for revision and resubmittal. Manuals shall contain, but not be limited to, the following:

a. Brief description of system and basic features.

b. Manufacturer's name and model number for all components in the system.

c. List of local factory authorized service companies.

d. Operating instructions.

e. Maintenance instructions

f. Trouble shooting instructions

g. Manufacturer's literature describing each piece of equipment.

h. Power and control wiring diagrams

i. Parts lists

1.18 ELECTRICAL PRODUCTS

A. Standards Products

1. Unless otherwise indicated in writing by the Engineer, the products to be furnished under this Specification shall be the manufacturer's latest design. Units of equipment and components of the same purpose and rating shall be interchangeable throughout the project. All products shall be newly manufactured. Defective equipment or equipment damaged in the course of installation or test, shall be replaced or repaired in a manner meeting with the approval of the Engineer at no additional expense to the Owner.

B. Delivery, Storage and Handling

1. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels and similar information needed for distinct

identification; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior instructions for storage locations.

C. Substitutions

1. Comply with instructions in the Contract General Conditions and Special Conditions and obtain pre-approval of the Engineer regarding substitutions.

1.19 ELECTRICAL IDENTIFICATION

A. Color Coding Conductor colors shall be in accordance with the N.E.C. and NFPA requirements. Refer also to applicable sections of these specifications. Three phase feeder and branch circuits shall be identified as follows:

B. Nameplates

1. The following items shall be equipped with nameplates: All motors, motor starters, motor control centers, pushbutton stations, control panels, time switches, disconnect or relays in separate enclosures, receptacles, wall switches, high voltage boxes and cabinets. All light switches and outlets shall carry a phenolic plate with the supply identified. Special Electrical systems shall be identified at junction and pull boxes, terminal cabinets and equipment racks.

2. Nameplates shall adequately describe the function of the particular equipment involved. Nameplates for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. For example, “Panel A, 277/480V, 3-phawe, 4-wire”. The name of the machine on the motor nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and P.B. station nameplates for that machine. Normal power nameplates shall be laminated phenolic plastic, white front and back with black core, with lettering etched through the outer covering; black engraved letters on white background. Lettering shall be 3/16 inch high at pushbutton stations, thermal overload switches, receptacles, wall switches and similar devices, where the nameplate is attached to the device plate. At all other locations, lettering shall be ¼ inch high, unless otherwise detailed on the Drawings. Nameplates shall be securely fastened to the equipment with No. 4 Phillips, round-head, cadmium plated, steel self-tapping screws or nickel-plated brass bolts. Motor nameplates may be non-ferrous metal not less than 0.003 inch thick, die stamped. In lieu of separate plastic nameplates, engraving directly on device plates is acceptable. Engraved lettering shall be filled with contrasting enamel. Equipment nameplate schedule for all equipment shall be submitted with shop drawing submittal for Engineer’s approval.

3. All junction and splice boxes shall be labeled using permanent shipping tags attached to boxes; not covers.

C. Wire and Cable Identification

1. All wire and cable shall be identified at each termination point and at each pull box, splice box, junction box, or manhole. Provide permanent, waterproof, non-metallic (paper unacceptable) tags indicating the circuit number in 3/16 inch letters.

2. Individual wires within equipment enclosures shall be identified using the equipment manufacturer's shop drawing wire numbers. Panel wire numbers and terminal numbers shall agree. Wire markers shall be T&B shrink-kon HVM marker heat shrink system or an approved equal.

D. Signs

1. Warning signs shall comply with OSHA requirements and reasonable safety precautions.

E. Conduit and Equipment Tagging Requirements

1. All conduits shall be tagged with permanent tag attached with tie wraps. Descriptive tags shall indicate conduit tag per drawing. This shall include spare conduits.

2. All circuits shall be tagged with permanent tag attached with tie wraps. Descriptive tags shall indicate tag per drawings.

3. All floats and the like shall be tagged with permanent tag attached with tie wraps. Descriptive tags shall indicate float function such as call, back up, lead as well as tag per drawings.

4. All I&C equipment shall be tagged. Tag information shall be provided per drawings as well as provide descriptive information. Provide stainless steel stamped tags with ¼" text.

5. Tagging shall be Brady Thermal ID-Expert.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 16000

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Contractor shall take precautionary and safety measures to assure the safety of his personnel. All wires shall be identified and disconnected from power sources before removal.

B. Contractor shall coordinate with the Owner, Engineer and FPL.

C. The general demolition scope shall also include the following minimum requirements whether indicated on plans or not.

1. Removal of all exposed unused conduit. Removal of all abandoned wire within raceways, cabinets, outlet boxes, trenches and the like associated with equipment to be removed.

2. Removal of all hangers and support systems which are not needed as a result of the demolition.

3. Removal of existing pump panel controls and meter, disconnect, equipment rack, electrical gear above or below ground at existing can station, all related power and control wires and raceways and the like.

4. Contractor shall cover all openings as a result of demolition and removals including, but not limited to the following:

a. Cut conduit, instrumentation line, etc., flush with slab, fill with concrete.

5. Removal of all existing interior and exterior lighting fixtures, lighting contactors, and switches, receptacles, and related wiring and conduit.

D. Operational Systems

1. To the fullest extent possible, all required systems shall remain operational. Contractor shall replace and/or repair existing facilities which may be damaged due to equipment removals.

2. Where required, wiring passes through or uses enclosures or raceways shown for demolition. Contractor shall provide raceways and wire as required to keep those systems operational.

3. Coordinate with the Power company representative to provide temporary utility power for the Contractor to provide full time by-pass pumping as required. The Contractor shall include an emergency generator that meets local noise ordinance in the event that normal power is Interrupted. Power must be available so by-pass pumping is not interrupted.

3. Contractor shall remove existing equipment in an orderly, planned and coordinated fashion. All replacement equipment shall be on site and ready to install immediately

after the removal of existing equipment.

4. Where demolition interrupts the normal automatic control of the station, Contractor shall provide full time manual control until automatic control is restored. Contractor shall obtain permission of the Owner before removing automatic control.

5. The Contractor shall coordinate with the City and carefully plan working hours since lift stations are located in a residential area.

1.02 SPECIFIC DEMOLITION

A. The following include, but do not limit the specific pieces of equipment for the removal and disposition.

1. Existing power service as indicated on the plans.

2. The existing RTU system will be turned over to the City, before performing demolition on existing RTU system, the Contractor shall coordinate its removal with the Owner; a new RTU system shall be supplied and installed compatible with the City's latest RTU standards, including tower and Yagi antenna.

3. Coordinate demolition of existing electrical service, electric meter, control panels, jboxes, disconnects and all electrical equipment above or below ground. Coordinate all this work with Owner and his staff, and coordinate bypass pumping where required. See drawings and specifications

4. The Contractor shall coordinate all demolition and installation work with FPL for the rehabilitated new electrical service to the new station, including disconnect of the existing service and connection of the new electrical service.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 DISPOSITION OF EQUIPMENT

A. Contractor shall demolish the control panel along with other equipment indicated in the contract documents.

B. Except as otherwise indicated, all removed or demolished electrical equipment shall become the property of the Contractor. All rubble shall be disposed of by the Contractor.

C. Contractor shall load, transport and properly dispose of all or demolished equipment including all enclosed gear, control panels, cabinets, raceways, wire and cable, supports, disconnects, panel covers, light fixtures, equipment racks and the like.

END OF SECTION 16001

PART 1 - GENERAL

1.01 SUBMITTALS

A. Submit data sheets on all items per Section 16000.

1.02 CODES AND STANDARDS

A. General applicable provisions of the following codes and standards and other codes and standards required by the State of Florida and local jurisdictions are hereby imposed on a general basis for electrical work (in addition to specific applications specified by individual work sections of these specifications):

1. U.L.: Electrical materials shall be approved by the Underwriters' Laboratories, Inc. This applies to materials which are covered by U.L. standards. Factory applied labels are required.

2. National Electrical Code

3. OSHA: Standard of the Occupational Safety and Health Administration are to be complied with.

4. NEMA: National Electrical Manufacturers Association Standards are to be met wherever standards have been established by that agency, and proof is specifically required with material submittals for switchboards, motor control centers, panelboards, cable trays, motors, switches, circuit breakers, and fuses.

5. ANSI: American National Standards Institute

6. NESC: National Electrical Safety Code

PART 2 - PRODUCTS

2.01 GROUNDING MATERIALS

A. All ground rods shall be 20 foot 5/8" copperclad, unless otherwise indicated.

B. Around wires shall be soft drawn copper sized per National Electrical Code, unless otherwise indicated.

2.02 CONDUIT

A. Galvanized Rigid Conduit (ANSI C80.1)

1. Rigid galvanized steel conduit "RGS" shall be U.L. approved, Schedule 40, mild steel pipe, zinc-coated on the inside and outside. Fittings shall be zinc-coated, U.L. approved. Comply with ANSI Spec C80.1 and Federal Spec WW-C-581.

B. PVC Conduit

1. PVC conduit shall be Schedule 80 unless otherwise noted and shall be U.L. approved. Comply with Federal Spec WC-1094 and NEMA TC-1.

C. Flexible Conduit

1. All flexible conduits shall be liquid tight, made of corrosion resistant plated steel with extruded polyvinyl covering and watertight connectors.

D. PVC Coated RGS

1. PVC coated Rigid galvanized steel conduit system shall be coated inside and outside; provided by Permacoat or Robroy or equal. All fittings used on PVC coated RGS conduits shall also be PVC coated fittings.

E. Conduit Sealing Hubs

1. Conduit sealing hubs shall be Crouse Hinds ESSG-iron alloy with Chico X Fiber and Chico A sealing compound. Armored gaskets and locknuts shall be provided. Standard finish.

2.03 CABLE, WIRE AND CONNECTORS

A. 600 Volt Power Wiring

1. Cable shall be rated for 600 volts and shall meet the requirements below:

a. Conductors shall be stranded.

b. All wire shall be brought to the job in unbroken packages and shall bear the date of manufacturing; not older than 12 months.

c. Type of wire shall be XHHW-2 except where required otherwise by the contract drawings.

d. No wire smaller than No. 12 gauge shall be used unless specifically indicated.

e. Conductor metal shall be copper.

f. All conductors shall be meggered after installation. Resistance shall exceed 50 mega ohms.

B. Instrumentation and Control Cable

1. Process instrumentation wire shall be 16 gauge twisted pair, 600 V., aluminum tape shielded, polyvinyl chloride jacketed, as manufactured by the American Insulated Wire Co., Eaton Corp., or equal. Multiconductor cables with individually shielded twisted pairs shall be installed where indicated.

2. Multiconductor control cable shall be stranded 14-gauge, 600 V. THWN insulated with PVC jacket, as manufactured by the American Insulated Wire Co., Eaton Corp., or equal.

2.04 TERMINATIONS AND SPLICES (600 VOLTS AND LESS)

A. Terminations of power cable shall be by means of U.L. approved connectors. All connectors shall meet U.L. 486B and shall be compatible with the conductor material.

B. Terminate all control and instrumentation cable with fork type compression lugs.

C. Splicing of power, control, or instrumentation wiring will not be allowed except by written approval of the Engineer. Where splicing is allowed, splices shall be made with approved compression connectors, and splices shall be made waterproof regardless of location.

2.05 BOXES

A. Boxes for wiring devices, (switches and receptacles) installed outdoors shall be weatherproof fiberglass with polycarbonate cover plates. Junction boxes shall be fiberglass with gasketed covers. All boxes shall be securely mounted plumb and level in readily accessible locations. Indoor boxes shall have stainless steel cover plates.

B. All outdoor junction boxes and pull boxes shall be NEMA 4X stainless steel or fiberglass.

2.06 AUXILIARY GUTTERS

A. Gutters shall be provided per NEC Article 374.

B. Provide fiberglass units. Gutters shall be painted with one prime coat and two finish coats. Final coats shall match other electrical enclosures.

C. Submit shop drawing for all gutters.

2.07 MOUNTING AND SUPPORTING ELECTRICAL EQUIPMENT

A. Furnish and install all supports, hangers, and inserts required to mount fixtures, conduits, cables, pull boxes, and other equipment.

B. Perforated straps and wires are not permitted for supporting electrical devices. Anchors shall be of approved types.

C. All supports, hangers, hardware, etc. used outdoors, in corrosive atmosphere or in hazardous areas shall be non-ferrous, corrosion resistant or stainless steel. Supports shall be selected to avoid galvanic reactions. Support devices shall be submitted for approval.

2.08 SAFETY DISCONNECT SWITCH

A. Fusible and non-fusible disconnect switches shall be heavy-duty, NEMA type H, quick-make, quick-break, visible blades, 480 volt (where applicable) and 240 volt, 3 pole with full cover interlock. Outside switches shall have copper lugs.

B. Unless otherwise indicated, disconnects shall be 3-pole, no fusible switch in a NEMA 4x, stainless steel enclosure.

C. Switches shall be horsepower rated, heavy duty as manufactured by the Square D Co., or equal.

D. Units provided as main service disconnects, shall be fused and labeled for service equipment.

2.08 DUCT SEAL

A. Provide Garvin Industries' duct seal or an approved equal

B. Provide and install duct seal at all conduit ends for all new conduit installations.

C. Duct seal shall be used to seal around junction boxes, control panels and the like. It shall be a permanently soft, non-toxic compound. It shall also not affect other plastic materials or corrode metals.

D. Duct seal shall be applied to the well control panel, PLC control panel, Main Disconnect switch, Terminal boxes, Motor junction box, instrument field boxes, and the like. Apply to each conduit penetration.

2.09 TESTING

A. The Contractor shall provide megger testing of the major power wire runs between the power service and meter, and the main, and control panel. Provide results of these tests as part of the O&M manual.

B. The Contractor shall provide testing for the station's grounding and this shall be 20 ohms or less. Provide results of this measurements/test as part of the O&M manual.

C. The Contractor shall provide results of loop checks with the I&C Contractor after the installation of the equipment has been performed. I&C O&M Manual shall include the loop checks.

PART 3 – EXECUTION

3.01 GROUNDING

A. Provide ground system as indicated on the drawings and as required by the National Electrical Code.

B. All raceways require grounding conductors. Metallic raceways are not adequate grounding paths. Bonding conductors through the raceway systems shall be continuous from main switch ground buses to panel ground bars of the panelboards, and from panel grounding bars of panelboards and motor control centers to branch circuit outlets, motors, lights, etc. THESE GROUND CONDUCTORS ARE REQUIRED THROUGHOUT THE PROJECT REGARDLESS OF WHETHER CONDUIT RUNS SHOW GROUND CONDUCTORS ON THE DRAWINGS.

C. All connections made below grade shall be of the exothermic type.

3.02 CONDUIT

A. Locations:

Conduit location shall be installed as called out in the schedule of materials, see drawings.

B. Installation

1. Conduits subjected to rough handling or usage shall be removed from the premises.

2. Conduits must be kept dry and free of water or debris with approved pipe plugs or caps. Care shall be given that plugs or caps be installed before pouring of concrete.

3. Where conduits pass through exterior concrete walls or fittings below grade, the entrances shall be made watertight. This shall be done by providing pipe sleeves in the concrete with one half inch minimum clearance around the conduits and caulking with askum and sealant, or by means of conduit entrance seals.

4. Conduits entering panelboards, pull boxes, or outlet boxes shall be secured in place by galvanized locknuts and bushings, one (1) locknut outside and one (1) locknut inside of box with bushing on conduit end. The locknuts shall be tightened against the box without deforming the box. Bushings shall be of the insulating type.

5. Field conduit bends shall be made with standard tools and equipment manufactured especially for conduit bending.

6. Where embedded conduits cross expansion joints, furnish and install offset expansion joints or sliding expansion joints. Sliding expansion joints shall be made with straps and clamps.

7. Exposed runs of conduits shall be installed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings, with

right angle turns consisting of symmetrical bends or pull boxes as indicated on the drawings. Bends and offsets shall be avoided where possible.

8. Conduits in structural slabs shall be placed between the upper and the lower layers of reinforcing steel, requiring careful bending of conduits. Conduits embedded in concrete slabs shall be spaced not less than eight (8) inches on centers or as widely spaced as possible where they converge at panels or junction boxes. Conduits running parallel to slab supports, such as beams, columns and structural walls shall be installed not less than 12 inches from such supporting elements. To prevent displacement during concrete pour, saddle supports for conduit, outlet boxes, junction boxes, inserts, etc., shall be secured.

9. Conduit runs shall always be concealed except where indicated on plans.

10. Pull lines shall be installed in all empty conduits. All pull wires shall be identified with conduit number at each end.

11. The use of running threads is prohibited and where some such device is necessary, split couplings, Erickson couplings, or equal shall be used. Where watertight conduit installations are required, watertight conduit unions shall be used.

12. Where conduits are run individually, they shall be supported by approved pipe straps secured by means of toggle bolts or tapcons on hollow masonry; tapcons on concrete or solid masonry; machine screws or bolts on metal surfaces and wood screws on wood construction. The use of perforated straps or wires will not be permitted.

13. Concrete inserts and pipe straps shall be galvanized. Steel bolts, galvanized or cadmium-plated. Individual hangers, trapeze hangers and rods shall be prime-coated and painted.

14. Wire shall not be installed until all work of any nature that may cause damage is completed, including pouring of concrete. Mechanical means shall not be used in pulling in wires No. 8 or smaller.

15. Underground conduits not under concrete slabs are to be buried at least two (2) feet below finished grade for circuits rated 600 volts or less, except under traffic areas where motor vehicles may cross. Under traffic areas, conduits are to be buried at least three (3) feet below finished grade.

16. All conduits shall be cleaned by pulling a brush swab through before installing cables.

17. All conduits shall be sealed at each end with electrical putty. Special care shall be taken at all equipment where entrance of moisture could be detrimental to equipment.

18. Where steel conduit penetrates ground or concrete, the conduit shall be painted with two (2) coats of asphaltic base paint one (1) foot on each side of

penetration.

19. No more than two (2) feet of flexible conduit shall be used at connections of all motors, transformers, motor operated valve and gates, instruments and other items of equipment where vibration is present. It shall be supported where required with stainless steel bands.

3.03 WIRES, CABLES AND CONNECTIONS

A. Cables pulled into conduits shall be pulled using pulling eyes attached to conductors.

B. Where exposed in manholes and pull boxes, cables shall be wrapped using 3M 77 Scotch electrical fireproofing tape or approved equal. Wrapping shall be made using 50 percent lap.

C. Shields shall be grounded at only one termination point.

D. A loop of each conductor shall be provided in each manhole to facilitate the addition of future tee splices.

3.04 BOXES

A. Installation of boxes shall be in accordance with the National Electrical Code requirements.

B. Boxes shall be mounted plumb and level in accessible locations and mounting shall be secure, vibration resistant and galvanically compatible. Hardware shall be used that is specifically intended for the purpose. When mounted in corrosive, damp or wet locations, stainless steel hardware shall be utilized.

3.05 WIRING DEVICES

A. Wiring devices shall be installed in device boxes approved for the application. All connections shall be made with screw terminals.

3.06 SUPPORTING DEVICES

A. All items shall be supported from the structural portion of the building and studs, except standard ceiling mounted lighting fixtures and small devices may be supported from ceiling system where permitted by the Engineer. However, no sagging of the ceiling will be permitted. Supports and hangers shall be types approved by Underwriters' Laboratories.

B. All floor-mounted devices (switchboards, motor control centers, transformers, etc.) shall be securely anchored to the floors. Where recommendations are made by manufacturer, these recommendations shall be followed.

END OF SECTION 16050

SECTION 16345
SHORT CIRCUIT, COORDINATION STUDY AND ARC FLASH HAZARD STUDY

PART 1 - GENERAL

1.01 SCOPE

A. The Contractor shall furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or an approved Engineering firm.

B. The Contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the NFPA 70E – Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2204, Annex D.

C. The scope of the studies shall include all new equipment as well as the power company fault current.

D. Provide Arch Flash Protection per NEC, Article 110.16 and shall be applicable to all new switchboards, panelboards, industrial control panels, motor control centers, variable frequency drives and the like.

E. Arch flash labels shall be provided and installed on applicable new equipment.

F. Include fault current from power company service, the service conductors, the Main disconnect, Control Panel with the DFS RTU, any equipment disconnects. Coordinate with manufacturer where needed. Provide a detail Arc Flash PPE label based on the results of the study and mount these Arc Flash labels on the inner door of the equipment.

1.02 RELATED SECTIONS

1.03 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems

2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis

4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings

5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems

6. IEEE 1584 – Guide for Performing Arc-Flash Hazard Conditions

B. American National Standards Institute (ANSI):

1. ANSI C57.1200 – Standard General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers

2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis

4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

C. The National Fire Protection Association (NFPA)

1. NFPA 70 – National Electrical Code, latest edition

2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.04 SUBMITTALS FOR REVIEW/APPROVAL

A. The short-circuit and protective device coordination studies shall be submitted to the Design Engineer prior to receiving final approval of the distribution equipment shop drawings and prior to release of equipment drawings for manufacturing.

1.05 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. Quantities of copies shall be per shop drawing quantities. Copies of the short-circuit input and output data shall be provided on CD in PDF format.

B. The report shall include the following sections:

1. Executive Summary

2. Descriptions, purpose, basis and scope of the study

3. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties.

4. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip unit settings, fuse selection.

5. Fault current calculations including a definition of terms and guide for interpretation of the computer printout.

6. Details of the incident energy and flash protection boundary calculations.

7. Recommendations for system improvements, where needed.

8. One-line diagram in AutoCAD format.

C. Detailed non-generic arc flash labels shall be provided fro all new equipment.

1.06 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be a full-time employee of the equipment manufacturer or an approved Engineering firm.

C. The equipment manufacturer or approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analysis it has performed.

1.07 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) software program.

1.08 SYSTEM STUDY PROVIDER

A. The system study provider shall be provided by Eaton, Square D, General Electric, Paul Lawrence or other approved equal.

PART 2 – PRODUCT

2.01 STUDIES

A. Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer or an approved Engineering firm.

B. The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E – Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D.

2.01 DATA COLLECTION

A. Contractor shall furnish all data as required by the power system studies. The system study Engineer performing the short-circuit performing the short-circuit protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source contributions shall include present and known future motors and generators.

C. Load data utilized shall include existing and proposed loads. Field investigation shall be required by the Contractor to obtain existing loads.

D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data to satisfy the study requirements.

E. Contractor shall coordinate with the power company to obtain the utility fault current. Contractor shall verify the fault current data on the drawings.

2.02 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

A. Use actual conductor impedances.

B. Transformer design impedances shall be used when test impedances are not available.

C. Provide the following:

1. Calculation methods and assumptions

2. Selected base per unit quantities

3. One-line diagram of the system being evaluated

4. Source impedance data, including electric utility system and motor fault contribution characteristics.

5. Tabulations of calculated quantities.

D. Results, conclusions and recommendations. Calculate short-circuit momentary and interrupting dies for a three-phase bolted fault at each applicable location. Locations shall include the following unless otherwise noted in the specifications or indicated in the drawings.

1. Electric utility's supply termination point

2. Incoming switchgear

3. Unit substation primary and secondary terminals.

4. Low voltage switchgear

5. Motor control centers

6. Standby generators and automatic transfer switches

7. Branch circuit panelboards

8. Other significant locations throughout the system

E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

F. Protective Device Evaluation:

1. Evaluate all applicable equipment and protective devices and compare to short circuit ratings.

2. Address adequacy of switchgear, motor control centers and panelboard bus bars to withstand short-circuit stresses.

3. Notify Owner in writing of existing circuit protective devices improperly rated for the calculated available fault current.

2.03 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and if applicable, tap, time delay and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:

1. Electric utility's overcurrent protective device.

2. Medium voltage equipment overcurrent relays.

3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance and damage bands.

4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.

5. Transformer full-load current, magnetizing inrush current and ANSI through-fault protection curves.

6. Conductor damage curves.

7. Ground fault protective devices, as applicable.

8. Pertinent motor starting characteristics and motor damage points, where applicable.

9. Pertinent generator short-circuit decrement curve and generator damage point.

10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.04 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E-2004, Annex D.

B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, bus way and the like) where work could be performed on energized parts.

C. The Arc Flash Hazard Analysis shall include all significant locations on 480 volt, 240 volt and 208 volt systems.

D. Safe working distances shall be based upon the calculated arc flash boundary considering incident energy of 1.2 cal/cm^2.

E. When appropriate, the short circuit calculations and the clearing of the phase overcurrent devices will be retrieved from the short-circuit and coordination study

model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

1. Fault contribution form induction motors should not be considered beyond 3-5 cycles.

2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

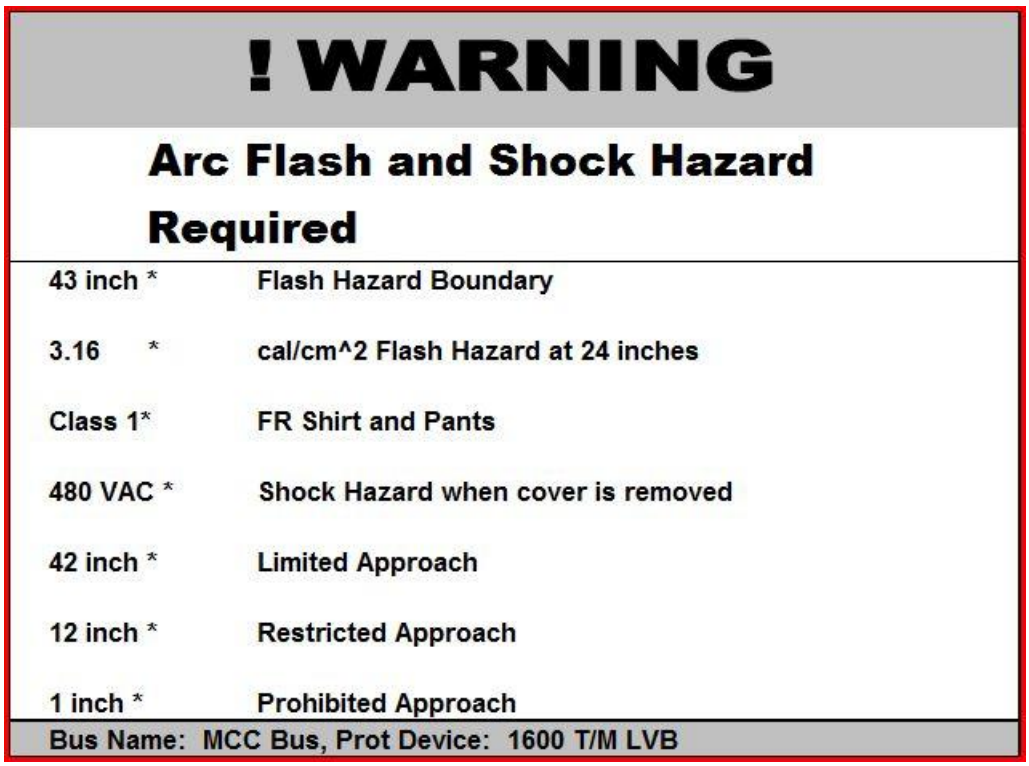
H. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

I. When performing incident energy calculations on the line side of a main breaker as required per above, the line side and load side contributions must be included in the fault calculation.

J. Miscoordination shall be checked among all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 Section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

K. Detailed Personnel Protective Equipment Warning Label

Example:



! WARNING	
Arc Flash and Shock Hazard Required	
43 inch *	Flash Hazard Boundary
3.16 *	cal/cm^2 Flash Hazard at 24 inches
Class 1*	FR Shirt and Pants
480 VAC *	Shock Hazard when cover is removed
42 inch *	Limited Approach
12 inch *	Restricted Approach
1 inch *	Prohibited Approach
Bus Name: MCC Bus, Prot Device: 1600 T/M LVB	

* The above is example data to be replaced by the study results data.

2.05 REPORT SECTIONS

A. Input data shall include, but not be limited to the following:

1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum). Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, kVA rating, impedance, % taps and phase shift.

2. Reactor data, including voltage rating and impedance.

3. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X”d), rated MVA rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.

4. Motor contribution data (induction motors and synchronous motors), including short-circuit reactance, rated horsepower or kVA, rated voltage and XR ratio.

B. Short-Circuit Output Data shall include, but not be limited to the following reports:

1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

a. Voltage

b. Calculated fault current magnitude and angle

c. Fault point X/R ratio

d. Equivalent impedance

2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

a. Voltage

b. Calculated symmetrical fault current magnitude and angle

c. Fault point X/R ratio

d. Calculated asymmetrical fault currents\

3. Equivalent impedance Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

a. Voltage

b. Calculated symmetrical fault current magnitude and angle.

c. Fault point X/R ratio

d. No AC Decrement (NACD) Ratio

e. Equivalent impedance

C. Recommended Protective Device Settings:

1. Phase and Ground Relays:

a. Current transformer ratio

b. Current setting

c. Time setting

d. Instantaneous setting

e. Recommendations on improved relaying systems, if applicable.

2. Circuit Breakers:

a. Adjustable pickups and time delays (long time, short time, ground)

b. Adjustable time-current characteristic

c. Adjustable instantaneous pickup

d. Recommendations on improved trip systems, if applicable.

D. Incident energy and flash protection boundary calculations

1. Arcing fault magnitude

2. Protective device clearing time

3. Duration of arc

4. Arch flash boundary

5. Working distance

6. Incident energy

7. Hazard Risk Category

8. Recommendations for arc flash energy reduction

PART 3 – EXECUTION

3.01 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Notify Owner in writing of any required equipment modifications.

3.02 ARC FLASH WARNING LABELS

A. The study provider of the Arc Flash Hazard Analysis shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed. Labels shall be installed by the Contractor.

B. The label shall be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the Owner and after any system changes, upgrades or modifications have been incorporated in the system.

C. The label shall include the following information, at a minimum:

1. Location designation

2. Nominal voltage

3. Flash protection boundary

4. Hazard risk category

5. Incident energy

6. Working distance

7. Engineering report number, revision number and issue date.

D. Labels shall be machine printed, with no field markings.

E. Unless otherwise indicated on the drawings or noted in the specifications, existing equipment shall not be provided with arch flash labels.

F. Arc flash labels shall be provided in the following manner and all labels shall be provided as applicable.

1. For each 480, 240 and applicable 208 volt panelboards, one arc flash label shall be provided per panel.

2. For each motor control center, one arc flash label shall be provided.

3. For each low voltage switchboard, one arc flash label shall be provided.

4. For each switchgear, one arc flash label shall be provided.

5. For medium voltage switches, one arc flash label shall be provided.

6. Control Panels, one arc flash label shall be provided.

G. Labels shall be field installed by the Contractor.

3.03 ARC FLASH TRAINING

A. The Contractor of the Arc Flash Hazard Analysis shall train the Owner’s qualified

electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

END OF SECTION 16345

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish all engineering, labor, material and equipment to furnish, install, adjust, test, document and start-up all process instrumentation and control equipment and controls as shown on the drawings and specified herein, complete.

B. The process instrumentation and control system specified herein shall be a complete system.

C. Like items of equipment provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, operation and maintenance.

D. See Contract for Construction and Division 1, GENERAL REQUIREMENTS, which contain information and requirements which apply to the work specified herein and are mandatory for this project.

E. The RTU system shall be provided as a sub-system to the pump control panel.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 16050 – Electrical General Provisions.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ISA Standards and Practices for Instrumentation – Current Edition.

B. Control panels shall meet U.L. 698A specification and must be built by a U.L. approved shop.

C. NFPA 820.

1.04 DEFINITION

A. The instrumentation and control (I&C) subcontractor shall be a single firm, under the direct contract and direction of the Contractor. The I&C subcontractor shall assume complete responsibility for the engineering, furnishing, technical advice on, certification as to correctness of installation, final connections to, adjusting, documenting, testing and startup of the process instrumentation and control system shown and described in these Contract Documents. The I&C subcontractor may have the electrical subcontractor make final connections of the I&C system, but the I&C subcontractor shall be fully responsible for these connections.

B. Contractor, as distinct from the I&C subcontractor, shall provide all additional materials and labor necessary to supplement the materials and labor provided by the I&C subcontractor as necessary to satisfy the requirements of this project.

C. System acceptance shall be defined as the point in time when:

1. All submittals and documentation have been submitted, reviewed and accepted.

2. The complete system of instrumentation and controls has successfully completed all testing requirements specified herein.

3. All city's staff personnel training has been completed.

1.05 SYSTEM INSTALLATION RESPONSIBILITY

A. The Contractor shall be ultimately responsible for the complete and proper installation of the process instrumentation and control system. The General Contractor shall either include installation within the scope of the I&C subcontractor's contract or shall provide for the installation by an experienced I&C installer, acceptable to Engineer.

B. The Contractor shall include in his bid the services of Data Flow Systems inc (DFS) for all RTU related hardware, upgrades and software modifications to the existing City's central RTU and SCADA computer systems. Only the authorized personnel from DFS shall be allowed to provide modifications to the City's existing DFS RTU SCADA system as required. The services of DFS personnel shall include the configuration, testing and startup phase of the I&C Construction services.

C. DFS shall work as Subcontractor to I&C. I&C shall have full responsibility.

1.06 SUBMITTALS

A. Submittals shall be in accordance with Section 01300 – Submittals.

B. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all controllers, recorders, indicators, transmitters, primary elements, flow measuring equipment and appurtenances, floats, pressure regulating valves, gauges and all other components of the system shall be provided.

C. Individual data (or specification) sheets shall be provided under this section. The purpose of these data sheets is to supplement the generalized catalog information provided by citing all specific features for each specific component (e.g.: scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown on the Drawings and Specifications.

D. Catalog information on all electrical devices furnished under this section.

E. Shop Drawings and catalog material for all control panels and enclosures.

F. Panel elementary diagrams of prewired panels. Diagrams shall be similar to those diagrams shown on the Drawings, but with the addition of all switched analog signals and all auxiliary devices such as relays, alarms, fuses, lights, fans, heaters, etc. Drawings shall include all terminal numbers.

G. Interconnecting wiring diagrams, showing all component and panel terminal board identification numbers and external wire numbers. This diagram shall include all intermediate terminations between field elements and panels (e.g., terminal junction boxes,

motor control centers, etc.). This diagram shall be coordinated with the Electrical Subcontractor and shall bear his mark showing that this has been done. Diagrams, device designations, and symbols shall be in accordance with NEMA ICA 1-101.

H. A tabulation of steady state air consumption of each pneumatic instrument (as applicable).

I. Loop diagrams, which shall consist of an individual wiring and/or plumbing diagram for each analog loop showing all terminal numbers, the location of the dc power supply, the location of any booster relays or common dropping resistors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus the following requirements: each loop diagram shall be divided into three areas for identification of element locations: panel face, back-of-panel, and field, respectively. On each diagram present a tabular summary of: (a) the output capability of the transmitting instruments, (b) the input impedance of each receiving instrument, (c) an estimate of the loop wiring impedance based on the wire sizes and lengths shown, (d) the total loop impedance, and (e) reserve output capacity. Loop diagrams shall be on individual 8-1/2-inch by 11-inch or 11-inch by 17-inch drawings.

J. Systems testing, calibration and adjustment procedures along with the proposed calibration, adjustment and check-out forms for this project.

K. Operation and maintenance manual including operating and maintenance information and specifications for all components specified under this Section. Submitted literature shall be of sufficient detail so as to facilitate the operation, removal, installation, adjustment, calibration and maintenance of each component specified in this Section. O&M Manuals shall include internal wiring diagrams for all panels. Wiring diagrams shall show all terminal block number designations and wire numbers.

L. The I&C subcontractor shall submit one set of as-built Drawings on reproducible mylars of all process and instrumentation diagrams. P&ID's shall be same format as in Contract Documents.

M. All test results, system calibration and adjustment settings shall be submitted to ENGINEER for review prior to the introduction of current to the system of individual components.

1.07 QUALITY ASSURANCE

A. The Contractor's attention is directed to the fact that the instrumentation and control functions result in an integrated system. Therefore, it is the intention of this specification that all controls and instruments including panel assemblies, telemetry systems, computer hardware and computer software will be provided, furnished, assembled and shipped, along with installation supervision, inspection and start-up by one Instrumentation Subcontractor which has a minimum of five (5) years of experience on installations of similar complexity even though individual control and instrumentation components may be the standard products of separate manufacturing companies.

B. Since many control items and instrumentation devices involve the assembly and interlocking functions of many individual parts, solenoids, pressure switches, timing relays, relays, switches, push buttons, contacts, dials, etc., the functional system descriptions contained herein are given to allow the Instrumentation Subcontractor to choose the proper components and to assemble them so as to provide a rugged, low maintenance, easy

cleaning, reliable mechanism suitable for the temperature, salt spray and humidity conditions of the Southeast Florida coastal area and which will perform the described function(s).

C. All of the equipment furnished by the Instrumentation Subcontractor shall be the latest and proven design. Specifications and Drawings call attention to certain features, but do not assume to cover all details entering into the design of the instrumentation system. The completed system shall be compatible with the functions required and the equipment furnished by the Contractor.

1.08 SEQUENCING AND SCHEDULING

A. Every effort shall be made to minimize interference with the Owner's existing plant operation. Should any shutdown, total or partial, be required, it shall be scheduled and coordinated with the Owner and his approval must be obtained prior to the shutdown.

B. The I&C subcontractor shall obtain from the Contractor the required information on those primary elements, valves, valve actuators and other control equipment or devices that are required to be interfaced with, but are not provided within the context of this section.

C. The I&C subcontractor shall coordinate his work with the Contractor to ensure that all components provided under this section are properly installed; the proper type, size and number of control wires and conduits are provided and installed; the proper type, size and number of pneumatic tubes with their conduits are provided and installed and proper electrical circuits are provided for all components and systems.

1.09 DELIVERY, STORAGE AND HANDLING

A. Proper shipping, storage and handling procedures shall be followed as recommended by the equipment Manufacturer and as specified herein.

B. All parts shall be properly protected so that no damage or deterioration will occur during shipment, normal unloading, storage and installation.

C. All equipment and parts must be properly protected against any damage during a prolonged storage period at the site. Proper job site storage is the responsibility of the Contractor.

D. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer. This provision shall not apply if the items are too large to be shipped in a completely assembled condition.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.10 WARRANTY

A. The Manufacturer and Contractor shall warrant the equipment being supplied to the Owner

against all defects in workmanship and materials for a period of one (1) year. Warranty period shall commence on Substantial Completion date as outlined in the General Conditions. Warranties for all equipment installed under this contract shall run concurrently.

B. The Manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision shall be allowed. The Contractor shall be responsible for proper storage of the equipment so as to remain in an "as shipped" condition. If the equipment remains in storage at the job site for longer than six (6) months, before installation, the Contractor shall provide factory service personnel for a complete inspection of the equipment. Any work necessary to restore the equipment to an "as shipped" condition will be the responsibility of the Contractor.

1.11 SPARE PARTS

A. Furnish the manufacturer's recommended spare parts including at least the following:

1. One (1) plug-in relay of each type provided.

2. One (1) time delay relay of each type provided.

3. One (1) carton of indicator lights of each color provided.

4. One (1) current transducer of each type provided.

5. One (1) panel and field signal surge arrestor of each type provided.

6. One (1) signal isolator of each type provided.

7. Five (5) fuses of each type used.

B. All parts shall be furnished in containers which are clearly marked and identified as to the contents.

C. One (1) spare DFS CTU controller unit shall be included in the spare parts turned over to the Owner.

D. One (1) spare DFS RTU battery shall be included in the spare parts.

1.12 TEST PROCEDURE DEVELOPMENT AND DOCUMENTATION

A. I&C subcontractor shall prepare and submit to the Engineer for review, a detailed description of the test procedures that he proposed to perform to demonstrate conformance of the complete system of instrumentation and controls to this Specification.

B. It is recommended that the I&C subcontractor develop the test procedures in two steps by first submitting general descriptions and outlines of the tests and then, upon receipt of approval, submit the required detailed procedures and forms.

C. Operational Acceptance Tests

1. The I & C subcontractor shall prepare check-off sheet(s) for each loop and an instrument calibration sheet for each active I & C element (except simple hand switches, lights, etc.). These check-off and data sheets shall form the basis for these operational tests and this documentation.

2. Each loop check-off sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the completed loop by the I & C subcontractor:

    a. Project name;

    b. Loop number;

    c. For each element: Tag number, description, manufacturer and model number, installation bulletin, and Specification sheet number;

    d. Loop description;

    e. Installation check;

    f. Termination check;

    g. Calibration check;

    h. Adjustment check;

    i. Space for comments;

    j. Space for loop sign-off by I&C subcontractor and date.

3. Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit by the I&C subcontractor:

    a. Project name;

    b. Loop number;

    c. Tag number;

    d. Manufacturer;

    e. Model number;

    f. Serial number;

    g. Calibration range;

    h. Calibration data: Input, output, and error at 10 percent, 50 percent and 90 percent of span;

i. Switch setting, contact action, and dead band for discrete elements;

j. Space for comments;

k. Space for sign-off by I&C subcontractor and date.

D. Functional Acceptance Tests

The I & C subcontractor shall prepare two types of test forms as follows:

1. For those functions that can be demonstrated on a loop-by-loop basis, the form shall include:

   a. Project name;

   b. Loop number;

   c. Loop description;

   d. Test procedure description;

   e. For each component: Tag number, description, manufacturer, and data sheet number;

   f. Space for sign-off and date by both I & C subcontractor and Engineer

2. For those functions that cannot be demonstrated on a loop-by-loop basis, the test form shall be a listing of the specific tests to be conducted. With each test description the following information shall be included:

   a. Spec page and paragraph of function demonstrated;

   b. Description of function;

   c. Space for sign-off and date by both I & C subcontractor and Engineer.

PART 2 PRODUCTS

2.01 GENERAL

A. The process instrumentation and control system shall provide all of the functions as described hereinafter for each loop and as shown by the electrical Drawings. Major equipment items are specified for each loop. However, it shall be the responsibility of the I&C subcontractor to provide all items of equipment, whether indicated or not, that are necessary to effect the required loop performance.

B. Display and control loops are shown on the Drawings.

C. Control panel shall be provided with a U.L. label and manufactured by a U.L. 698A panel manufacturer. Panel manufacturer shall submit proof of current enrollment in the U.L.'s

custom builder's program.

D. Process instrumentation and control systems shall be manufactured and provided by CC Control Corporation, Champion Controls, or equal.

E. All RTU hardware modifications and programming required at existing central RTU/SCADA computers shall be carried out by the authorized personnel of Data Flow Systems of Florida, DFS Inc, no equal. The Contractor is responsible to include in its bid the services of Data Flow Systems Inc.

2.02 UNIT PROCESS – WASTEWATER PUMPING

A. Functions:

1. Monitor phase of normal and emergency power supply. When any power leg is out of phase, indicate phase failure and stop pumps.

2. Provide Hand/Off/Auto control for submersible wastewater pumps. Operation is same for each pump. In Hand mode, pump runs. In Off mode, pump will not run. In Auto mode, pump runs when called by RTU with input by the bubbler system. There is a level transducer instrument being used to provide wetwell continuous level, but also to control the pumps if selected via a selector switch. The Bubbler system will act as a backup to the level transducer instrument in the event this fails.

   When the bubbler is operating the pumps it will provide backup pump control based on a time delay relay setting. High level condition to start and run command in event level instrument fails. Adjustments for start and stop levels to be performed in field. Provide time delay relay, TDR, to stagger pump starts in override operation. Under bubbler control lead pump will run first, followed by lag pump. This station is equipped with two (2) pumps, the pumps will run alternate and run one at any as called out by the pump controller based on the chosen sensor (bubbler or level transducer). The controller shall be configured for duplex operation of lead and lag pump alternating which pump gets called first, but depending on wetwell high demand periods the 2nd or lag pump shall be called to run in addition to the first or lead pump during such periods. The DFS system shall include hardware and programming to monitor pump fault and remove from the alternation sequence a pump with a fault condition; include in the programming an option to place pump out of service and also to place pump back in service either manually, or whenever a pump fault is cleared.

3. Monitor pump amps through the pump current transducers, provide these signals to the RTU.

4. Provide test/normal selector switch where called for on the controls.

5. Receive at control panel a discrete signal on high level in wetwell and indicate high level visually at control panel. Provide pushbutton reset to silence audible alarm.

6. Provide continuous 4-20 mA DC signal to RTU, corresponding to pump station level

based on bubbler line.

7. Provide a continuous 4-20mA DC signal to the RTU, corresponding to the wetwell Blue ribbon level transducer instrument.

8. Provide continuous 4-20 mA DC signal from AE/AIT for the combustible gas Detector to LS control panel/RTU.

9. Provide an intrinsically safe flush diaphragm level transmitter as manufactured by Wika, model IS-21-S family. Transmitter shall be a 4-20mA, 2 wire loop device. Transmitter to be installed to read from bubbler line. Furnish 24Vdc power supply, Square D or equal for transmitter.

10. Provide a flush diaphragm level transmitter as manufactured by Wika, model S10 family. Transmitter shall be a 4-20mA, 2 wire loop device. Transmitters to be installed to monitor potable water system pressure on potable water line pipe as indicated on drawings; provide a separate Wika pressure transmitter to monitor the water pressure on the reuse water line pipe adjacent to control panel, see drawings. Furnish 24Vdc power supply, Square D or equal for transmitter.

11. Provide a continuous flow signal of the waste water flow from the station via a Rosemount 8750WDMW series mag-meter flow meter in discharge flow monitoring vault, the magmeter shall be compatible with the city of Wilton Manors standards, see drawings.

12. Provide fluorescent courtesy light, convenience outlet, motor starters, all indicated breakers, lightning arrestor and surge capacitor.

13. Provide analog and discrete status, alarm, and continuous signals to RTU from field devices and LS CP equipment as called out in these specifications and on the drawings.

2.03 RTU

A. Contractor shall provide a complete new RTU system with PLC. Unit shall include a DFS modular TCU 800 controller built built-in RTU radio interface compatible with the city's DFS TACII system; digital and analog I/O monitor and pump control terminal shall be included, along with a DFS RIO-32 expansion I/O module board as required per the drawings and specifications, include power supply and RTU surge protection as indicated on the drawings and as needed per DFS CTU and RIO 32 board power requirements. Provide RTU battery along with the extended deep cycle battery by the RTU tower; a complete antenna subsystem which includes the ROHN tower assembly with mast and yagi antenna, concrete base; coaxial cable and coaxial surge arrestor; Power supply for 4-20mA powered loops as required; the RTU/CTU system shall be included inside the lift station control panel. Provide all support components as needed to a fully working RTU system.

C. RTU antenna system shall meet the Florida building code, latest wind loading requirements. Contractor shall submit signed and sealed shop drawings proving that wind loading is met.

D. Contractor shall test new control system with related I/O. Coordinate all testing and startup

with Data Flow Systems.

E. All normal pump down control logic shall reside in the RTU. All pump control and field signal modifications in the RTU shall be carried out by DFS personnel, under the Contractor's bid.

F. The Contractor shall provide programming for the pump's lead-follow pump down logic with alternation on the off level. Contractor shall include additional requirements as directed by the Owner and the normal features per the latest requirements and lift station standards from the Owner.

G. Provide programming, by DFS personnel, of the Owner's central RTU station to have all pump operation and alarms, status, and field instrument readings available at the Owner's central station RTU/SCADA. Provide all additional I/O needed at the Owner's central station and provide modifications to their existing SCADA to implement all Lift station elements as called out in the Contract Drawings.

2.04 COMBUSTIBLE GAS DETECTOR

A. The Combustible Gas Detector shall be a Sensalert detector with built-in 4-20mA transmitter, as manufactured by Sensidyne Inc, or an approved equal. The detector shall be furnished in a NEMA 4X housing with built-in LCD readout indicating the percent gas concentration as detected by the sensor. Provide a sensor cable with the proper length to reach from the sensor in the wetwell to the indicating transmitter adjacent to the control panel. Provide field signal surge suppressor; provide power as required for transmitter. Provide all 316 SS mounting hardware and indicating transmitter sensor housing as required.

2.05 LEVEL/PRESSURE TRANSMITTER

A. The Level/Pressure transmitters shall be a bird cage blue ribbon level transducer, model and type as indicated on the drawings, coordinate with Engineer.

B. Provide instrument calibration data during after installation.

C. Provide additional components, as required, including but not limited to: terminals, impulse piping, signal panel surge arrestors (PSA), signal field surge arrestors (FSA).

2.06 FLOW METER - MAGMETER

A. The Flow Meter shall be an electromagnetic type suitable for direct burial and submersible. complete with a remote mount signal converter. Signal converter shall provide a 4-20 mA output corresponding to flow in gpm. Meter size and flow range shall be as indicated on the drawings and specified herein.

B. Provide additional components, as required, including but not limited to: terminals, impulse piping, power supplies, signal panel surge arrestors (PSA), signal field surge arrestors (FSA), transient voltage surge suppressors (TVSS), etc.

B. Sensor Electronics shall be remotely mounted from the flow tube. Electronics shall be provided loose for integration into the field panel. Provide manufacturer's cable length as required. Unit shall provide digital indication of current (GPM) and total flow (gal x1000) concentration as detected by the sensor. Refer to drawings for stanchion mount of transmitter readout portion of instrument.

C. Flow tube shall be stainless steel with 150lb stainless steel flanges. Tube shall be NSF fusion bonded epoxy lined. Tube shall be rated for 150 psi maximum working pressure.

D. Provide type 316 stainless steel grounding rings.

E. Provide magnetic flow meter calibration report after installation. Hydraulically calibrate meter in accordance with Mil-Std-45662A and ANSI/Z540.

F. Flow meter shall be rated for waste water use. Provide a Rosemount 8750WDMW series, flanged tube, ultra mag meter, as manufactured by Rosemount, or an approved equal to meet the city current standards.

2.07 LIMIT SWITCH

A. The limit switches shall be Allen Bradley, explosion proof, or approved equal.

2.08 CONTROL PANEL MISCELLANEOUS ELECTRICAL

A. Circuit Breakers

1. Square D

2. Amperage Ratings shall be as indicated on drawings

3. Interrupting ratings shall be as indicated on drawings.

4. MCB and ECB shall be furnished with an auxiliary contact.

B. Fuses

1. Bussman 600 volt, dual element type.

C. Control Relays

1. Control relays shall be programmable.

2. Omron or equal.

D. Indicator Lights

1. Square D trans type 6 volt, class 9001, Type K, push to test, or equal.

2. Lens color shall be as noted.

E. Selector Switches

1. Square D, Class 9001, Type K or equal.

2. Operators shall be black knob type or key switch, 3-position or 2-position, as noted.

3. Selector switches shall be spring return where noted.

F. Pushbuttons

1. Square D Class 9001, Type K, pushbutton or equal.

G. Elapsed Time Meter

1. Hour meter, non-reset type, Cramer 635K, or equal.

H. Ground Fault Duplex Receptacle

1. Leviton Duplex receptacle or equal.

2. AC receptacle box shall be Steel City 58351-1/2 or equal.

3. Covers shall be Steel City 58-C-5 or equal.

I. Motor Starter

1. Square D 8536 motor starters with NEMA rated contactors, minimum size 4 or as called out in the drawings. Provide overload blocks with overloads as required.

2 Provide auxiliary contacts as required.

3. Reset buttons Square D 9066-RA1, or equal.

J. Signal Isolation

1. Signal isolator shall be plug-in type.

2. Wilkerson or equal.

K. Phase Monitor

1. Diversified or equal with auto reset.

L. Surge and Lightning Arrestors

1. All control panels shall be provided with surge and lightning arrestors as specified.

2. Control Panel Surge Suppressor

a. Lightning surge suppressors shall be Edco, 15kA or equal.

b. Surge arrestor shall be GE Tranquell, 9L15FCB001.

3. Signal

a. Panel surge suppressors (PSA) shall be Edco PC 642C Series, 2 channel or equal.

b. Field surge suppressors (PSA) shall be Edco SS64 Series, pipe style or equal.

a. Power
a. ATP match Owner's standard.

M. Generator Receptacle, match Owner's standard, base bid on the following:

1. Amperage rating shall match Owner's standard; base bid based on 200 amp unit.

2. Coordinate with Owner before submitting shop drawing for exact model number.

N. Control Panel LED Lamp

1. 8 watt, 120V, 12", or equal.

2. LED Fixture, Phillips, or equal.

3. Provide handy box with light switch.

O. High Level Alarm Light

1. Red, 120V, Major, CVP10R, or equal.

2. Alarm light guard, Major, VGD-1, or equal.

P. Flasher

1. 90 FPM, 120V.

2. SSAC, FS127, or equal.

3. Alarm Horn

Q Ground Lug

1. #1/0 Wire Ilsco AU-O, or equal.

R. Magnetic Door Switch

1. Simplex, UL listed, magnetic flush or surface mounted contact and magnet.

Contacts shall be hermetically sealed.

2. Edwards, Model #61 or equal.

S. Intrinsically Safe Relay

1. Intrinsically safe relays shall be Gems SAF-PAK or equal.

2. Furnish additional intrinsically safe relays per pump manufacturer.

T. Time Delay Relays

1. Time delay relays shall have programmable with adjustable ranges, DIP switch settable.

2. Omron or equal

U. Pressure Gauge

1. Provide an analog pressure gauge.

V. Bubbler System Air Compressor System

1. Provide a 120 V air compressor along with pressure regulator, needle valves, pressure switches and copper tubing and valves as required; coordinate with City for latest standard requirements.

2. Provide a backup air compressor and pump.

W. Pump Motor Ground Fault Monitor

1. Provide a ground fault monitor system at each pump motor power feeder. Monitor shall be capable of disabling each motor starting logic. Provide all additional logic and pilot devices required to stop motor starter in event of a ground fault in pump motor/pump motor cable. Refer to control panel schematic for details.

X. Pump Current Transducer.

1. Provide a current transducer for each pump power circuit. Coordinate with City and DFS personnel for type and model required. Each pump transducer shall provide a 4-20mA output to be connected to RTU for control/monitoring of the pumps.

2.09 CONTROL POWER TRANSFORMER

A. Square D, Type KF, Class 9070

2.10 FIELD PANEL CONSTRUCTION

A. Field panels shall be UL listed, NEMA 3R, Type 316 Stainless Steel enclosure with padlockable draw latches or 3-point padlockable handles conforming to the requirements of

the National Electrical Manufacturer's Association.

B. The panel shall conform to the following requirements:

1. Minimum metal thickness shall be 12-gauge.

2. All doors shall be rubber-gasketed with continuous hinge.

3. Provide type 316 stainless steel drip shield.

4. Provide aluminum dead front panel for component mounting as shown on drawings.

5. Cabinets shall be mounted as indicated on drawings.

6. Print pocket and one (1) set of reduced drawings shall be provided on interior side of door.

7. Minimum overall dimensions shall be as indicated by drawings.

C. Control Panel shall be as manufactured by EK Phelps, CC Control Corp. no equal.

2.11 PANEL ELECTRICAL

A. Wiring

1. All electrical wiring shall be in accordance with the applicable requirements of Division 16 – Electrical. Wires shall be 600-volt class, PVC insulated stranded copper and shall be the sizes required for the current to be carried but not below 14 AWG enclosed in either sheet metal raceway or plastic wiring duct. Wiring for signal circuits shall be twisted shielded pairs not smaller than No. 18 AWG, and be separated at least 6 inches from any power wiring.

2. All panel wiring shall be labeled with T&B Shrink-Kon HVM marker system.

3. All wires shall be run in plastic wire ways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring run from components on a swing-out panel to components on a part of the fixed structure, (4) wiring run to panel mounted components on the door and the like. Wiring run on a swing out panel to other components on a fixed panel shall be made up in nylon wire ties bundles and secured so that bundles are not strained at the terminals.

4. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon ties and secured to the inside face of the panel using adhesive mounts and adhesive strips.

3. Wiring to rear terminals on panel mounted instruments shall be run in plastic wares secured to horizontal brackets run above or below the instruments in the same plane as the rear of the instruments.

4. Shields of instrument cable shall only be grounded on one side of each circuit.

The side to be grounded shall be nearest the source of excitation.

5. Care shall be exercised to properly insulate the ungrounded side of the loop to prevent ground loops from occurring.

6. Conformance to the above wiring installation requirements shall be reflected by details shown on the shop drawings for the Engineer's review.

7. Wire Marking

   a. Each signal, alarm, control, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors using white plastic heatshrink sleeves with typewritten characters. Instrument signal conductors shall be tagged with unique multiple digit numbers. Wires from the circuit breaker panelboard shall be tagged indicating the branch circuit breaker number.

B. Terminal Blocks

1. Terminal blocks shall be on-piece molded plastic blocks with screw type terminals and barriers rated for 300 volts. Terminals shall be double sided. Terminals shall have permanent, legible identification.

2. Wires shall be terminated at the terminal blocks with crimp type, preinsulated, locking forked-tongue lugs. Lugs shall be of the appropriate size for the terminal block screws and for the number and size of the wires terminated.

3. Allow 20% extra terminals for spares.

C. Power Supplies

1. Provide dc power supplies as required to power instruments requiring external dc power.

2. Power supplies shall convert 120V ac, 60-Hz power to dc power of the appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that the instruments being supplied can operate within their required tolerances.

3. Output overvoltage and overcurrent protective devices shall be provided with the power supply to protect the instruments from damage due to power supply failure and to protect the power supply from damage due to external failure. Provide NEMA 1 enclosure for all power supplies. Power supplies shall be mounted such that dissipated heat does not adversely affect other components.

2.12 NAMEPLATES, NAME TAGS AND SERVICE LEGENDS

A. All components provided under this section, both field and panel mounted, shall be provided with permanently mounted name tags bearing the entire ISA tag number of the components. Panel mounted tags shall be plastic; field mounted tags shall be stamped stainless steel.

B. Circuit breakers and all dead front panel items shall be clearly labeled by name, not tag number. Nameplates are defined as inscribed laminated plastic plates mounted under or near a panel face mounted instrument. Service legends are defined as inscribed laminated plastic integrally mounted on a panel face mounted instrument.

C. Service legends and nameplates shall be engraved, rigid, laminated plastic. Service legends and nameplates shall be fastened to the panel by screws or with a specially applied adhesive. Fastening shall not depend only on the adhesive backing of the nameplate. Unless otherwise noted, color shall be black with white letters and letter height shall be 3/16-inch high characters.

D. All field mounted tags shall be 16-gauge, 304 stainless steel with 3/16-inch high characters.

E. Each panel shall be provided with a cabinet face mounted laminated nameplate as specified above. Unless otherwise noted, color shall be black with white letters ½-inch high.

PART 3 EXECUTION

3.01 GENERAL

A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance.

B. Electrical work shall be performed in compliance with these Specifications. Where these Specifications and the Drawings do not delineate precise installation procedures, API RP 550 shall be used as a guide to installation procedures.

C. Coordinate I&C work with the City, the Contractor and work of other trades to avoid conflicts, errors, delays and unnecessary interference with operation of the existing lift station during construction.

3.02 PROTECTION OF EQUIPMENT

A. Throughout this Contract, the Contractor shall provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Specific storage requirements shall be in accordance with the ENGINEER-reviewed I&C subcontractor's recommendations.

3.03 EQUIPMENT INSTALLATION

A. Field equipment and panels shall be mounted as shown by the drawings. Provide 316 stainless steel hardware for all panels, enclosures, and instruments to be mounted onto existing structures and new racks.

B. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between manufacturers' instructions, and these Contract Documents, follow Engineer's decision, at no additional cost to Owner. Keep copy of

manufacturers' instructions on the jobsite available for review at all times.

C. Where existing materials and equipment are removed or relocated, remove and deliver to the Owner all materials no longer used unless otherwise directed by the Engineer. Repair affected surfaces to conform to the type, quality and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given by the Engineer.

3.04 ELECTRIC CONTROL AND SIGNAL WIRING

A. Control and signal wiring external to the control panels and all power wiring shall conform to the requirements of Division 16 - Electrical.

B. Control and signal wiring in control panels shall be restrained by plastic ties or ducts. Hinge wiring shall be secured at each end so that any bending or twisting will be around the longitudinal axis of the wire and the bend area shall be protected with a sleeve.

C. Arrange wiring neatly, cut to proper length and remove surplus wire. Provide abrasion protection for any wire bundles which pass through holes or across edges of sheet metal.

D. Wiring shall not be spliced or tapped except at device terminals or terminal blocks.

E. Panels and panel mounted equipment shall be assembled as far as possible at the I&C subcontractor's plant. No work, other than correction of minor defects or minor transit damage, shall be done on the panels at the job site.

F. I&C subcontractor shall observe and advice on the installation to the extent required to certify in writing that the equipment will perform as required.

3.05 MANUFACTURER'S SERVICES

A. The supervisory services of a factory-trained person who is specifically trained on the type of equipment herein specified shall be provided for a period of not less than one (1) eight (8)-hour day during construction to assist the Contractor in the location of sleeves; methods of installing conduits and special cable; mounting, piping and wiring of one of each type of device and the method of protecting all of the equipment prior to placing it into service. Upon completion of the installation, the services of the above service engineer shall be provided for a period of not less than one (1) eight (8)-hour day for calibration and start-up of the equipment and instructing the operating personnel. The minimum days specified above does not relieve the Instrumentation Subcontractor from providing sufficient service to place the system into satisfactory operation.

B. No form of energy shall be turned on to any part of the instrumentation system prior to receipt by the Engineer of a certified statement of approval of the installation from the Contractor containing his supplier's authorization for energizing the system.

C. A factory trained service person shall be provided for placing the system into operation. After the system is being operated by the Owner's personnel, the service engineer shall return for a one-day instruction course in the maintenance and operation of the system.

D. All instrumentation shall be calibrated in the presence of the Engineer in accordance with

the range and accuracy specified herein. Certified test reports shall be filed with the Engineer.

3.06 TESTING

A. All elements of the Instrumentation and Control system shall be tested to demonstrate that the total system satisfies all of the requirements of this specification.

B. Include into the O&M manual all tests results, including loop checks with the electrician, and specific instruments requiring calibration, include calibration sheets.

C. All special testing materials and equipment shall be provided by the I & C Subcontractor. Where it is not practical to test with real process variables, the I & C subcontractor shall provide suitable means of simulation. These simulation techniques shall be subject to the approval of the ENGINEER.

D. The I & C Subcontractor shall coordinate all of his testing with the CONTRACTOR and all other associated subcontractors.

E. As a minimum, the testing shall include the following:

1. Factory Tests

a. All analog panels and panel assemblies shall be tested for proper operation at the I & C subcontractor's factory prior to the shipment of any system element to the site. Results of the factory tests shall e recorded and submitted for approval before shipment of any panel or panel assembly to the plant.

2. Operational Acceptance Tests

a. The objective of these tests is to demonstrate that the system of Process Instrumentation and Control is READY for final operation.

b. The I & C System shall be checked for proper installation, adjusted, and calibrated on a loop-by-loop basis to verify that it is ready to function as specified

c. All system elements shall be checked to verify that they have been installed properly and that all terminations have been made correctly.

d. All discrete elements and systems shall have their set points adjusted and shall be checked for proper operation (e.g., interlock functions, contact closure on rising/falling P.V., etc.).

e. All continuous elements and systems shall have three-point calibrations performed. All controller tuning constants shall be adjusted to preliminary settings.

f. The OPERATIONAL ACCEPTANCE TESTS shall be completed prior to

starting the FUNCTIONAL ACCEPTANCE TESTS. The actual testing program shall be conducted in accordance with prior approved procedures and shall be documented as required hereinafter.

3. Functional Acceptance Tests

   a. The objective of these tests is to demonstrate that the system of Instrumentation and Controls is operating and complying with the specified performance requirements.

   b. A witnessed, FUNCTIONAL ACCEPTANCE TEST shall be performed on the complete system of Instrumentation and Controls. Each function shall be demonstrated to the satisfaction of the ENGINEER on a loop-by-loop and/or paragraph-by-paragraph basis.

   c. The personnel of Data Flow Systems shall be hired to perform the RTU and Owner's SCADA system functional tests, and start up.

   d. Each test shall be witnessed and signed off by both the I & C subcontractor and the ENGINEER upon satisfactory completion.

   e. The actual testing program shall be conducted in accordance with prior approved procedures and shall be documented as required hereinafter.

   f. The I & C subcontractor shall notify the ENGINEER at least 2 weeks prior to the date of the FUNCTIONAL ACCEPTANCE TEST.

3.07 CLEAN-UP

A. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency and type of surface of the original finish.

END OF SECTION 16900